Year	Title	Author(s)
2009	LTPP Beyond FY 2009: What Needs to Be Done?	Federal Highway Administration
2009	Stochastic Modeling for Pavement Warranty Cost Estimation	Moynihan, Gary; Zhou, Hao; Cui, Qingbin
2009	Preserving and Maximizing the Utility of the Pavement Performance Database	Transportation Research Board
2008	Year in Review 2007	Federal Highway Administration
2008	Long-Term Pavement Performance Compliance with Department of Transportation Information Dissemination Quality Guidelines	Elkins, Gary E.
2007	Actual Applications of LTPP Data for Pavement Research and Management Purposes	Zaghloul, Sameh; Springer, Jack
2007	Year in Review 2006	Federal Highway Administration
	LTPP Ancillary Information Management System (AIMS)	
	LTPP Customer Support Service	
	ERD File Builder	
	Highway Community Exchange	
	LTPP DataPave Online	
	LTPP Standard Data Release (SDR)	
	LTPP Table Navigator	
2006	Assignments with Purpose: Using LTPP for Educating Tomorrow's Engineer	Tighe, Susan L.
2006	Guidelines for the Collection of Long-Term Pavement Performance Data	Simpson, A. L; Ostrom, B. K; Schmalzer, P. N.
2006	Improving Pavements with Long-Term Pavement Performance: Products for Today and Tomorrow. Papers from the 2003-2004 International Contest on Long-Term Pavement Performance Data Analysis	
2006	Long-Term Pavement Performance Maintenance and Rehabilitation Data Collection Guide	Simpson, Amy L; Thompson, Travis
2006	Long-Term Pavement Performance Inventory Data Collection Guide	Simpson, A. L; Copeland, C. R.
2006	Long-Term Pavement Performance Program (LTPP): Year in Review, 2005	
2005	Improving Pavements with Long-Term Pavement Performance: Products for Today and Tomorrow; Papers from the 2001-2002 International Contest on Long-Term Pavement Performance Data Analysis	
2005	Study of LTPP Pavement Temperatures	Lukanen, E. O;

		Stubstad, R. N; Clevenson, M. I.
2005	Use of the Long-Term Pavement Performance Database in the Pavement Engineering Curriculum	Buch, N; Chatti, K; Haider, S. W; Salama, H.
2004	Collection and Interpreting Long-Term Pavement Performance Photographic Distress Data: Quality Control- Quality Assurance Processes	Rada, G. R; Simpson, A. L; Hunt, J. E.
2004	Key Findings from LTPP Analysis 2000-2003	
2004	Long-Term Pavement Performance: Reference Library	
2004	LTPP: Year in Review 2003	
2004	LTPP: Year in Review 2004	
2004	Strategic Highway Research Program (SHRP) Activities in Connecticut	McDonnell, Anne-Marie H.
2003	DataPave Online: Improving Pavement Design Through Performance Data Analysis	
2003	LTPP Information Management System Pavement Performance Database User Guide	Elkins, Gary E; Schmalzer, Peter; Thompson, Travis; Simpson, Amy
2003	LTPP: 2002 Year in Review	
2002	Digging into LTPP Pavement Data	Torres, A. N; Sullivan, J. J.
2002	LTPP: Year in Review 2001	
2002	Using the Long Term Pavement Performance Database in Pavement Design Courses	Delatte, N. J.
2001	An Investment Benefiting America's Highways: The Long Term Pavement Performance Program	
2001	DataPave/LTPP International Contest	
2001	Fulfilling the Promise of Better Roads: A Report of the TRB Long-Term Pavement Performance Committee	
2001	Pavement Performance Data at Your Fingertips	Braswell, B.
2001	LTPP Product Plan	
2000	2000 Transportation Scholars Conference: Compendium of Papers, Iowa State University - November 16, 2000	
2000	Key Findings from LTPP Analysis 1990-1999	
2000	LTPP-Distress Due to Environments	Mantravadi, K. K.
2000	LTPP: 1999 Year in Review	
2000	Long Term Pavement Performance (LTPP): Year in Review 2000	
1999	Introduction to LTPP Data	
1999	LTPP Analysis: Putting the Data to Work	

1999	LTPP Program Now More Complete	Churilla, C.
1999	Products Bring LTPP Data to Agencies	Churilla, C.
1998	Canadian Strategic Highway Research Program (C-SHRP) Phase III Program Proposal 1999-2004	
1998	LTPP: The Next Decade	Churilla, C. J.
1998	LTPP: The Next Decade	
1997	-SHRP: Objectives, Achievements and Future Directions	Wells, S.
1997	Long-Term Pavement Performance Information Management System Data Users Reference Manual	Ostrom, B. K; Walker, D; Harris, S; Rowshan, S.
1997	Long Term Pavement Performance Program: Status Report	
1996	1996 Product Preview: The Long-Term Pavement Performance (LTPP) Program	
1996	SHRP Update	Scofield, L.
1996	SHRP/LTPP 1987-1992. Report from the Swedish Group Reviewing SHRP	
1996	Status of the Long Term Pavement Performance Program in the USA	Symons, M.G; Miller, J. S.
1994	Design Specifications and Implementation Requirements for State-Level Long-Term Pavement Performance Program	Saeed, A; Weissmann, J; Dossey, T; Hudson, W. R.
1994	Early Analyses of LTPP General Pavement Studies Data: Data Processing and Evaluation	Killingsworth, B. M., et al
1994	Long-Term Pavement Performance Information Management System: Five-Year Report	Hadley, W. O; Copeland, C.
1994	SHRP-LTPP Data Analysis Studies: Five-Year Report	Hadley, W. O.
1994	SHRP-LTPP General Pavement Studies: Five-Year Report	Hadley, W. O.
1994	SHRP-LTPP International Participation: Five-Year Report	
1994	SHRP-LTPP Overview: Five-Year Report	Hadley, W. O.
1994	SHRP-LTPP Specific Pavement Studies: Five-Year Report	Hanna, A. N; Tayabji, S D; Miller, J. S.
1994	Strategic Highway Research Program --Long-Term Pavement Performance Information Management System	Hadley, W. O; Copeland, C; Rowshan, S.
1993	Pacific Rim Trans Tech Conference Proceedings. Volume II. Long-Term Pavement Performance Program for Years 1992-1997: A Strategic Plan	Teng, P.
1993	Transfer of Research Results and Continuation of the Long-Term Pavement Performance (LTPP) Studies	

1992	Long-Term Pavement Performance at Year Five	Hawks, N. F.
1992	Missouri SHRP LTPP Monitoring Sections	
1991	Canada's Reaction to LTPP	Williams, G. J.
1991	Information Management System	Jamsa, H., et al
1991	Lessons to be Learned from the SHRP General Pavement Studies. Bituminous Roads in the 1990s. Seminar Papers. Dublin, 1 November, 1990	Hawks, N. F; Elkins, G. E.
1991	Long-Term Pavement Performance: Proceedings of the SHRP Midcourse Assessment Meeting	
1991	Proceedings of the Conference "Strategic Highway Research Program and Traffic Safety on Two Continents" in Gothenburg, Sweden, September 18-20, 1991, Part 6: Long-Term Pavement Performance	
1991	Strategic Highway Research Program	Kulash, D.
1990	Database Structure Reference Manual	
1990	Policy for Supplemental Test Sections on Specific Pavement Study (SPS) Sites	
1990	The SHRP Long Term Pavement Performance (LTPP) Program – Summary	Skok, E L; Ingberg, R. C.
1986	Understanding SHRP: Long-Term Pavement Performance	

Title: Year in Review 2006

Author(s): Federal Highway Administration

Date: January 2007

Publisher: Federal Highway Administration

Abstract/Synopsis:
Improving the productivity and mobility of the national highway transportation system are key goals of the Federal Highway Administration (FHWA). During 2006, FHWA's Long-Term Pavement Performance (LTPP) program worked toward these goals through its efforts to provide answers to "how" and "why" pavements perform as they do. To better understand pavement performance, the LTPP program gathers and processes data describing the structure, service conditions, and performance of 2,513 pavement test sections in North America. Highway engineers use these data and data analysis findings to help make decisions that lead to more cost-effective and better performing pavements. The LTPP program was designed as a partnership when it was initiated as a 20-year Strategic Highway Research Program (SHRP) project in 1987. The State and Canadian Provincial highway agencies, the American Association of State Highway and Transportation Officials, the Transportation Research Board (TRB), the Canadian Strategic Highway Research Program, and FHWA all continued to play key roles in helping the program achieve its goals in 2006. These partners stay informed about research results and other program activities through the LTPP Web site, e-mail newsletter, publications, meetings and workshops, industry trade associations, and professional societies. In 2006, the funding provided to the LTPP program by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was not adequate for meeting all of the program's needs. As a result, LTPP implemented a new operational plan to focus available resources on the most critical and time-sensitive issues. The primary priority program deliverable for LTPP in September 2009 will be a quality pavement performance database and supporting ancillary information along with a document warehouse that will enable researchers to better understand pavement performance. In collaboration with the TRB LTPP Committee, the LTPP program developed a framework for writing a post-2009 report, which will detail what needs to be done to secure the legacy of the LTPP program.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: Long-Term Pavement Performance Compliance with Department of Transportation Information Dissemination Quality Guidelines

Author(s): Elkins, Gary E.

Date: November 2008

Publisher: MACTEC Engineering and Consulting, Incorporated; Federal Highway Administration

Abstract/Synopsis: This document provides information on the compliance of the Long-Term Pavement Performance (LTPP) program with the guidelines the Department of Transportation (DOT) issued in the Information Dissemination Quality Guidelines (IDQG). These guidelines were developed in response to requirements of Section 515 of the Treasury and General Government Appropriations Act for fiscal year (FY) 2001. The purpose of the guidelines is to ensure and maximize the quality, utility, objectivity, and integrity of information that is disseminated by the Federal government. This document discusses the activities performed under the LTPP program, and it also addresses the policies and procedures established by these guidelines.

Application/Use: This document is directly applicable to those interested in LTPP data quality.

Contribution: Implementation/Usage

Present Benefit: The LTPP program is a large investment with numerous benefits; quality control checks at various levels are utilized to protect this investment and to capitalize on the benefits generated by this program. The compliance of the LTPP program with the IDQG is significant and demonstrates the effectiveness of LTPP QC/QA abilities.

Future Benefit: The LTPP database will continue to be a source of information for researchers and agencies in pavement design and maintenance. As the LTPP program continues, it will advance the way pavements are designed, built, and maintained. Therefore, it is important to perform quality control checks at various levels throughout the program to protect this investment by ensuring quality in the data and in the methods used to collect the data, and in how the data is disseminated to interested parties.

Title: LTPP Beyond FY 2009: What Needs to Be Done?

Author(s): Federal Highway Administration

Date: 2009

Publisher: Federal Highway Administration

Abstract/Synopsis:
This report briefly summarizes the current status of the Long-Term Pavement Performance (LTPP) program and describes the work needed after 2009 to capitalize on the investment made in developing the world's most comprehensive pavement research database. The purpose of this report is to provide LTPP's stakeholders with a look ahead to the critical activities and products that need to be pursued beyond 2009 in order to reap the high return rewards of this unique and critical program that has and will continue to influence the way pavements are designed, built, and maintained. The additional work currently identified as necessary to take full advantage of the investment already made in LTPP is as follows: 1. Provide ongoing security and maintenance of the LTPP database and manage the materials Reference Library (MRL); 2. Continue to support LTPP database users; 3. Further develop the LTPP database including additional data collection and database refinements; and 4. Continue data analysis and product development.

Application/Use: This report can be used by those supporting the LTPP program in identifying the current program needs and focusing resources in order to fully capitalize on the program benefits.

Contribution: Improvement in Knowledge

Present Benefit: The LTPP database has provided researchers and agencies in the pavement industry with information that has led to advancements in the industry. Identifying the needs of the LTPP program allows stakeholders to plan accordingly to meet these needs and continue the effort in pavement advancement.

Future Benefit: The LTPP database will continue to be a source of information for researchers and agencies in pavement applications. As the LTPP program continues, it will advance the way pavements are designed, built, and maintained.

Title: Stochastic Modeling for Pavement Warranty Cost Estimation

Author(s): Moynihan, Gary; Zhou, Hao; Cui, Qingbin

Date: May 2009

Publisher: Journal of Construction Engineering and Management Vol. 135 No. 5

Abstract/Synopsis:
This paper presents a cost estimation model for long-term pavement warranties with multiple distress indicators. One application area for such warranties involves performance-based specifications (PBSs). In contrast to traditional approaches, PBS gives contractors the flexibility to select construction methods, materials, and even design. However, the contractors must then warrant the performance of their work for a specified period of time. Therefore, an accurate estimation of the risks associated with the warranty is a significant cost issue for any contractor to cover potential risks while still being competitive in bidding. Quantitative evaluation of the cost of risk incurred by the warranty has several difficulties. The deterioration of a highway project is a complex process, affected by pavement structure, material, traffic load, and weather conditions. Based on a probabilistic risk analysis of failures of performance indicators, the resulting model can estimate the warranty cost at a detailed level. Application of the model is shown via a numerical case study using long-term pavement performance data.

Application/Use: This report is directly applicable to pavement contractors bidding on projects involving performance-based specifications (PBSs).

Contribution: Cost Savings; Implementation/Usage

Present Benefit: The cost estimation model benefits contractors by assisting them with identifying the potential risks of the project while maintaining a competitive bid. In this project, the LTPP data is used to show how the cost estimation model should be applied in different circumstances and site conditions.

Future Benefit: As contractors continue to work with performance-based specifications, this project and the LTPP program will continue to be a useful tool to help them perform quality work and take reasonable risks, while remaining competitive in the market.

Title: Preserving and Maximizing the Utility of the Pavement Performance Database

Author(s): Publisher Transportation Research Board

Date: 2009

Publisher: Transportation Research Board

Abstract/Synopsis:
The Transportation Research Board's Long-Term Pavement Performance (LTPP) Committee developed this report as a statement of what is needed to preserve the LTPP database, to facilitate its continued use for decades to come, and, through its use for data analysis and product development, to fulfill LTPP's promise of better roads. In summary, the committee recommends, as priorities for the post-LTPP era, the following actions: Establishment of the National Pavement Performance Database (NPPD) to be the custodian and steward of the LTPP database, as a self-contained and fully funded entity within an existing agency, with the appropriate mandate and staffing resources to carry out the duties encompassed in this and the following three actions; Authorization of the NPPD to preserve the LTPP database and keep current its hardware and software as the technology of computers and data storage evolves, and to incorporate additional pavement performance data into the database as the data become available; Authorization of the NPPD to enhance the quality and ensure the completeness of data in the LTPP database where feasible, and to conduct LTPP data analysis and product development, to support those who seek to analyze the data to better understand the causes of pavement deterioration, and to develop new designs and maintenance procedures based on this improved knowledge; and Funding of the NPPD in the amount of $9 million annually during the next period of reauthorization of surface transportation research to enable the above actions.

Application/Use: This report can be used by those supporting the LTPP program in identifying the current program needs and focusing resources to meet these needs in order to fully capitalize on the program benefits.

Contribution: Improvement in Knowledge

Present Benefit: The LTPP database has provided researchers and agencies in the pavement industry with information that has led to significant advancements in the industry. The preservation and maintenance of the LTPP database greatly benefits researchers and the pavement community by making data readily available so that they can better understand how to develop high-performance pavements with limited resources.

Future Benefit: The LTPP database will continue to be a source of information for researchers and agencies in pavement design and maintenance. As the LTPP program continues, it will advance the way pavements are designed, built, and maintained.

Title: Year in Review 2007

Author(s): Federal Highway Administration

Date: January 2008

Publisher: Federal Highway Administration

Abstract/Synopsis:
Improving mobility on our Nation's highways is the mission of the Federal Highway Administration (FHWA). During 2007, FHWA's Long Term Pavement Performance (LTPP) program worked toward this mission through its efforts to provide answers to "how" and "why" pavements perform as they do. To better understand pavement performance, the LTPP program gathers and processes data describing the structure, service conditions, and performance of 2,513 pavement test sections in North America. Highway engineers use these data and data analysis findings to help make decisions that lead to more cost effective and better performing pavements. The LTPP program was designed as a partnership when it was initiated as a 20-year Strategic Highway Research Program (SHRP) project in 1987. The State and Canadian Provincial highway agencies, the American Association of State Highway and Transportation Officials (AASHTO), the Transportation Research Board (TRB), the Canadian Strategic Highway Research Program, and FHWA all continued to play key roles in helping the program achieve its goals in 2007. These partners stay informed about research results and other program activities through the LTPP Web site, e-mail newsletter, publications, meetings and workshops, industry trade associations, and professional societies. This annual review is presented in the following sections: Introduction; 2007 Accomplishments; Pooled Fund Studies; LTPP Products; and The Future.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge; Lessons Learned

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: Actual Applications of LTPP Data for Pavement Research and Management Purposes

Author(s): Zaghloul, Sameh; Springer, Jack

Date: 2007

Publisher: Fifth International Conference on Maintenance and Rehabilitation of Pavements and Technological Control (MAIREPAV5), University of Iowa, Iowa City

Abstract/Synopsis:
The Federal Highway Administration's (FHWA) Long Term Pavement Performance (LTPP) study is a multi-year, multi-million-dollar project being conducted on test sections across North America (originally over 2,500 sections). Objectives of the study are to evaluate existing design procedures; develop improved methodologies and strategies for pavement rehabilitation; develop improved design equations for new / reconstructed pavements; determine the effects of loading, environment, material properties, construction quality, and maintenance levels on pavement distress and performance; determine the effects of specific design features on pavement performance; and establish a national database to support these objectives and meet future highway industry needs. With best practices in equipment calibration, data collection, and quality control having been employed in this program and with many test sections having been monitored for more than 15 years, the LTPP database represents one of the most comprehensive sources of reliable data for pavement information and research needs. Through case studies from projects performed for several Departments of Transportation in North America, this paper presents real life examples that highlight the benefits that can be gained from applying and utilizing LTPP data in pavement research and management studies.

Application/Use: This document provides a summary for those interested practical applications from the LTPP program and activities.

Contribution: Improvement in Knowledge; Implementation/Usage

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get a better understanding of the benefits that have been made available from the LTPP program.

Future Benefit: Documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: LTPP Ancillary Information Management System (AIMS)

Abstract/Synopsis: Some data is not stored in the pavement performance database and not included with the Standard Data Release, typically because of intensive storage memory requirements. Point-by-point road profile, FWD time-history waveforms, scanned distress map images, distress photographs, and raw traffic data are a few examples.

Application/Use: The LTPP AIMS provides additional information that is not stored in a database format.

Contribution: Cost Savings; Improvement in Knowledge.

Present Benefit: The LTPP AIMS provides information that supplements the LTPP IMS database. Photographs and raw data can be extremely useful for researchers using the LTPP database. Making this information available is yet another LTPP analysis tool.

Future Benefit: Having raw data available will be particularly useful when new computational processes are developed. As techniques evolve and change, the availability of raw data is critical to advancements in the state of practice. Photographs and other permanent record information can add tremendous value to numerical data, particularly in distress survey information. Photographs can shed light on unique findings and outlier data points.

Title: LTPP Customer Support Service

Abstract/Synopsis: LTPP Customer Support Service was established in December 1997 to provide a single point of contact for LTPP data and information requests. LTPP is committed to high-quality data, truth-in-data, and data availability through:

- Guidance in Selection of Appropriate Data
- Preparation and Dissemination of Data
- Explanation of Database Structure and Tools
- Explanation of Data Collection Methods and Data Files
- Customer Feedback & Follow-up

Application/Use: LTPP Customer Support Service has assisted nearly 5,000 users to date.

Contribution: Cost Savings; Improvement in Knowledge; Implementation/Usage.

Present Benefit: The LTPP Customer Support Service has proven beneficial in distributing LTPP information as well as assisting users with the proper application and use of the data.

Future Benefit: LTPP Customer Support has played a critical role in the distribution and use of LTPP data. The future benefit it will provide is largely dependant on future funding. Without adequate funding, the Customer Support may not be available. This will reduce the use of LTPP data and will increase the probability of errors in analysis.

Title: ERD File Builder

Abstract/Synopsis: ERD File Builder is an online application that lets users download longitudinal road profile measurements for LTPP sections in ERD file format. The ERD file format was developed by the Engineering Research Division (ERD) at the University of Michigan Transportation Research Institute; the ERD format facilitates automated plotting of simulation data, experimentally measured data, and data to various other analysis programs including another LTPP product called ProVal.

Application/Use: ERD File Builder has been used to access profile data from LTPP sites. This information has been used to conduct numerous evaluations.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: Longitudinal profile data from LTPP sites has been used in variety of projects ranging including: variability studies, pavement performance evaluations, equipment comparisons, WIM accuracy, and rehabilitation/maintenance effectiveness.

Future Benefit: While many studies have been conducted, there remain numerous problems statements requiring the use of longitudinal profile data. Research needs include: the impact of roughness on dynamic loads, pavement damage caused by swelling and frost susceptible soil, as well as relating ride quality and structural adequacy. The ability to extract raw profile data will continue to add benefit to the highway community into the future.

Title: Highway Community Exchange

Publisher: FHWA

Abstract/Synopsis: LTPP continues to deliver user tools and other information to aid in the use and understanding of the SDR, however it can be daunting to navigate and extract the most relevant information from a database that has hundreds of tables, thousands of fields and millions of records! Therefore this Community of Practice (CoP) site was established to provide a forum for SDR users to post questions and share their experience.

Application/Use: The Community of Practice has over 25 registered users and provides an excellent resource for those accessing LTPP data.

Contribution: Cost Savings; Improvement in Knowledge; Implementation/Usage.

Present Benefit: The Community of Practice assists users of LTPP data and ensures that the data is appropriately applied. By doing this, the analysis findings and recommendations will be accurate thereby providing cost savings, improving knowledge, and advancing technology.

Future Benefit: The benefit of the Community of Practice will grow as additional people register and make use of the resource. The ability to post questions and get multiple responses is extremely helpful in navigating the LTPP data. This also helps users overcome initial stumbling blocks with extracting data and will likely promote additional use of LTPP data.

Title: LTPP DataPave Online

Abstract/Synopsis: The LTPP program was initiated in 1987, as part of the Strategic Highway Research Program (SHRP). Responsibility for program management was transferred to FHWA in 1992. Today, the program has more than 2,400 test sections on in-service highways at over 900 locations throughout North America. Data are collected through cooperative efforts with state agencies (USA) and provincial governments (Canada) that own the pavement and the LTPP program organization. The extensive data collection effort includes inventory, material testing, pavement performance monitoring, climatic, traffic, maintenance, rehabilitation, and seasonal testing modules. The data are housed in an information management system (IMS) - the LTPP database - that is the world's largest pavement performance database, with enormous potential for the development of products to improve pavement technology. The data are subject to an extensive series of quality control checks before being made available to the public. This online LTPP database is a major effort to make the LTPP data more accessible to the worldwide transportation community.

Application/Use: DataPave provides web-access to LTPP data and has been used by State Highway Agencies (SHA), local agencies, researchers, consultants, and students in a variety of applications.

Contribution: Cost Savings; Improvement in Knowledge; Implementation/Usage.

Present Benefit: To date, approximately 3000 users have made 43,000 data requests from the website. The data has been used in the development of over 500 published reports, journal papers, and conference presentations. These numbers stand as a testament to the benefit of LTPP data. There is currently no source of pavement information that approaches the LTPP database. The LTPP database contains comprehensive inventory, materials, traffic, climatic, and performance data for pavements across North America.

Future Benefit: When considering the future benefit of the LTPP database, comparisons must be made to the AASHO road test. Data collected at the road test has been used for over 40 years. Considering that the LTPP database is much larger and more comprehensive than the road test dataset, it is highly likely that LTPP will be referenced and utilized for at least the next 40 years. In the short term, the LTPP database will be an essential component of calibrating and validating the M-E PDG to local conditions. Without the LTPP database, SHA and local agencies would be hard pressed to find the condition data required to properly implement the M-E PDG.

Title: LTPP Standard Data Release (SDR)

Publisher: FHWA

Abstract/Synopsis: The Long-Term Pavement Performance (LTPP) Program makes the world's largest pavement performance database available annually to the public in Microsoft Access® format and available as a 6 CD-ROM set or on two DVD-ROMs. The Standard Data Release (SDR) may be obtained through LTPP Customer Support Services. A Reference Library CD-ROM accompanies the Standard Data Release and gives the user the capability to search for software utilities, resource documents, and research reports that support the database. Perhaps one of the most useful documents contained here for beginners is the tutorial "Accessing LTPP Data," which includes step-by-step examples of working with the SDR in MS Access and building queries for data extraction.

Application/Use: The SDR has been used by State Highway Agencies (SHA), local agencies, researchers, consultants, and students in a variety of applications.

Contribution: Cost Savings; Improvement in Knowledge; Implementation/Usage.

Present Benefit: To date, approximately 1,000 copies of the SDR have been requested. The data has been used in the development of 500 published reports, journal papers, and conference presentation. These numbers stand as a testament to the benefit of LTPP data.

It is well documented that the M-E PDG used LTPP data extensively in developing the M-E PDG software. The M-E PDG is just one example of the numerous studies that would not have been possible without LTPP. There is currently no source of pavement information that approaches the LTPP database.

The database has many uses from national pavement studies to local practice evaluations to educational supplement.

Future Benefit: When considering the future benefit of the LTPP database, comparisons must be made to the AASHO road test. Data collected at the road test has been used for over 30 years. Considering the LTPP database is much larger and more comprehensive than the road test dataset, it is highly likely that LTPP will be referenced and utilized for at least a century. In the short term, the LTPP database will be an essential component of calibrating and validating the M-E PDG to local conditions. Without the LTPP database, SHA and local agencies would be hard pressed to find the condition data required to properly implement the M-E PDG.

Title: LTPP Table Navigator

Abstract/Synopsis: The LTPP Information Management System (IMS) is the central database for data collected as part of the long-term pavement performance (LTPP) program. The Table Navigator software was developed to provide users of the LTPP IMS a fast and easy means of navigating the complex table and record structure of the database. The program combines the contents of the Database Schema, Data Dictionary, and Codes List into a searchable database. Table Navigator simplifies the search for locations of specific data elements within the IMS. It also enables the user to find definitions for codes stored in the database. These capabilities make the program a valuable tool for users of LTPP data who are not intimately familiar with the structure of the IMS.

Application/Use: Table Navigator is very useful tool for anyone accessing the LTPP database.

Contribution: Cost Savings; Improvement in Knowledge; Implementation/Usage.

Present Benefit: Table Navigator is beneficial as an instrument that allows LTPP users to find data of interest. The field descriptions in Table Navigator also ensure that the data use properly applied. This is extremely beneficial as erroneous findings can result from the improper application of LTPP data.

Future Benefit: When considering the future benefit of the LTPP database, comparisons must be made to the AASHO road test. Data collected at the road test has been used for over 40 years. Considering that the LTPP database is much larger and more comprehensive than the road test dataset, it is highly likely that LTPP will be referenced and utilized for at least the next 40 years. Table Navigator will be an extremely valuable tool for locating information in the LTPP database for many years to come.

Title: Assignments with Purpose: Using LTPP for Educating Tomorrow's Engineer

Author(s): Tighe, Susan L.

Date: 2006

Publisher: Federal Highway Administration; American Society of Civil Engineers

Abstract/Synopsis: The overall scope of this paper involves a university perspective on how the Long-Term Pavement Performance (LTPP) program can be used to educate and train skilled engineers in the pavement sector. Building on a presentation at the 2003 Transportation Research Board Annual Meeting, this paper first presents a context for using the LTPP data. In formulating and addressing the use of the data, the following main points are discussed: education and training using LTPP, development of assignments with purpose, discussion of using LTPP to develop pavement research themes, and conclusions. The paper is directed primarily at academics. However, it does have relevance to the public and private sectors, as it directs assignments that will result in highly qualified people and potential leaders in the field of pavement engineering. It also recognizes the competing demands that face academics, so the assignments are intended to be straightforward and are designed for academics with limited preparation time. Overall there is a need to produce intelligent engineers with good problem-solving skills. Thus, the primary focus is to encourage independence and creativity through inquiry-based learning. In summary, the basic premise of this paper is that good design, construction, and maintenance of long-life pavements can be realized most effectively in education and training through inquiry-based learning with LTPP.

Application/Use: This paper has been used by university professors as an educational tool that supplements their curriculum.

Contribution: Improvement in Knowledge

Present Benefit: The LTPP database provides a comprehensive avenue of introducing students to concepts such as pavement research, statistical analysis, and performance monitoring. In addition to learning these concepts, students also get to explore the LTPP database which can be used as they enter the workforce.

Future Benefit: This exposure will undoubtedly result in future advancements in the practice. Through their coursework, the next generation of pavement engineers and researchers is being exposed to the LTPP Program.

Title: Guidelines for the Collection of Long-Term Pavement Performance Data

Author(s): Simpson, A. L; Ostrom, B. K; Schmalzer, P. N.

Date: 2006

Publisher: MACTEC Engineering and Consulting, Incorporated; Federal Highway Administration

Abstract/Synopsis: A set of data collection guidelines has been provided for the collection of all data obtained for the Long-Term Pavement Performance (LTPP) program. These guidelines were provided to the Regional Support Contractors (RSCs) to facilitate data collection on a uniform basis. Over time, additional documents were developed providing more specific requirements for the collection of LTPP data. The primary purpose for the various data collection guides is to provide a uniform basis for data collection during long-term monitoring of the performance of pavement test sections under study by the LTPP program initiated under the Strategic Highway Research Program (SHRP) and continued under the Federal Highway Administration (FHWA). As methods for collection of the data have changed and improved over the years, the guidelines used in obtaining these data have changed. The objective of this document is not to provide the exact guidelines, but rather to provide references for the guidelines and revisions to those guidelines used in collecting each type of data for LTPP over the lifetime of the LTPP program.

Application/Use: This is an excellent resource for those interested in the methodologies used in collecting LTPP data.

Contribution: Improvement in Knowledge

Present Benefit: This document is beneficial as a reference providing information on the collection of LTPP data. Understanding the method of collection is critical to properly analyzing and evaluating data. This will also provide insight on anomalous or potential outlier data points.

Future Benefit: Not only will this document assist LTPP data users in the future, it can also be used in laying the framework for data collection activities conducted at a state highway agency or local agency level.

Title: Improving Pavements with Long-Term Pavement Performance: Products for Today and Tomorrow. Papers from the 2003-2004 International Contest on Long-Term Pavement Performance Data Analysis

Date: 2006

Publisher: Federal Highway Administration; American Society of Civil Engineers

Abstract/Synopsis: This report is a compilation of award-winning technical papers from the Third Annual International Contest on Long-Term Pavement Performance (LTPP) Data Analysis 2003-2004.

Application/Use: The contest promotes education through exploration of the LTPP database.

Contribution: Improvement in Knowledge

Present Benefit: The benefit of education cannot be quantified. This contest has sparked research from over forty students since its inception. Not only does this contest promote research and analysis, but it also familiarizes participants with the LTPP database.

Future Benefit: This exposure will undoubtedly result in future advancements in the practice. Through their coursework, the next generation of pavement engineers and researchers is being exposed to the LTPP Program.

Title: Long-Term Pavement Performance Maintenance and Rehabilitation Data Collection Guide

Author(s): Simpson, Amy L; Thompson, Travis

Date: 2006

Publisher: MACTEC Engineering and Consulting, Incorporated; Federal Highway Administration

Abstract/Synopsis: This document provides guidelines and forms for documenting maintenance and rehabilitation treatments on test sections in the Long-Term Pavement Performance (LTPP) program and is an update to chapters 6 and 7 of the 1993 version of the "LTPP Data Collection Guide." The terms maintenance and rehabilitation are used within the LTPP program to classify how various treatments which alter a test section's structure are documented in the database. This is an important distinction, since classification of some of these treatments may differ from highway agency terminology. For example, thin overlays that some agencies may classify as maintenance are classified within the LTPP program as rehabilitation, since the data forms for overlays of any thickness are the same.

Application/Use: This is an excellent resource for those interested in the methodologies used in collecting LTPP maintenance and rehabilitation data.

Contribution: Improvement in Knowledge

Present Benefit: This document is beneficial as a reference providing information on the elements of LTPP maintenance and rehabilitation data. Understanding these elements is critical to properly analyzing and evaluating the data. This will also provide insight on anomalous or potential outlier data points.

Future Benefit: Not only will this document assist LTPP data users in the future, it can also be used in laying the framework for data collection activities conducted at a state highway agency or local agency level.

Title: Long-Term Pavement Performance Inventory Data Collection Guide

Author(s): Simpson, A. L; Copeland, C. R.

Date: 2006

Publisher: MACTEC Engineering and Consulting, Incorporated; Federal Highway Administration

Abstract/Synopsis: The primary purpose for this data collection guide is to provide a uniform basis for data collection during long-term monitoring of the performance of pavement test sections under study by the Long-Term Pavement Performance (LTPP) program. It is a revision to chapter 2 of the 1993 LTPP Data Collection Guide. Inventory data include those data necessary to: 1) identify the test section, 2) describe the geometric details of its construction and the material properties of its structural constituents, and 3) identify construction costs and costs of subsequent maintenance and repair before the long-term monitoring effort. These data are intended to describe the pavement test section at the time the section was included in the LTPP study.

Application/Use: This is an excellent resource for those interested in the methodologies used in collecting LTPP data.

Contribution: Improvement in Knowledge

Present Benefit: This document is beneficial as a reference providing information on the elements of LTPP inventory data. Understanding these elements is critical to properly analyzing and evaluating the data. This will also provide insight on anomalous or potential outlier data points.

Future Benefit: Not only will this document assist LTPP data users in the future, it can also be used in laying the framework for data collection activities conducted at a state highway agency or local agency level.

Title: Long-Term Pavement Performance Program (LTPP): Year in Review, 2005

Date: 2006

Publisher: Federal Highway Administration

Abstract/Synopsis: Improving the productivity and mobility of the national highway transportation system are key goals of the Federal Highway Administration (FHWA). During 2005, FHWA's Long-Term Pavement Performance (LTPP) program continued to work toward these goals through its efforts to provide answers to "how" and "why" pavements perform as they do. To better understand pavement performance, the LTPP program gathers and processes data describing the structure, service conditions, and performance of more than 2,400 pavement test sections in North America. Highway engineers can use these data and findings from the analyses conducted to date to help them make decisions leading to more cost-effective and better performing pavements. The LTPP program was designed as a partnership when it was initiated as a 20-year Strategic Highway Research Program (SHRP) project in 1987. The State and Canadian Provincial highway agencies, the American Association of State Highway and Transportation Officials (AASHTO), the Transportation Research Board (TRB), the Canadian Strategic Highway Research Program (C-SHRP), and FHWA all continued to play key roles in helping the program achieve its goals in 2005. The partners stay informed about research results and other program activities through the Web site, e-mail newsletter, publications, meetings, and workshops in cooperation with State highway agencies, industry trade associations, and professional societies. In 2005, LTPP worked hard to develop a new operational plan for the future under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). In addition, LTPP continued to focus on improving the quality and quantity of data in the LTPP database, and on addressing gaps in the materials and traffic data through the Materials Data Action Plan and the Specific Pavement Study (SPS) Traffic Data Collection Pooled Fund Study.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research and other activities.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: Improving Pavements with Long-Term Pavement Performance: Products for Today and Tomorrow; Papers from the 2001-2002 International Contest on Long-Term Pavement Performance Data Analysis

Date: 2005

Publisher: Federal Highway Administration; American Society of Civil Engineers

Journal Title: International Journal of Pavement Engineering Vol. 6 No. 3

Abstract/Synopsis: This report is a compilation of award-winning technical papers from the Third Annual International Contest on Long Term Pavement Performance (LTPP) Data Analysis 2001-2002.

Application/Use: The contest promotes education through exploration of the LTPP database.

Contribution: Improvement in Knowledge

Present Benefit: The benefit of education cannot be quantified. This contest has sparked research from over forty students since its inception. Not only does this contest promote research and analysis, but it also familiarizes participants with the LTPP database.

Future Benefit: This exposure will undoubtedly result in future advancements in the practice. Through their coursework, the next generation of pavement engineers and researchers is being exposed to the LTPP Program.

Title: Study of LTPP Pavement Temperatures

Author(s): Lukanen, E. O; Stubstad, R. N; Clevenson, M. I.

Date: 2005

Publisher: Consulpav International; Federal Highway Administration

Abstract/Synopsis: This study focuses on the quality of the pavement temperature data in the Long-Term Pavement Performance (LTPP) program. Reliable pavement temperature data are necessary in the research planned for the LTPP program. Pavement surface temperature measurements and in-depth pavement temperature measurements have been recorded since the beginning of the LTPP program. Until this study, these data have been subject to only broad checks established for individual fields; no additional quality checks were made. The LTPP database is now undergoing various quality investigations focusing on comparisons of the data from two independent sources--infrared surface temperature measurements that were recorded automatically and in-depth temperature measurements that were made manually. The comparative processes identified various data errors and errors in associated data elements such as the time measurement. Examples of such errors include data entry errors such as transposition of numbers and errors in the tens-place entries. Missing data, malfunctioning infrared sensors, and time-recording errors such as errors with time zone changes or daylight savings time changes were identified. All identified pavement temperature errors were submitted for further evaluation, which could lead to either corrections or removal of erroneous data from the LTPP database.

Application/Use: The results from this study were used to investigate and resolve suspect temperature readings, thereby improving the quality of the data.

Contribution: Improvement in Knowledge

Present Benefit: Because FWD backcalculation results are sensitive to pavement temperature, it is important to have high quality temperature data stored with FWD data. The availability of data in the LTPP database allows various backcalculation methods to be evaluated and compared over a large data set.

Future Benefit: Improving the quality of data will benefit findings and results from future research, including enhanced prediction capabilities and reduced variability.

Title: Use of the Long-Term Pavement Performance Database in the Pavement Engineering Curriculum

Author(s): Buch, N; Chatti, K; Haider, S. W; Salama, H.

Date: 2005

Publisher: American Society of Civil Engineers

Journal Title: Journal of Professional Issues in Engineering Education and Practice Vol. 131 No. 1

Abstract/Synopsis: In this paper, the writers demonstrate the inclusion of the Long-Term Pavement Performance (LTPP-DATAPAVE 3.0) data within the pavement engineering curriculum at Michigan State University (MSU). The authors present two examples, one from an undergraduate course on pavement rehabilitation and one from a graduate course on pavement analysis and design. These examples illustrate the use of LTPP data in computing responses, predicting traffic, developing rehabilitation strategies, and predicting performance of both rigid and flexible pavements.

Application/Use: This paper has been used by university professors as an educational tool which supplements their curriculum.

Contribution: Improvement in Knowledge

Present Benefit: The LTPP database provides a comprehensive avenue of introducing students to concepts such as pavement research, statistical analysis, and performance monitoring. In addition to learning these concepts, students also get to explore the LTPP database which can be used as they continue into the workforce.

Future Benefit: This exposure will undoubtedly result in future advancements in the practice. Through their coursework, the next generation of pavement engineers and researchers is being exposed to the LTPP Program.

Title: Collection and Interpreting Long-Term Pavement Performance Photographic Distress Data: Quality Control- Quality Assurance Processes

Author(s): Rada, G. R; Simpson, A. L; Hunt, J. E.

Date: 2004

Publisher: Transportation Research Board

Journal Title: Transportation Research Record No. 1889

Abstract/Synopsis: The Long-Term Pavement Performance (LTPP) program is making use of photographic technology to provide, first, detailed, distress-specific condition data for use in the development and validation of pavement performance models and, second, a permanent, objective, high-resolution record of pavement condition over the full length and width of the sections in the program. Because high-quality distress data are critical to the success of the LTPP program, numerous quality control-quality assurance (QC-QA) processes have been implemented over the life of the program. Those processes address data quality before the start of data collection, during data collection, during data interpretation, after data interpretation, and after the uploading of data to the LTPP database. Some of the processes are a direct result of advance planning, based on past experience, while others are the result of lessons learned in the course of the program. Some were implemented early in the program, while others were introduced well into the program. The Distress Identification Manual, distress rater accreditation workshops, time series review, database checks, data studies and analyses, and feedback reports are just a few of the elements that make up the full suite of QC-QA processes. A detailed summary of the QC-QA processes associated with the LTPP photographic distress data is presented.

Application/Use: This paper can serve two purposes. It is useful for those interested in utilizing LTPP photographic distress data. The QC/QA process established by LTPP can also be implemented by those collecting and analyzing photographic distress data.

Contribution: Improvement in Knowledge; Lessons Learned.

Present Benefit: Pavement management is dependent on quality distress data. Erroneous data can lead to ineffective treatment schedules, improper segment prioritization and inaccurate budgets. The QC/QA procedures documented in this paper provide a means of reducing inconsistent data and improving the data system. This can improve network-level conditions and lead to better informed decisions.

Future Benefit: The use of photographic distress data collection techniques will increase in the future. As these techniques are implemented, the QC/QA processes documented in this paper will be beneficial in ensuring quality data is collected.

Title: Key Findings from LTPP Analysis 2000-2003

Date: 2004

Publisher: Federal Highway Administration

Abstract/Synopsis: The Long-Term Pavement Performance (LTPP) program established in 1987 is a comprehensive 20-year study of in-service pavements using a series of rigorous long-term field experiments to monitor more than 2,400 asphalt and portland cement concrete (PCC) pavement test sections across the United States and Canada. This document highlights some key findings from LTPP analysis studies completed between 2000 and 2003. The goal of this report is to provide LTPP partners with information that can help them in their efforts to design, build, and maintain cost-effective and long-lasting pavements, by providing sections on: site conditions, structural features, material characterization, initial roughness, pavement maintenance, pavement rehabilitation, and local calibration of the 2002 Pavement Design Guide.

Application/Use: Findings from LTPP analysis projects can be used in a wide variety of pavement applications.

Contribution: Cost Savings; Improvement in Knowledge; Lessons Learned.

Present Benefit: Findings from the numerous analysis studies conducted under the LTPP program are beneficial to state highway agencies, local municipalities, researchers, and practitioners. The key findings document summarizes and increases awareness of the analysis reports available.

Future Benefit: Not only will the analysis projects conducted as part of the LTPP program add future benefit, but the database will provide analysis opportunities that would not be possible without LTPP. This will be especially critical as practices are introduced, evaluated, and implemented. One such example is the M-E PDG.

Title: Long-Term Pavement Performance: Reference Library

Date: 2004

Publisher: Federal Highway Administration

Abstract/Synopsis: This CD-ROM contains ten sections that provide information concerning the long-term pavement performance (LTPP) program. The first section, Library Home, describes the data and information from the program that are available in a variety of forms. Another section, LTPP: 2003 Year in Review, discusses the accomplishments of the LTPP program in 2003. Another section, Table Navigator, is an offline version of the online Table Navigator designed for stand-alone use on windows computers. The remaining seven sections list, respectively, Research Reports, Resource Documents, SHRP-LTPP Reports, Tech Briefs, Product Briefs, Application Notes, and Brochures that have been published as a result of the LTPP program. Either the reports or abstracts are provided, as well as information for obtaining online or printed copies.

Application/Use: The reference library is used by those interested in LTPP products, tools, data, and reports.

Contribution: Improvement in Knowledge

Present Benefit: This reference library is a compilation of many LTPP-related items. Having all of this information on one CD-ROM makes locating specific items easy. This improves accessibility of data and increases awareness of available LTPP data.

Future Benefit: The improvement in accessibility and increased awareness offered by the reference library will provide future benefits by exposing new users to LTPP data.

Title: LTPP: Year in Review 2003

Date: 2004

Publisher: Federal Highway Administration

Abstract/Synopsis: The Long-Term Pavement Performance (LTPP) program collects data from more than 1,800 active pavement sections in the United States and Canada, analyzes these data, and then translates these insights into products and information for pavement design, rehabilitation, maintenance, and management. This report outlines LTPP's 2003 area accomplishments and previews some 2004 programs. The 2003 accomplishments fall under the following headings: data collection, data analysis, products, and field operations. The report also discusses pooled fund studies undertaken in 2003, and describes how research results were disseminated. Partnerships are also discussed.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: LTPP: Year in Review 2004

Date: 2004

Publisher: Federal Highway Administration

Abstract/Synopsis: Highways are the backbone of our Nation's transportation system. They play a vital role in the Nation's economy as well. In 2004, the Long-Term Pavement Performance (LTPP) program continued working toward optimizing the public's investment in the highway system by providing the information, data, and products that highway engineers and managers need to design, build, maintain, and manage cost-effective and better performing roads. This report outlines LTPP's 2004 program area accomplishments and how the Transportation Equity Act for the 21st Century (TEA-21) extension impacted the LTPP program. Major headings in the document include: Revitalizing the Partnerships; LTPP's Partners; Funding Levels impact Program; 2004 Accomplishments; and Status of LTPP Pooled Fund Studies.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: Strategic Highway Research Program (SHRP) Activities in Connecticut

Author(s): McDonnell, Anne-Marie H.

Date: April 2004

Publisher: Connecticut Department of Transportation

Abstract/Synopsis: In 1987, AASHTO member states initiated the five-year research program entitled, "The Strategic Highway Research Program." It was designed to address needs in five functional areas which were subsequently consolidated into four major program areas: asphalt, concrete and structures, highway operations and long-term pavement performance. It was designed to provide research results which were cost-effective, and deliverable at the conclusion of the five-year program, the exception was the twenty year term of the long-term pavement performance element.

This report describes ConnDOT efforts in the design and planning of SHRP, its execution and field verification studies, and other efforts to implement SHRP research products and results. A summary of lessons learned is presented.

Application/Use: This report documents Connecticut's participation in SHRP, including research and product implementation.

Contribution: Implementation/Usage.

Present Benefit: Connecticut has participated in 23 studies that were initiated from the SHRP program. This illustrates how SHRP and the LTPP program provide avenues for additional research to be conducted at an agency level. Connecticut has benefited from improved traffic data collection as well as performance information on SUPERPAVE mixes via the SPS-9 project.

Future Benefit: Agencies, including Connecticut, will continue to utilize LTPP data and products to improve pavement performance at a local level. Additional benefit will be realized in improved traffic data collection that yields more cost-effective decisions in planning and design.

Title: DataPave Online: Improving Pavement Design Through Performance Data Analysis

Date: 2003

Publisher: Federal Highway Administration

Journal Title: Product Brief

Abstract/Synopsis: DataPave Online is a Web site that provides worldwide access to information on thousands of long-term pavement performance (LTPP) test sections across the United States and Canada. This Web site quickly and cost-effectively circulates every new LTPP data release, providing users with the latest information. LTPP reference documents are available on the site for users to download. The site allows users to select and view pavement section-specific information, such as section location, experiment type, pavement layers, falling weight deflectometer and profile information. Other features include a data dictionary to aid in understanding LTPP data elements, data export capabilities, and online support.

Application/Use: DataPave provides web-access to LTPP data and has been used by State Highway Agencies (SHA), local agencies, researchers, consultants, and students in a variety of applications.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: To date, approximately 2968 users in 75 countries have requested 29 GB of data from the website. The data has been used in the development of numerous published reports, journal papers, and conference presentations. These numbers stand as a testament to the benefit of LTPP data.

It is well documented that the M-E PDG used LTPP data extensively as it was a critical element in the development of the guide. The M-E PDG is just one example of the numerous studies that would not have been possible if LTPP data was unavailable. There is currently no source of pavement information that approaches the LTPP database.

Future Benefit: When considering the future benefit of the LTPP database, comparisons must be made to the AASHO road test. Data collected at the road test has been used for over 40 years. Considering that the LTPP database is much larger and more comprehensive than the road test dataset, it is highly likely that LTPP will be referenced and utilized for at least the next 40 years. In the short term, the LTPP database will be an essential component of calibrating and validating the M-E PDG to local conditions. Without the LTPP database, SHA and local agencies would be hard pressed to find the condition data required to properly implement the M-E PDG.

Title: LTPP Information Management System Pavement Performance Database User Guide

Author(s): Elkins, Gary E; Schmalzer, Peter; Thompson, Travis; Simpson, Amy

Date: 2003

Publisher: FHWA, Office of Infrastructure Research and Development, McLean, VA

Abstract/Synopsis: This document provides information to aid in understanding and using the Long-Term Pavement Performance (LTPP) program pavement performance database. This document provides an introduction to the structure of the LTPP program, the relational structure of the LTPP database, a description of the location of various data elements, contents of the data table, tips on efficient means of manipulating data for specific types of investigations, how to obtain data, and example Structured Query Language (SQL) scripts that can be used to build user-defined custom extractions.

This manual is supplemented by various other documents including:

- LTPP Codes List
- LTPP Data Dictionary
- LTPP Table Navigator
- LTPP Schema
- LTPP IMS Directives

Application/Use: The user guide is a tool to aid all analysts, particularly those unfamiliar with LTPP.

Contribution: Cost Savings; Improvement in Knowledge; Implementation/Usage.

Present Benefit: The LTPP database was designed to store information efficiently. This was critical in the early years of the Program when memory was exponentially more expensive than it is today. Designing for storage rather than retrieval can make it challenging for anyone not intimately familiar with the LTPP database to be confident they have extracted the information they need. Researchers who do not utilize the User Guide risk incomplete data extractions or missing important data elements, jeopardizing the satisfactory completion of a project. In the worst case, conclusions are wholly inaccurate and the money invested in the research is wasted (as well as any investment made to implement the research findings). The User Guide helps insure those not choosing to utilize LTPP Customer Support will still be able to access the information necessary to complete their research.

The associated tools available with the User Guide (i.e., the Data Dictionary and Table Navigator) further assist analysts in the retrieval and understanding of the data contained in the LTPP database. By utilizing these tools, the researcher can save substantial amounts of time in assimilating data sets.

Future Benefit: The LTPP database will be a critical source of information for anyone studying the long-term performance of in-service pavements. The User Guide and its associated tools will enable future users to understand how the data is organized as well as the best ways to access the data.

Title: LTPP: 2002 Year in Review

Date: 2003

Publisher: Federal Highway Administration

Abstract/Synopsis: The Federal Highway Administration's (FHWA's) Long Term Pavement Performance (LTPP) program focuses on how and why pavements perform the way that they perform. LTPP collects data from more than 2,500 pavement sections in the United States, analyzes these data, and then translates these insights into products and information for pavement design, rehabilitation, maintenance, and management. This brochure reviews LTPP's accomplishments during 2002 and comments on its plans for 2003. In 2002, LTPP continued to improve the quality and quantity of data in the LTPP database by completing an extensive review of the materials database and an action plan that addresses any gaps in the data. LTPP also reexamined the Specific Pavement Studies (SPS) test sections, completed several data analysis projects, and developed two new products--the Seasonal Monitoring Program (SMP) CD-ROM and the Resilient Modulus (M sub R) CD-ROM. LTPP's partners remained strong in their support of the program in 2002. The States, Provinces, American Association of State Highway and Transportation Officials, the Canadian Strategic Highway Research Program, the Transportation Research Board (TRB), and FHWA all continued to play key roles in helping the program achieve its goals. In 2003, LTPP will continue its mission to provide a better understanding of the "hows" and "whys" of pavement performance. It will do so by supplying the information and tools highway engineers and managers need to design, build, and maintain long-lasting and cost-effective pavements. Throughout 2003, LTPP will develop a budget request for the new legislation that will cover FY 2004-2009, using a variety of sources, including TRB's publication "Fulfilling the Promise of Better Roads," which assesses the program's status and identifies crucial program needs during this timeframe.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: Digging into LTPP Pavement Data

Author(s): Torres, A. N; Sullivan, J. J.

Date: 2002

Publisher: Federal Highway Administration

Journal Title: Public Roads Vol. 66 No. 3

Abstract/Synopsis: The Long-Term Pavement Performance (LTPP) database represents the largest collection of pavement performance data ever compiled, containing nearly 2 decades of data on climate, materials tests, maintenance, rehabilitation, traffic, and pavement monitoring. To encourage greater use of the LTPP data to benefit the pavement industry, the Federal Highway Administration (FHWA) challenged students and faculty from the U.S. and around the world to come up with new, innovative analyses of the LTPP data. This article provides an overview of 5 separate research papers that were generated by academic participation in the LTPP/FHWA project.

Application/Use: The contest promotes education through exploration of the LTPP database.

Contribution: Improvement in Knowledge

Present Benefit: The benefit of education cannot be quantified. This contest has sparked research from over forty students since its inception. Not only does this contest promote research and analysis, but it also familiarizes participants with the LTPP database.

Future Benefit: This exposure will undoubtedly result in future advancements in the practice. Through their coursework, the next generation of pavement engineers and researchers is being exposed to the LTPP Program.

Title: LTPP: Year in Review 2001

Date: 2002

Publisher: Federal Highway Administration

Abstract/Synopsis: State Highway Agencies (SHAs) in the United States use smoothness specifications to insure that they are providing the public with quality roads. Monetary incentives/disincentive policies based on the initial roughness values are used by SHAs to encourage contractors to build smoother roads. To justify the extra costs associated with smoothness specifications, it is important to demonstrate that smoother roadways do stay smooth over time. This research study was conducted at the University of Wyoming to examine if the initial roughness of a pavement section has any effects on its long-term performance. A large number of test sections from the long-term pavement performance (LTPP) database were included in the study. The statistical tests performed indicate that asphalt and concrete pavements with low initial smoothness stay smooth over time. This study also emphasized the importance of utilization of the LTPP database.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: Using the Long Term Pavement Performance Database in Pavement Design Courses

Author(s): Delatte, N. J.

Date: 2002

Publisher: American Society of Civil Engineers

Journal Title: NCHRP Research Results Digest No. 26 Journal of Professional Issues in Engineering Education and Practice Vol. 128 No. 4

Abstract/Synopsis: The Strategic Highway Research Program Long Term Pavement Performance (LTPP) database provides considerable information about a large number of pavement test sections. The information may be easily accessed using DataPave 2.0 software, available free from the Federal Highway Administration. DataPave 2.0 provides information on ~3,000 sections, with several modules for data analysis and extraction. This paper describes integration of LTPP DataPave 2.0 into a pavement design course. The database was used at several points on the course, including lessons on traffic characterization, reliability, materials, performance, and design. 12 Texas pavement case studies were used. Each student was required to complete an individual project requiring the use of the database. Student projects and evaluations of the use of the DataPave 2.0 software in this course are also discussed. This paper gives sufficient information for interested faculty to implement the use of DataPave 2.0 in their own courses in pavement design and related areas.

Application/Use: This paper has been used by university professors as an educational tool which supplements their curriculum.

Contribution: Improvement in Knowledge

Present Benefit: The LTPP database provides a comprehensive avenue of introducing students to concepts such as pavement research, statistical analysis, and performance monitoring. In addition to learning these concepts, students also get to explore the LTPP database, which can be used as they continue into the workforce.

Future Benefit: This exposure will undoubtedly result in future advancements in the practice. Through their coursework, the next generation of pavement engineers and researchers is being exposed to the LTPP Program.

Title: An Investment Benefiting America's Highways: The Long Term Pavement Performance Program

Date: 2001

Publisher: Federal Highway Administration

Abstract/Synopsis: This report discusses why the Long Term Pavement Performance (LTPP) program is still important today; what the current investment in LTPP is; what the value of this investment is; the benefits of LTPP to date; falling weight deflectometer (FWD) calibration procedures; the 1998 rigid pavement design procedure and spreadsheet; LTPPBind (a software tool that allows engineers to accurately select the correct Superpave asphalt binder for their specific regional conditions); pothole patching; LTPP studies; benefits that LTPP will yield in the next couple of years; whether future investment is needed; and why LTPP investment should be made.

Application/Use: The document provides a synopsis on the value of the LTPP program.

Contribution: Cost Savings; Advancement in Technology; Implementation/Usage; Lessons Learned.

Present Benefit: The LTPP database has made major contributions to the pavement community. The program has advanced data collection, processing, and review practices and both directly and indirectly supported analysis of pavement-related data in a variety of ways. This document highlights some of the contributions made by the program.

Future Benefit: The LTPP program will continue to add benefit in the years to come. The database is the most comprehensive source of research quality pavement performance data in the world. Because of this, LTPP will be utilized for many projects in the future and will provide a means of conducting research that would not otherwise have been possible.

Title: DataPave/LTPP International Contest

Author(s): Rodzik, E.

Date: 2001

Publisher: National Center for Asphalt Technology

Conference Title: Second International Symposium on Maintenance and Rehabilitation of Pavements and Technological Control. Segundo Simposio Sobre Manutencao e Rehabilitacao de Pavimentos e Controle Technologico

Abstract/Synopsis: The International Contest on LTPP Data Analysis is a joint effort between the Federal Highway Administration (FHWA) Long Term Pavement Performance (LTPP) Program and the American Society of Civil Engineers (ASCE) Highway Division Pavement Committee. It is a contest designed to involve university students, or ASCE student chapters, in analysis of data contained in the LTPP database. More specifically, it will put the data in the hands of professors and students for the first time offering opportunities to use this significant database for research, class projects, and Masters or PhD theses. The contest, which was initiated in August 1998, is designed to encourage students and/or ASCE student chapters to participate in the analysis of data compiled by FHWA over the past decade. The database offers a unique opportunity for students to work in teams or in partnership with their state highway agency, on papers which are considered for awards at the zonal and national levels. This presentation introduces the history of LTPP database and an introduction to the latest version of the DataPave program, a CD-ROM that contains most of the releasable LTPP data.

Contribution: Improvement in Knowledge

Present Benefit: The benefit of education cannot be quantified. This contest has sparked research from over forty students since its inception. Not only does this contest promote research and analysis, but it also familiarizes participants with the LTPP database.

Future Benefit: This exposure will undoubtedly result in future advancements in the practice. Through their coursework, the next generation of pavement engineers and researchers is being exposed to the LTPP Program.

Title: Fulfilling the Promise of Better Roads: A Report of the TRB Long-Term Pavement Performance Committee

Date: 2001

Publisher: Transportation Research Board

Abstract/Synopsis: The Transportation Research Board's Long-Term Pavement Performance (LTPP) Committee monitors the status and progress of the LTPP studies and provides guidance on ongoing and prospective activities to the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO). In keeping with this task and in response to FHWA's request, the committee in this report reviews the history of LTPP, assesses its status, identifies crucial needs of the program during the 2004 through 2009 period, and recommends actions to prepare for this period and fulfill the LTPP mission. The report's contents are organized as follows: Executive Summary; (1) Introduction; (2) LTPP's Current Status; (3) The Work Still to Be Done; (4) Beyond 2009; (5) What Will Be Lost If the Job Is Not Completed; (6) Recommendations; (Appendix 1) LTPP Background; (Appendix 2) LTPP Funding; (Appendix 3) LTPP Data Collection Status; (Appendix 4) LTPP Data Analysis Status; and (Appendix 5) LTPP Product Development Status.

Application/Use: This document was used as a planning tool for the LTPP program.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology; Lessons Learned.

Present Benefit: The document provides an overview of the LTPP program, its current status, and prioritizes the tasks in light of current pavement research needs as well as the objectives of the program. In this way, the document laid the framework for the program moving forward from 2001.

Future Benefit: The decisions and plans for the LTPP program in regards to data collection and data analysis will continue to play a key role into the future. The program has continually been refined and improved to match current and projected research needs. It is because of this process that the program has had such a positive impact.

Title: Pavement Performance Data at Your Fingertips

Author(s): Braswell, B.

Date: 2001

Publisher: James Informational Media, Incorporated

Journal Title: Better Roads Vol. 71 No. 11

Abstract/Synopsis: The Federal Highway Administration (FHWA) has released version 3.0 of their DataPave software. The package, which is now available on two CD-ROMs, allows quick access to FHWA Long-Term Pavement Performance (LTPP) program data, including information on inventory, material testing, pavement performance monitoring, and other such data collected by the agency between 1987 and May 2001.

Application/Use: The SDR has been used by State Highway Agencies (SHA), local agencies, researchers, consultants, and students in a variety of applications.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology;

Present Benefit: To date, approximately 2968 users in 75 countries have requested 29 copies of the SDR. The data has been used in the development of numerous published reports, journal papers, and conference presentation. These numbers stand as a testament to the benefit of LTPP data. The database has many uses from national pavement studies to local practice evaluations to an educational supplement.

It is well documented that the M-E PDG used LTPP data extensively as it was a critical element in the development of the guide. The M-E PDG is just one example of the many studies that would not have been possible if LTPP data was unavailable. There is currently no source of pavement information that approaches the LTPP database. The LTPP database contains comprehensive inventory, materials, traffic, climatic, and performance data for pavements across North America.

Future Benefit: When considering the future benefit of the LTPP database, comparisons must be made to the AASHO road test. Data collected at the road test has been used for over 40 years. Considering that the LTPP database is much larger and more comprehensive than the road test dataset, it is highly likely that LTPP will be referenced and utilized for at least the next 40 years. In the short term, the LTPP database will be an essential component of calibrating and validating the M-E PDG to local conditions. Without the LTPP database, SHA and local agencies would be hard pressed to find the condition data required to properly implement the M-E PDG.

Title: LTPP Product Plan

Date: 2001

Publisher: Federal Highway Administration

Abstract/Synopsis: The contents of this report are as follows: (I) Background; (II) Introduction; (III) Key Definitions; (IV) Product Development Organizational Elements; (V) Further Defining the National Pavement Needs; (VI) The Development and Delivery Processes; (VII) Product Monitoring; (VIII) Communication Plan; and (IX) Conclusion. A Long-Term Pavement Performance (LTPP) Product table shows how current and future LTPP products address the national pavement needs.

Application/Use: This is used for planning purposes for the LTPP program.

Contribution: Cost Savings; Advancement in Technology; Implementation/Usage.

Present Benefit: The LTPP product plan was produced to coordinate LTPP product development with national pavement needs. The intent was for LTPP to focus resources on addressing high priority needs in the pavement community.

Future Benefit: The LTPP product plan may be used in the future in selecting and prioritizing research efforts outside of LTPP. Additionally, the products developed under the plan will continue to benefit the pavement industry.

Title: 2000 Transportation Scholars Conference: Compendium of Papers, Iowa State University - November 16, 2000

Date: 2000

Publisher: Center for Transportation Research and Education

Conference Title: 2000 Transportation Scholars Conference

Abstract/Synopsis: This volume is comprised of 16 student papers which were presented at the 2000 Transportation Scholar's Conference held at Iowa State University, November, 16, 2000. The papers are: Expanding the Use of Pavement Management Data, by Vanessa Amado; Airbag: Is it an Effective Occupant Protection System, by Rajasekhar Basavaraju; Pedestrian Arrivals at Signalized Intersections in Central Business Districts, by Venkata Chilukuri; Map Interface for Iowa Department of Transportation's Access-ALAS, by Aravind Gottemukkula; Application of Influence Diagram and Sequential Hypothesis Testing Method in Bridge Maintenance Decision Making, by Daifeng Hao; Access Management: Median Treatments and Their Effects on Reducing Crashes on Iowa's Urban Arterials, by Kyle P. Kosman; Analytical Modeling of Glued Laminated Girder Bridges Using ANSYS, by Anil Kurian; LTPP- Distress Due to Environment, by Kamesh Kumar Mantravadi; The Relationship Between Urban Density and Roadway Maintenance Costs, by Terry W. Powell; Geographic Information Systems-Based Crash Data Analysis and The Benefits To Traffic Safety, by Jerry Roche; Visualizing System-Wide Economic Impacts of Transportation Projects, by Jerry K. Shadewald; Human Factors and Traffic Crashes, by Daniel J. Smith; Pavement Markings and Incident Reduction, by Richard Storm; Report on the Technical Issues Surrounding the Demonstration of the Sign Management and Retroreflectivity Tracking Systems (Smarts) Technology -- Summer of 2000, by Joseph D. Turner; Collision Avoidance Systems, by Srinivasa Rao Veeramallu; and Safety and Design Improvements at Rural Expressway Median Crossovers, by Kai Zhao.

Application/Use: This illustrates the use of LTPP data for educational purposes.

Contribution: Improvement in Knowledge

Present Benefit: The LTPP database provides a comprehensive avenue of introducing students to concepts such as pavement research, statistical analysis, and performance monitoring. In addition to learning these concepts, students also get to explore the LTPP database which can be used as they continue into the workforce.

Future Benefit: This exposure will undoubtedly result in future advancements in the practice. Through their coursework, the next generation of pavement engineers and researchers is being exposed to the LTPP Program.

Title: Key Findings from LTPP Analysis 1990-1999

Date: 2000

Publisher: Federal Highway Administration

Abstract/Synopsis: The Long Term Pavement Performance (LTPP) analysis program has addressed a broad array of topics - from field validation of pavement design procedures, to the study of variability in traffic and materials data, to investigating pothole repair techniques. The purpose of this document is to highlight some of the key findings from LTPP analysis studies between 1990 and 1999. These findings have been organized into the following areas: site conditions, structural features, materials, initial roughness, pavement maintenance, pavement rehabilitation, American Association of State Highway and Transportation Officials (AASHTO) design validation, and performance modeling.

Application/Use: Findings from LTPP analysis projects can be used in a wide variety of pavement applications.

Contribution: Cost Savings; Lessons Learned.

Present Benefit: Findings from the numerous analysis studies conducted under the LTPP program are beneficial to state highway agencies, local municipalities, researchers, and practitioners. The key findings document summarizes and increases awareness of the available analysis reports and products.

Future Benefit: Not only will the analysis projects conducted as part of the LTPP program add future benefit, but the database will provide analysis opportunities that would not be possible without LTPP. This will be especially critical as practices are introduced, evaluated, and implemented. One such example is the M-E PDG.

Title: LTPP-Distress Due to Environments

Author(s): Mantravadi, K. K.

Date: 2000

Publisher: Center for Transportation Research and Education; Center for Transportation Research and Education

Conference Title: 2000 Transportation Scholars Conference

Abstract/Synopsis: This paper presents the deterioration and distress in the pavement due to environment. Long Term Pavement Performance (LTPP) deals with various experiments in General Pavement Studies (GPS) and Specific Pavement Studies (SPS). The environmental effects are dealt with in SPS-8 experiments. Data Pave is the software available to extract the history data from the LTPP database for the experiments. The paper tries to analyze the pavements subjected to different environmental conditions. Data is extracted from the database for different states whose environments are significantly different. The International Roughness Index (IRI) values for the experimental sections in the different states are collected and analyzed in relation with the temperature. The linear regression on this data reveals the effect on the pavements due to the change in the temperature. The performance of the pavement is predicted based on the results obtained. The results can be implemented in the design of new pavements.

Application/Use: This student paper illustrates the use of LTPP for educational purposes.

Contribution: Improvement in Knowledge

Present Benefit: The LTPP database provides a comprehensive avenue of introducing students to concepts such as pavement research, statistical analysis, and performance monitoring. In addition to learning these concepts, students also get to explore the LTPP database which can be used as they continue into the workforce.

Future Benefit: This exposure will undoubtedly result in future advancements in the practice. Through their coursework, the next generation of pavement engineers and researchers is being exposed to the LTPP Program.

Title: LTPP: 1999 Year in Review

Date: 2000

Publisher: Federal Highway Administration

Abstract/Synopsis: Throughout 1999, the Long Term Pavement Performance (LTPP) program of the Federal Highway Administration continued its quest to provide the information and data that highway engineers and managers need to design, build, and maintain cost-effective and long-lived roads. This report outlines the program's 1999 accomplishments in each of its program areas and provides an overview of key initiatives that LTPP will be pursuing in 2000.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: Long Term Pavement Performance (LTPP): Year in Review 2000

Date: 2000

Publisher: Federal Highway Administration

Abstract/Synopsis: Whether it is for moving people or goods, or whether it is to support local activities or national trade and tourism, the quality of pavements is an integral part of the quality of life in America. The Long Term Pavement Performance (LTPP) program is a major contributor toward ensuring that our Nation will have good pavements into the 21st century. LTPP answers key questions about pavement design characteristics that will help the States and Provinces achieve pavement performance that is both long-lived and cost-effective. The purpose of this report is to outline the program's 2000 accomplishments in each of its program areas and to provide an overview of key initiatives that LTPP will be pursuing in 2001.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: Introduction to LTPP Data

Date: 1999

Publisher: Law PCS

Abstract/Synopsis: The Long Term Pavement Performance (LTPP) program was established to support a broad range of pavement performance analyses leading to improved engineering tools to design, construct, and manage pavements. Since 1989, LTPP has collected data on the performance of pavement test sections located on in-service roadways across North America. Most of the data and information collected on the approximately 2,500 test sections are stored in the LTPP database, called the Information Management System (IMS). Currently, the LTPP IMS consists of 16 general data modules with 430 tables containing more than 8,000 unique data elements. In the eleventh year of the LTPP program, the IMS continues to evolve. In 1998, the migration of the database to a Windows NT distributed environment was completed. This required programming and other structural changes to the database. Currently, new tables are being added to store computed parameters resulting from various preliminary analyses performed on the data. These computed parameters represent engineering calculations from raw data to enable higher order types of pavement performance analysis to be performed more efficiently. Layer elastic modulus from backcalculation of deflection measurements is an example of a computed parameter. This document presents a discussion of the uses of and limitations of LTPP data in pavement performance analyses, general data availability, and data update schedule. Specific details on the structure of the IMS and how to obtain data can be found in the LTPP Data User's Reference Manual.

Application/Use: This document is an excellent resource for those interested in the LTPP program.

Contribution: Improvement in Knowledge

Present Benefit: This discussion provides general information on the LTPP program for new users. It is beneficial in informing interested parties of the various components of the LTPP database.

Future Benefit: Documents describing the LTPP program will provide future benefit as the data will continue to be used in the future. As the program comes to an end, it is critical to have adequate documentation to clearly record all aspects of the program and associated database. This is essential to guarantee the database can be used long after the program has been completed.

Title: LTPP Analysis: Putting the Data to Work

Date: 1999

Publisher: Federal Highway Administration

Abstract/Synopsis: This report provides an overview of the Long Term Pavement Performance (LTPP) program's analysis program. Specifically, it outlines the analysis projects that will be undertaken by the Federal Highway Administration in fiscal years 1999 and 2000 and those planned for pursuit through 2003. In addition, since analysis of LTPP data is now a shared responsibility with the National Cooperative Highway Research Program (NCHRP), this report also outlines the project selection process and projects recommended for the fiscal years 1999 and 2000 NCHRP LTPP analysis projects.

Application/Use: Findings from LTPP analysis projects can be used in a wide variety of pavement applications.

Contribution: Cost Savings; Lessons Learned.

Present Benefit: Knowing the LTPP data analysis program allows other national and agency-level research groups to develop and implement their own programs.

Future Benefit: Not only will the analysis projects conducted as part of the LTPP program add future benefit, but the database will provide analysis opportunities that would not be possible without LTPP. This will be especially critical as practices are introduced, evaluated, and implemented.

Title: LTPP Program Now More Complete

Authors: Churilla, C.

Date: 1999

Publisher: Scranton Gillette Communications, Incorporated

Journal Title: Roads & Bridges Vol. 37 No. 6

Abstract/Synopsis: Having complete data from a broad sample of pavement test sections is essential to the success of the Federal Highway Administration's (FHWA) Long-Term Pavement Performance (LTPP) program. To this end, a data resolution effort was initiated in 1997 as the LTPP program entered its second decade. The goal of the data resolution effort has been to obtain complete data sets from as many of the program's pavement test sections as possible. Overall, the effort has been a great success, with a 15 percent increase in the amount of data available for analysis. However, a shortfall still exists in the areas of monitored traffic volume and weight data for the Specific Pavement Study sections. The next step in the data resolution effort is to review the data in order to adjust the monitoring schedules for the test sites. The new monitoring schedules place the data collection emphasis on those sections that can best contribute to the development of improved pavement technologies from the LTPP data, while optimizing the resources of the states, provinces, and FHWA.

Application/Use: The data resolution effort was used as an internal tool for LTPP planning purposes. It resulted in more complete data sets available to the pavement community.

Contribution: Improvement in Knowledge; Lessons Learned.

Present Benefit: The LTPP database has provided significant benefit to the pavement community. Resolving gaps in the data will only increase the benefit offered by the program.

Future Benefit: More complete data sets as a result of data resolution will continue to provide value as additional research needs arise.

Title: Products Bring LTPP Data to Agencies

Authors: Churilla, C.

Date: 1999

Publisher: Scranton Gillette Communications, Incorporated

Journal Title: Roads & Bridges Vol. 37 No. 4

Abstract/Synopsis: Now in its second decade, research from the long-term pavement performance (LTPP) program continues to pay off with a host of new products designed to improve highway design, construction, and maintenance. These products include the LTPPBind software, which simplifies selection of the correct performance graded (PG) binder to use when implementing the Superpave mix design system. A series of videotapes presents the LTPP program's falling-weight deflectometer calibration procedures. Another series of three videotapes focuses on the LTPP studies' revised resilient modulus laboratory tests and procedures.

Application/Use: The article highlights some of the many uses of LTPP products.

Contribution: Cost Savings; Advancement in Technology; Implementation/Usage.

Present Benefit: LTPP has developed numerous products in the form of protocols, software, and reports that are directly applicable to State Highway Agencies. LTPP's main product is the comprehensive database, which has been used by numerous agencies in conducting evaluation studies at a local level.

Future Benefit: Existing products will continue to benefit State Highway agencies in the future. Agencies will utilize LTPP developed protocols for improved data collection. However, the largest benefit will be realized in utilizing the vast amounts of data in the LTPP database. Local calibration and validation of the M-E PDG is one such example of how the data could be used.

Title: Canadian Strategic Highway Research Program (C-SHRP) Phase III Program Proposal 1999-2004

Date: 1998

Publisher: Transportation Association of Canada

Abstract/Synopsis: The Canadian Strategic Highway Research Program (C-SHRP) was launched in 1987 to systematically extract the benefits from research undertaken by the Strategic Highway Research Program (SHRP) in the United States. This program was initiated in response to the continuing deterioration of highway infrastructure, with the intention of making significant advances in traditional highway engineering and technology through the concentration of research funds on four key technical areas. C-SHRP aims to solve high priority highway problems in Canada that are related to SHRP topics. The goal of both SHRP and C-SHRP is to improve the performance and durability of highways and to make them safer for motorists and highway workers. The initial SHRP and C-SHRP research contributed 138 products to improve highway systems and initiated the 20-year Long-Term Pavement Performance (LTPP) studies. Since 1994, activities have concentrated on technology transfer to put the research findings into practice and on continuation of the LTPP studies. Fifty-three of the research products have been put into practice by at least one agency in Canada. An additional 14 are partially implemented. The third term proposed for C-SHRP (1999-2004) will spread the use of these products to other sponsoring agencies to improve the performance, durability and economy of the nation's highway system.

Application/Use: The C-SHRP program will be useful for pavement engineers in Canada.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: The C-SHRP program has provided additional data that supplements the LTPP program. In particular, the program has allowed test sections in extreme northern climates to be monitored. This provides additional research data and improves the experimental design.

Future Benefit: Canadian provinces and northern-tiered states will benefit from the C-SHRP program by having a data source that can be used to better understand pavement performance in cold climates. Additionally, these agencies will use the data to calibrate and validate the M-E PDG.

Title: LTPP: The Next Decade

Authors: Churilla, C. J.

Date: 1998

Publisher: Federal Highway Administration

Journal Title: Public Roads Vol. 62 No. 1

Abstract/Synopsis: The Federal Highway Administration (FHWA) Long-Term Pavement Performance Program (LTPP) is the largest and most comprehensive pavement study in the world. In 1987, LTPP began a series of rigorous long-term field experiments monitoring more than 2,400 asphalt and portland cement concrete pavement test sections across the United States and Canada. Throughout its first decade, LTPP has furthered the understanding of how pavements perform. As it moves into its second decade, LTPP seeks to build on these efforts to further knowledge of why pavements perform as they do. To address this challenge, FHWA has developed a Strategic Analysis Plan that establishes a clear focus for analytical activities and data collection, launched a data resolution effort to address the gaps in data collected over the past several years, and initiated a monitoring adjustments effort.

Application/Use: This document was used as a planning tool for the LTPP program.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: The document provides an overview of the LTPP program, its current status, and prioritizes the tasks in light of current pavement research needs as well as the objectives of the program. In this way, the document laid the framework for the program moving forward from 1998.

Future Benefit: The decisions and plans for the program in regards to data collection and data analysis will continue to play a key role in the benefit that the program will provide the community. The program has continually been refined and improved to match current and projected research needs. It is because of this process, that the program has had such a positive impact.

Title: LTPP: The Next Decade

Date: 1998

Publisher: Federal Highway Administration

Abstract/Synopsis: Established as part of the Strategic Highway Research Program (SHRP) and now managed by the Federal Highway Administration (FHWA), the Long Term Pavement Performance (LTPP) program faces a significant challenge. Over the past decade, the LTPP program has developed a solid knowledge base for understanding how pavements perform. Its challenge throughout its second decade is to build on this foundation--to further the understanding of why pavements perform as they do. To address this challenge, FHWA has initiated several efforts that require the support and active participation of the States and Provinces. The intent of this document is to describe the challenge the LTPP program faces and explain the efforts underway to address this challenge. This document is presented in the following sections: Introduction; The Challenge; Addressing the Challenge; Critical Issues; and Future Opportunities.

Application/Use: This document was used as a planning tool for the LTPP program.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: The document provides an overview of the LTPP program, its current status, and prioritizes the tasks in light of current pavement research needs as well as the objectives of the program. In this way, the document laid the framework for the program moving forward from 1998.

Future Benefit: The decisions and plans for the program in regards to data collection and data analysis will continue to play a key role in the benefits that the program will provide the pavement community. The program has continually been refined and improved to match current and projected research needs. It is because of this process that the LTPP program has had such a positive impact.

Title: C-SHRP: Objectives, Achievements and Future Directions

Authors: Wells, S.

Date: 1997

Publisher: Bibliotheque Nationale du Quebec

Conference Title: Proceedings of the 1997 Conference of the Northeast Association of State transportation Officials

Abstract/Synopsis: This workshop presentation will highlight the achievements of the C-SHRP Program. The status of the C-LTPP program will be reported with a focus on its products including the largest national database of pavement data in Canada, Bayesian modeling software and users' manual, and several data insight projects. Recent accomplishments and planned future activities in the technology transfer program to promote the assessment and implementation of SHRP products will also be highlighted.

Application/Use: This document provides a summary for those interested in current C-LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of C-LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help C-LTPP maintain a presence in the research community.

Title: Long-Term Pavement Performance Information Management System Data Users Reference Manual

Authors: Ostrom, B. K; Walker, D; Harris, S; Rowshan, S.

Date: 1997

Publisher: EBA Engineering, Incorporated; Federal Highway Administration

Abstract/Synopsis: The Long-Term Pavement Performance Information Management System (LTPP IMS) Data Users Reference Manual contains an overview of the LTPP program and the data available to researchers. LTPP is a 20-year study of pavements to improve design, rehabilitation, and maintenance practices. This document is intended to assist researchers in understanding the data that are currently available for General Pavement Studies Experiments and how to obtain it. The General Pavement Studies are a group of asphalt concrete (AC) and portland cement concrete (PCC) experiments using in-service pavements. In addition to materials test results for the pavement sections, data on pavement history, maintenance, and rehabilitation are stored in the IMS. Information on distress, transverse profile, cross profile, pavement deflection, and traffic is collected on a routine basis and added to the data base regularly. The manual includes information on the quality control process. One chapter discusses a related, but separate, traffic data base. Data for all valid sections are available in various formats. A copy of a data request form is included, along with instructions on filling out the form and any applicable fees.

Application/Use: The user guide is a tool to aid all analysts, particularly those unfamiliar with LTPP.

Contribution: Cost Savings; Implementation/Usage.

Present Benefit: The LTPP database was designed to store information efficiently. This was critical in the early years of the program, when memory was exponentially more expensive than it is today. In designing for storage rather than retrieval, it can be confusing for anyone not intimately familiar with the LTPP database to be confident they have extracted the information they need. Researchers who do not utilize the User Guide risk incomplete data extractions or missing important data elements, jeopardizing the satisfactory completion of a project. In the worst case, conclusions are wholly inaccurate and the money invested in the research was wasted (as well as any investment made to implement the research findings). The User Guide helps insure those who do not choose to ask questions of LTPP Customer Support will still be able to access the information necessary to complete their research.

The associated tools available with the User Guide (i.e., the Data Dictionary and Table Navigator) further assist analysts in the retrieval and understanding of the data contained in the LTPP database. By utilizing these tools, the researcher can save substantial amounts of time in assimilating data sets.

Future Benefit: The LTPP database will be a critical source of information for anyone studying the long-term performance of in-service pavements. The User Guide and its associated tools will enable future users to understand how the data is organized as well as the best ways to access the data.

Title: Long Term Pavement Performance Program: Status Report

Date: 1997

Publisher: Federal Highway Administration

Abstract/Synopsis: This status report on the long term pavement performance (LTPP) program includes the following: highlights from the LTPP program; LTPP program background; Data Base/Operations Group activities; the LTPP Information Management System (IMS); LTPP IMS customer service; LTPP performance monitoring program; LTPP traffic activities; report on a meeting of AASHTO and industry to discuss the Specific Pavement Studies (SPS) part of the LTPP program; Product/Analysis Group activities; SPS-3 and SPS-4 field trip report summary; the Strategic Highway Research Program (SHRP) H-106 pothole study; and LTPP product implementation information.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Lessons Learned

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program. Additionally, the document serves as a planning tool to ensure resources were used as efficiently as practical.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: 1996 Product Preview: The Long-Term Pavement Performance (LTPP) Program

Date: 1996

Publisher: Federal Highway Administration

Abstract/Synopsis: The long-term pavement performance (LTPP) program is a 20-year study of in-service pavements across North America. Its goal is to develop improved pavement technologies for designing, building, and maintaining roads that will be more durable, longer lasting, and less costly. The program was established by the Strategic Highway Research Program and is now managed by the Federal Highway Administration (FHWA). The LTPP products are "things"--information, computer software, analysis procedures, testing procedures, design procedures, guidelines, and so forth--derived from the LTPP database or resulting from the research effort and delivered in a form that can be used by the States and Provinces to build better pavements. This booklet lists products of the LTPP program, which are grouped in four categories: Pavement Design Guides and Maintenance Strategies; Pavement Monitoring Procedures; Materials Testing; and Equipment Standards and Calibration Procedures. Each product listing includes the following information: Description of the product and its intended use; target audience for the product; applicability; and source if product is currently available or expected date of availability if product is still under development. Some products are already being used by certain States. These States are identified in the product listings as initial users. Within each product category are the name, telephone and fax numbers, and email address of the office to contact for more information on any of the products.

Application/Use: This can be used by those in the pavement engineering community to find resources and products. The document was also used as a planning tool for the LTPP program to prioritize resources.

Contribution: Cost Savings; Advancement in Technology; Implementation/Usage.

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program. The LTPP program has developed a myriad of products, each contributing significantly to pavement engineering.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community. The LTPP program continues to develop practical products that can be used by SHAs as well as others in the pavement community.

Title: SHRP Update

Authors: Scofield, L.

Date: 1996

Publisher: University of Arizona, Tucson

Conference Title: Forty-Fifth Annual Arizona Conference on Roads and Streets

Abstract/Synopsis: The Arizona Department of Transportation (ADOT) was very active in the development and implementation of the Strategic Highway Research Program's (SHRP) activities, especially the Long Term Pavement Performance (LTPP) program. After approximately eight years of involvement, much has been accomplished and many benefits have been obtained. This paper provides background on these activities and an update on the Arizona LTPP accomplishments.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Lessons Learned

Present Benefit: This document increases awareness of LTPP and is a tool that can be used to get updated quickly regarding recent research conducted by the program. Additionally, the document served as a planning tool for the program to ensure resources were used as efficiently as practical.

Future Benefit: Documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.

Title: SHRP/LTPP 1987-1992. Report from the Swedish Group Reviewing SHRP

Date: 1996

Publisher: National Swedish Road & Traffic Research Institute

Journal Title: VTI Meddelanden No. 786

Abstract/Synopsis: The report gives an account and an evaluation of the reporting for the first five years of the LTPP project in SHRP (1987-1992). A number of reports have been published during this period, and were completed with five-year reports on the various parts of the LTPP project. In addition to a comprehensive report on the entire LTPP (SHRP-P-416), five-year reports have been published for the following parts: General Pavement Studies (GPS) SHRP-P-387; Specific Pavement Studies (SPS) SHRP-P-395; Pavement Materials Characterization SHRP-P-687; Monitoring Activities SHRP-P-696; Information Management Systems (IMS) SHRP-P-679; Data Analysis Studies SHRP-P-688; and Traffic Data Collection and Analysis SHRP-P-386. These reports as well as others considered interesting are reported and evaluated. The report concludes with a section concerning international participation in SHRP.

Application/Use: Five-year reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides a background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Status of the Long Term Pavement Performance Program in the USA

Authors: Symons, M.G; Miller, J. S.

Date: 1996

Publisher: PTRC Education and Research Services Limited; Swedish National Road and Transport Research Institute

Conference Title: Proceedings of the Conference: Road Safety in Europe and Strategic Highway Research Program (SHRP)

Abstract/Synopsis: As the Long Term Pavement Performance (LTPP) program nears the halfway point, adjustments are being made to accommodate immediate needs. This paper presents a brief summary of the status of key LTPP program areas and provides an insight into the future direction of the program by presenting highlights from the LTPP Roadmap document. Critical program issues have been identified, along with efforts to address these issues, and demand for products from the LTPP program. The LTPP program continues to provide the promise of information for the development of new and improved models and procedures for pavement design.

Application/Use: This document was used as a planning tool for the LTPP program.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: The document provides an overview of the LTPP program, its current status, and prioritizes the tasks in light of current pavement research needs as well as the objectives of the program. In this way, the document laid the framework for the program moving forward from 1996.

Future Benefit: The decisions and plans for the program in regards to data collection and data analysis will continue to play a key role in the benefits that the program will provide the community. The LTPP program has continually been refined and improved to match current and projected research needs. It is because of this process that the program has had such a positive impact.

Title: Design Specifications and Implementation Requirements for State-Level Long-Term Pavement Performance Program

Authors: Saeed, A; Weissmann, J; Dossey, T; Hudson, W. R.

Date: 1994

Publisher: Transportation Research Board

Journal Title: Transportation Research Record No. 1455

Abstract/Synopsis: The procedures for developing a state-level long-term pavement performance (LTPP) program for rigid pavement performance modeling for future pavement management efforts are documented. The program builds on principles already developed for the national-level Strategic Highway Research Program LTPP program. A method used to develop an experimental design that meets current pavement design standards is described. The description of the experimental design is followed by a discussion of the type of data that should be collected. The data items to be collected are divided into two categories: (a) inventory data items and (b) monitoring data items. Inventory data item sources are identified. The human and financial resources required to establish the data base and the resources required to maintain and monitor this data base periodically are reported. In addition to developing the design specifications and implementation requirements for a state-level LTPP program, the implementability of the procedure is evaluated through a case study LTPP program for Texas. The results are an important contribution to providing a basis for collecting the data items needed for the analysis to update current pavement design standards, direct needed research covering climatic and geographic needs, and improve pavement management system efforts overall.

Application/Use: This paper can be used by agencies wishing to initiate a long-term pavement research project specific to local conditions.

Contribution: Cost Savings; Improvement in Knowledge.

Present Benefit: Significant effort was put forth in developing the LTPP structure. This includes establishing experimental designs, data collection protocols, data storage, and quality control procedures. All of these aspects have been fully documented by the LTPP program and can be utilized by SHAs or other agencies wishing to initiate a smaller-scale monitoring program. The availability of an established framework allows agencies to tailor a program without expending considerable resources.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Early Analyses of LTPP General Pavement Studies Data: Data Processing and Evaluation

Authors: Killingsworth, B. M; Simpson, A. L; Rauhut, J. B; Owusu-Antwi, E; Ahmad, R; Darter, M. I ; Pendleton, O. J.

Date: 1994

Publisher: Strategic Highway Research Program

Abstract/Synopsis: The purpose of this volume is to provide statistical data that may be used to characterize the nature of the data in the various data sets. The specific data sets are the General Pavement Studies (GPS)-1, GPS-2, GPS-3, GPS-4, and GPS-5 data. Data were obtained from the Long-Term Pavement Performance (LTPP) database (also referred to as the LTPP Information Management System).

Application/Use: Early analysis reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Improvement in Knowledge; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of data users.

Title: Long-Term Pavement Performance Information Management System: Five-Year Report

Authors: Hadley, W. O; Copeland, C.

Date: 1994

Publisher: Strategic Highway Research Program

Abstract/Synopsis: Past pavement research efforts often were hindered by a lack of availability and access to comprehensive, diverse, and consistent traffic, materials, structural, and climatic data for different pavement types. A principal goal of the Strategic Highway Research Program's Long-Term Pavement Performance (SHRP-LTPP) study is to design a national database for the collection of information that will allow researchers to pursue long-term pavement performance studies with confidence. To this end, a major activity of SHRP-LTPP is the establishment of a National Pavement Performance Database (NPPDB). This report describes the information management system within SHRP-LTPP to service the NPPDB and the quality assurance checks that verify the presence, reasonableness, accuracy, and validity of the data prior to incorporation into the NPPDB. The NPPDB houses many types of data including inventory, materials characterization, longitudinal profile, deflection, cross profile, distress, friction, maintenance, rehabilitation, climate, and traffic. The report discusses data types and elements in detail and notes data sources. Equipment and operations of the NPPDB are described, as well as NPPDB products.

Application/Use: Five-year reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future data users.

Title: SHRP-LTPP Data Analysis Studies: Five-Year Report

Authors: Hadley, W. O.

Date: 1994

Publisher: Strategic Highway Research Program

Abstract/Synopsis: One of the principal objectives of the Strategic Highway Research Program Long-Term Pavement Performance (SHRP-LTPP) study was the development of a comprehensive electronic media database for housing pavement performance data covering a wide range of conditions and service life factors. The database was structured to address pavement management and engineering design issues. The extent and scope of information contained within the LTPP database and Information Management System (IMS) also provides the resources not only to evaluate or revise existing design equations but to develop new ones. During the first five years of the SHRP-LTPP program, most issues have been addressed in various data analysis studies. Data analysis studies concerning load equivalency factors, materials and construction variability, rutting initiation studies, and the results of the specific SHRP-LTPP data analysis contracts are presented in subsequent sections of this report. These studies represent initial efforts in pursuit of LTPP goals and operatives and are based primarily on early General Pavement Studies data. More extensive data analysis studies will follow in the years to come.

Application/Use: Five-year reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Cost Savings; Lessons Learned; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: SHRP-LTPP General Pavement Studies: Five-Year Report

Authors: Hadley, W. O.

Date: 1994

Publisher: Strategic Highway Research Program

Abstract/Synopsis: The General Pavement Studies (GPS) examine selected in-service pavements and compile data to form a comprehensive national pavement performance database that meets the objectives of the Strategic Highway Research Program's Long-Term Pavement Performance (SHRP-LTPP) project. The purpose of this report is to document the development, evolution, and current status of GPS. Data collection criteria were developed for each of the various data elements in GPS, including traffic, skid resistance, deflection, profile, distress, environment, material properties, and climate. Some data were collected by states, others by the SHRP regional offices. Data that have been released can be accessed through the Transportation Research Board.

Application/Use: Five-year reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: SHRP-LTPP International Participation: Five-Year Report

Date: 1994

Publisher: Strategic Highway Research Program

Abstract/Synopsis: This book is a compilation of reports submitted by Australia, Austria, Canada, Denmark, Finland, France, India, Japan, The Netherlands, Norway, Poland, Slovenia, Sweden, Switzerland, and the United Kingdom about their involvement with the Strategic Highway Research Program (SHRP) Long-Term Pavement Performance (LTPP) program. These reports describe the varieties of international cooperation with SHRP-LTPP. Appendices note the people involved in the program and SHRP's research design.

Application/Use: Five-year reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Improvement in Knowledge; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process. This particular report highlights the benefits of the LTPP program realized outside of the United States and Canada. Many other countries have utilized the LTPP program for pavement research.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of data users. With international access to LTPP data, the program can improve pavements around the world.

Title: SHRP-LTPP Overview: Five-Year Report

Authors: Hadley, W. O.

Date: 1994

Publisher: Strategic Highway Research Program

Abstract/Synopsis: This report provides an overview of the first five years of the Strategic Highway Research Program Long-Term Pavement Performance (SHRP-LTPP) program. The background, LTPP history, activities and approaches, and decision-making processes of the program are detailed. Included are summaries of the studies initiated for general and specific pavement types, the characterization of pavement materials, monitoring activities, the LTPP database and Information Management System, data analysis, traffic data collection and analysis, as well as a summary of the contributions made by international participants. The general LTPP program is described and the expected results, products, and benefits are also outlined.

Application/Use: Five-year reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Cost Savings; Lessons Learned; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the LTPP program. This information can be used to understand how the program evolved and provides background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: SHRP-LTPP Specific Pavement Studies: Five-Year Report

Authors: Hanna, A. N; Tayabji, S D; Miller, J. S.

Date: 1994

Publisher: Strategic Highway Research Program

Abstract/Synopsis: Although pavements have been built and maintained in North America for more than 100 years, and although road tests and laboratory analyses have improved the design and performance of pavements, much remains to be learned. The General Pavement Studies (GPS) portion of the Strategic Highway Research Program's Long-Term Pavement Performance (SHRP-LTPP) project will provide much of the needed information. GPS will not, however, provide all the comparisons and parameters needed to study the effects of certain important factors on pavement performance. The Specific Pavement Studies (SPS) portion examines specially constructed pavements, which will help develop better understanding of the effects on performance of a few targeted factors not widely covered in GPS. SPS also explores options for construction of new pavements, the application of maintenance treatments to existing pavements, and the rehabilitation of distressed pavements. This report summarizes the status of SPS as of June 30, 1992.

Application/Use: Five-year reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Strategic Highway Research Program --Long-Term Pavement Performance Information Management System

Authors: Hadley, W. O; Copeland, C; Rowshan, S.

Date: 1994

Publisher: Transportation Research Board

Journal Title: Transportation Research Record No. 1435

Abstract/Synopsis: A major impediment to past pavement research efforts was the lack of availability of and access to comprehensive diverse, yet consistent, traffic, materials, structural, and climatic data for various pavement types. One of the basic objectives or goals of the Strategic Highway Research Program (SHRP) was to establish a national pavement performance data base in which to store all of the data being collected or generated, or both, under the Long-Term Pavement Performance (LTPP) Program. Under this program researchers could pursue long-term pavement performance studies by accessing all sorts of data with confidence. The quality assurance approach used in the SHRP-LTPP Information Management System to verify the accuracy and correctness of the data it receives and stores before releasing the data to the public is presented. In addition, the levels of data release are presented and the information sources of benefit to the user are identified.

Application/Use: Early summary reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Pacific Rim Trans Tech Conference Proceedings. Volume II. Long-Term Pavement Performance Program for Years 1992-1997: A Strategic Plan

Authors: Teng, P.

Date: 1993

Publisher: American Society of Civil Engineers

Conference Title: Pacific Rim Trans Tech Conference. ASCE Third International Conference on Applications of Advanced Technologies in Transportation Engineering.

Abstract/Synopsis: The Federal Highway Administration's operational management of the Strategic Highway Research Program's (SHRP) Long-Term Pavement Performance (LTPP) program is described. LTPP is an international in-service pavement performance monitoring program, and the FHWA is responsible for the management and coordination of the data collection efforts on more than 2,000 test sections in the United States and Canada. This paper discusses the strategic research plan for 1991 through 1997. The work required to conduct the LTPP experiments and establish the LTPP data base fall into 8 categories: field operations pavement engineering activities; traffic engineering; information management system; integration of the SHRP asphalt research into LTPP; integration of the SHRP maintenance cost effectiveness research into LTPP; integration of the SHRP concrete and structures research into LTPP; and international activities. Each of these areas is discussed in this paper.

Application/Use: This document was used as a planning tool for the LTPP program.

Contribution: Improvement in Knowledge; Implementation/Usage.

Present Benefit: The document provides an overview of the LTPP program, including its current status, and prioritizes ongoing and future tasks in light of current pavement research needs as well as the program objectives. In this way, the document laid the framework for the program moving forward from 1991.

Future Benefit: The decisions and plans for the program in regards to data collection and data analysis will continue to play a key role in the benefit that the LTPP program will provide the pavement community. The program has continually been refined and improved to match current and projected research needs. It is because of this process, that the program has had such a positive impact.

Title: Transfer of Research Results and Continuation of the Long-Term Pavement Performance (LTPP) Studies

Date: 1993

Publisher: Transportation Association of Canada

Abstract/Synopsis: The Canadian Strategic Highway Research Program (C-SHRP) was launched in 1987 in response to establishment in the United States of the Strategic Highway Research Program (SHRP). SHRP was initiated in response to the rapid deterioration of highway infrastructure and was intended to make significant advances in traditional highway engineering and technology through the concentration of new research funds on four key technical areas: pavement performance, asphalt, concrete and structures, and highway operations. In formulating the C-SHRP concept, a number of specific objectives were established for extracting the benefit of the US program: to identify, collect and disseminate information on SHRP research; to provide Canadian benchmarks in SHRP research; to support international cooperation by becoming a SHRP partner; to provide an interpretive mechanism for relating SHRP results to Canadian practice; and to leverage the effectiveness of Canadian research dollars.

Application/Use: This is directly applicable to pavement research in Canada.

Contribution: Cost Savings; Improvement in Knowledge.

Present Benefit: Significant effort and coordination took place in developing the LTPP structure, experimental design, and strategic plan. This report provides an example of how other countries can use the LTPP program as a model for implementing a research program.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Documentation describing the design and implementation of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Long-Term Pavement Performance at Year Five

Authors: Hawks, N. F.

Date: 1992

Publisher: Transportation Research Board

Journal Title: TR News No. 158

Abstract/Synopsis: The Strategic Highway Research Program's Long-Term Pavement Performance (LTPP) program is nearing a time of transition. April 1992 will mark five years of effort by the LTPP research team and cooperating highway agencies to get the LTPP studies under way. In June 1992, day-to-day management of the LTPP program will be transferred from the National Research Council (NRC) to the Federal Highway Administration (FHWA). Under FHWA management, with advice from the NRC, the program will complete the remaining 15 years of research to provide data critical to improving the performance of roads. This article looks at what the LTPP program has achieved as it approaches the end of its first phase.

Application/Use: Summary reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Lessons Learned; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Missouri SHRP LTPP Monitoring Sections

Date: 1992

Publisher: Missouri Highway and Transportation Department

Abstract/Synopsis: The Strategic Highway Research Program (SHRP) is a highly focused, five year, $150 million research program, funded under the Surface Transportation and Uniform Relocation Assistance Act of 1987. SHRP's program covers the following four technical areas: asphalt; concrete and structures; highway operations; and pavement performance. This booklet outlines the 20 Missouri sites in the Long Term Pavement Study and five Missouri sites for Special Pavement Studies which are a part of the Long Term Pavement Performance (LTPP) technical area.

Application/Use: This report is directly applicable to pavement research in Missouri.

Contribution: Improvement in Knowledge; Advancement in Technology.

Present Benefit: The LTPP database provides pavement structure, climatic, traffic, materials, and performance data on in-service pavements. Agencies can use this information to improve pavement design practices, evaluate treatment selection/timing, develop prediction tools, and investigate specific issues of interest. The LTPP program has also advanced data collection and quality control techniques for FWD, profile, distress, traffic, and laboratory testing—all of which are collected at an agency level.

Future Benefit: The LTPP database will be a valuable tool for agencies as they implement the M-E PDG. The local calibration/validation requires site-specific information that is available for the LTPP test sections.

Title: Canada's Reaction to LTPP

Authors: Williams, G. J.

Date: 1991

Publisher: Thomas Telford Limited

Conference Title: Highway Research: Sharing the Benefits. The United States Strategic Highway Research Program

Abstract/Synopsis: Since the inception of the Long Term Pavement Performance studies within the United States Strategic Highway Research Program, Canada has been an active international participant with the hope of extracting the benefit of this mammoth effort. Jointly funded on a cooperative basis by the thirteen senior governments of Canada, Canada's reaction has been the establishment of the Canadian Strategic Highway Research Program (C-SHRP) through which individual highway agencies in Canada participate directly in some aspects of the U.S. program while also undertaking separate, complementary efforts within Canada.

Application/Use: The C-SHRP program will be useful for pavement engineers in Canada and Northern tier state highway agencies.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: The C-SHRP program has provided additional data that supplements the LTPP program. In particular, the program has allowed test sections in extreme northern climates to be monitored. This provides additional research data and improves the experimental design of the program.

Future Benefit: Canadian provinces and northern-tiered states will benefit from the C-SHRP program by having a data source that can be used to better understand pavement performance in cold climates. Additionally, these agencies will use the data to calibrate and validate the M-E PDG.

Title: Information Management System

Authors: Jamsa, H; Seise, A; Sherwood, J; Harris, S; Heitzman, A.

Date: 1991

Publisher: Thomas Telford Limited

Conference Title: Highway Research: Sharing the Benefits. The United States Strategic Highway Research Program

Abstract/Synopsis: One of the major products of the SHRP Long-Term Pavement Performance (LTPP) study is the Information Management System (IMS). It is a data base which will be used for maintaining LTPP data and distributing it to the research community. The IMS runs at the moment on both personal computer (MS-DOS operating system) and VAX (VAX/VMS operating system) and it is based on the ORACLE data base management system. Data will be distributed to the researchers and outside agencies from the national center located at the Transportation Research Board (TRB) in Washington, D.C. Data are likely to be released in blocks after the data quality checks have been conducted according to SHRP procedures. A need may occur to make modifications in the IMS, especially by the overseas countries participating in the LTPP program. SHRP is developing guidelines regarding how the changes could be handled. This paper describes some preliminary ideas about how different types of changes could be incorporated in the data base in a most efficient and simple manner.

Application/Use: This early report can be used by those interested in establishing a comprehensive research database.

Contribution: Improvement in Knowledge; Advancement in Technology.

Present Benefit: Significant effort, planning, and coordination took place in the development of the LTPP IMS. The large number of data elements and records stored in the LTPP database made the development of a database schema a challenging task, particularly with early 1990s computer hardware and software. The documentation on this process proves useful to others interested in implementing a similar database. Start-up costs may be reduced by implementing some methodologies documented by LTPP.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Lessons to be Learned from the SHRP General Pavement Studies. Bituminous Roads in the 1990s. Seminar Papers. Dublin, 1 November, 1990

Authors: Hawks, N. F; Elkins, G. E.

Date: 1991

Publisher: Institute of Asphalt Technology, Irish Branch; Institution of Engineers of Ireland

Journal Title: Publication of: Institute of Asphalt Technology, Irish Branch

Abstract/Synopsis: The research plans for the Strategic Highway Research Program includes the improvement of design and rehabilitation techniques to extend pavement service life and enhance performance. The research plans include a two-year Long-Term Pavement Performance (LTPP) program to address 6 specific objectives: evaluate existing design methods; develop improved design methodologies for the rehabilitation of pavements; develop improved design equations for new and reconstructed pavements; determine the effects of loading, environment, material properties, etc; determine the effects of design on pavement performance; and establish a long-term data base to support SHRP objectives. The LTPP consists of the General Pavement Studies (GPS) and the Specific Pavement Studies (SPS). This paper describes the asphalt studies within the GPS: asphalt concrete (AC) on granular base; AC on bound base; AC overlay of AC pavement; AC overlay of concrete pavement. The expected products of the research are noted.

Application/Use: Summary reports can be used by those interested in early program activities. These reports were also used as internal planning tools.

Contribution: Cost Savings; Improvement in Knowledge; Advancement in Technology.

Present Benefit: Findings from status or summary reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process. This report provides insight into the early objectives and expected deliverables from the asphalt GPS studies.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future data users.

Title: Long-Term Pavement Performance: Proceedings of the SHRP Midcourse Assessment Meeting

Date: 1991

Publisher: Strategic Highway Research Program

Abstract/Synopsis: This document presents 21 papers on Long-Term Pavement Performance that were presented at the Strategic Highway Research Program Midcourse Assessment Meeting. While not complete, the proceedings include papers from each of the five technical workshops on pavement performance. Session 1 on LTPP data analysis relating to general pavement studies (GPS) experiments and data, includes five papers. Session 2 on LTPP data analysis relating to perspectives on impacts, includes five papers. Three papers are included in Session 3 on LTPP data analysis relating to strategic objectives. Session 4 (LTPP data analysis: workshop on approaches) includes four papers. Session 5 (LTPP: products and progress) includes four papers.

Application/Use: These proceedings provide papers documenting early LTPP program activities and can be used by those interested in LTPP activities during the infant stages of the program.

Contribution: Lessons Learned; Implementation/Usage.

Present Benefit: These papers can provide significant insight into the early program activities. This information can be used to understand how the LTPP program evolved and provides background on the decision process. This report provides insight into the early objectives and expected deliverables from asphalt GPS studies, LTPP data analysis, LTPP workshops, and program products.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Proceedings of the Conference "Strategic Highway Research Program and Traffic Safety on Two Continents" in Gothenburg, Sweden, September 18-20, 1991, Part 6: Long-Term Pavement Performance

Date: 1991

Publisher: National Swedish Road & Traffic Research Institute

Journal Title: VTI Rapport

Abstract/Synopsis: Papers presented at the seminar were as follows: Early Evaluations of SHRP LTPP Data and Planning Sensitivity Analyses, J.B. Rauhut, P. Jordahl, M.I. Darter, N.F. Hawks, O. Pendleton and E. Owusu-Antwi; Specific Pavement Studies: Key Issues and Potential Products, A.N. Hanna and N.F. Hawks; Expected Changes to the AASHTO Design Guide, N.F. Hawks; Cost Effectiveness of Asphalt Concrete Overlays - The Canadian Approach, G.A. Sparks, D. Nesbitt and G. Williams; Long Term Pavement Performance Trials and Data Analysis in the United Kingdom, H.R. Kerali and J.F. Potter; SHRP-NL: A Research Project Parallel to SHRP, G.T.H. Sweere; Structural Assessment, Performance and Economic Maintenance of Minor Roads, J.R. Duffell; Treatment of Bearing Capacity Results, B. Leben and A. Petkovsek; Model of IRI for Jointed Plain Concrete Pavements, M. Poblete, P. Ceza, J. David, J. Gonzalez and P. Gutierrez; High Speed Road Deflection Tester, P.W. Arnberg, A.A. Holen and G. Magnusson; and PAVUE: A Real-Time Pavement Distress Analyzer, M.W. Burke, P.W. Arnberg and K. Raahs.

Application/Use: These proceedings offer some insight into the early evaluations and planning of the LTPP program.

Contribution: Improvement in Knowledge; Advancement in Technology.

Present Benefit: Findings from early reports can provide significant insight into the early activities of the program. This information can be used to understand how the program evolved and provides background on the decision process.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Strategic Highway Research Program

Authors: Kulash, D.

Date: 1991

Publisher: American Association of State Highway and Transportation Officials

Journal Title: AASHTO Quarterly Magazine Vol. 70 No. 2

Abstract/Synopsis: The unique organizational features of the Strategic Highway Research Program - accelerated research, dollar-driven, management-directed, and product-oriented - are noted, and its products and implementation plan are described. Ninety four products are being developed, which include improved specifications and test methods, new equipment, computer software, manuals, and training aids. Work in the asphalt area is reviewed, and research on the identification of alkali-silica reactivity is reviewed. SHRP has just released the "Handbook for the Identification of Alkali-Silica Reactivity in Highway Structures." SHRP's Long-Term Pavement Performance (LTPP) program is designed to overcome obstacles to the transferring of pavement performance know-how. In this program, all fifty states are working together to record pavement performance data on about 800 sites in a consistent manner. Attention is now being given to an implementation plan which includes seven activities: field trials and demonstrations; training for product users; audio visual materials; new test equipment; acceleration of standards adoption; and adaptation to changing conditions.

Application/Use: This is article provides information on the SHRP implementation plan.

Contribution: Improvement in Knowledge

Present Benefit: Significant effort and coordination took place in developing the LTPP structure, experimental design, and strategic plan. This article provides an overview of the implementation plan, which can be used by other agencies in developing a long term research plan.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Documentation describing the design and implementation of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated

Title: Database Structure Reference Manual

Date: 1990

Publisher: Strategic Highway Research Program

Abstract/Synopsis: This manual provides information to Long-Term Pavement Performance (LTPP) Information Management System (IMS) data base administrators (DBAs), programmers, and users on the LTPP IMS data base structure. Although it is primarily intended to accompany the LTPP Programmer's Reference Manual, it may also be used in conjunction with the LTPP Operations Manual and the LTPP User's Manual. For each of the seven modules in the LTPP IMS, the following information is provided: a description of the module, a logical data base diagram, and a schema definition. The module's logical data base diagrams show all the table names that contain data for the module. The schema provides a description of the table and a list of all the column names. The data dictionary for the LTPP IMS is provided alphabetically in an attached appendix.

Application/Use: This can be used by those interested in the structure of the LTPP database.

Contribution: Improvement in Knowledge

Present Benefit: Documentation on the effort of structuring the LTPP database is useful for those interested in using the data as well as those looking to implement a similar research program. Structuring of the database was a challenging task, given the large quantity of data elements and records stored in the database and limitations in early 1990s computer hardware and software. As LTPP has already established a protocol, others looking to develop a similar database can benefit from the LTPP work and associated documentation.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Program documentation since the inception of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Policy for Supplemental Test Sections on Specific Pavement Study (SPS) Sites

Date: 1990

Publisher: Strategic Highway Research Program

Abstract/Synopsis: This document describes the policy to be observed as part of the selection and approval process for supplemental test sections on Strategic Highway Research Program (SHRP) Long Term Pavement Performance (LTPP) Specific Pavement Studies construction projects. The policy outlines criteria to be used by the state and provincial highway agencies when developing plans for these test sections. It also identifies the criteria which SHRP will use in approving and incorporating the test sections into the program.

Application/Use: This report can be used by those interested in the SPS experiments.

Contribution: Improvement in Knowledge; Implementation/Usage.

Present Benefit: Significant effort was devoted to the experimental design, structure, data requirements, and performance monitoring of LTPP test sites. Documentation of these efforts is available to those who are interested in SPS supplemental test sections, which were included at the discretion of the SHA and included features that were of particular interest to the State constructing the SPS project. These sections were tailored to the specific needs of the State and, therefore, the performance data collected can provide a State with extremely valuable information specific to their needs.

Future Benefit: The LTPP project was instrumental in the development of the M-E PDG. Supplemental sections may be used in the local calibration/validation of the guide during the implementation phase for materials and/or designs specific to the SHA. Documentation on the design of the LTPP experiments can be applied to the implementation of future research endeavors as well.

Title: The SHRP Long Term Pavement Performance (LTPP) Program – Summary

Authors: Skok, E L; Ingberg, R. C.

Date: 1990

Publisher: Association of Asphalt Paving Technologists

Conference Title: Asphalt Paving Technology 1990

Journal Title: Journal of the Association of Asphalt Paving Technologists Vol. 59

Abstract/Synopsis: This paper summarizes the progress in the Long Term Pavement Performance (LTPP) program of the Strategic Highway Research Program (SHRP). The LTPP program has as its goal to observe the performance of in-service test sections throughout the United States and Canada. Similar studies are being made in a number of other countries around the world in cooperation with SHRP. The pavement sections observed for the LTPP program are being observed under actual mixed traffic conditions using procedures developed by SHRP which are as consistent as possible across the whole program. The LTPP program will include performance evaluations in four designated climate regions: (1) wet/freeze; (2) dry/freeze; (3) wet/no freeze; and (4) dry/no freeze. It will include many different pavement and subgrade soil materials in each of these climatic regions. The data obtained will be as consistent and well controlled as possible, and will be stored in a computer system which will be accessible to all agencies participating in the program. The initial phase of the LTPP program is five years. This includes setting up the experiments, procedures, and test sections which will then be observed over a 20-year period.

Application/Use: This overview of the LTPP program can be used by those interested in the structure and design of the program.

Contribution: Improvement in Knowledge; Advancement in Technology.

Present Benefit: Significant effort and coordination took place in developing the LTPP structure, experimental design, and strategic plan. This report provides an overview of the program as a whole and can serve as a model for implementing similar research programs.

Future Benefit: Establishing a national, long-term research program requires significant planning and coordination. Documentation describing the design and implementation of the LTPP program will be extremely beneficial to future endeavors of similar nature. One such example is the Long Term Bridge Performance program, which was recently initiated.

Title: Understanding SHRP: Long-Term Pavement Performance

Date: 1986

Publisher: James Informational Media, Incorporated

Journal Title: Better Roads Vol. 56 No. 11

Abstract/Synopsis: The Long-Term Pavement Performance (LTPP) program covers the entire range of pavement information needs. It will draw on current technical knowledge and will develop models that will better explain how pavements perform. It will also investigate the specific effects on pavement performance of various design features, traffic and environment, use of various materials, construction quality, and maintenance practices. The specific objectives of LTPP are listed, and the LTPP study program is detailed. The latter has 3 potential types of studies: general pavement studies; specific pavement studies; and accelerated pavement studies. The accelerated loading facility under development by the Federal Highway Administration is described. Details are also given of the data collection and data management aspects.

Application/Use: This document provides a summary for those interested in current LTPP activities.

Contribution: Improvement in Knowledge

Present Benefit: This document increases awareness of LTPP and was a tool that could be used to get updated quickly regarding recent research conducted by the program.

Future Benefit: Brochures and documents such as this keep users up to date on activities and help LTPP maintain a presence in the research community.