

MISSISSIPPI SPR-1(49)

GENERAL COMMENTS ON RESEARCH WORK PROGRAM
FOR FISCAL YEAR 2007

The SPR (Part II) research work program allocation for FY 2007 totals \$1,756,910 (estimated) and includes a National Cooperative Highway Research Program (NCHRP) contribution of \$96,630 (estimated) for FY 2007, a TRB Correlation Service contribution of \$27,534 and pooled-fund studies totaling \$609,164 as detailed in the program tabulation and narrative included in this document. The NCHRP funding is 5.5% of the SPR Part II allocation. 25% of MDOT's TRB Correlation Service contribution is funded using SPR Part II funds. The remaining agency required funding for both NCHRP and TRB are funding through MDOT's Planning Division (SPR-1(47)) using SPR Part I funds. This work program tabulation also includes renewal statements for all on-going line items. The renewal statements for state studies contain financial information including total study budget, total expenditures to date, and cost estimates for fiscal year 2007. Also included in the renewal statements for state studies are narrative descriptions of study objectives, accomplishments of the past year, and work planned for fiscal year 2007. Beginning and completion dates are shown for each state study. Line items other than state studies have narrative descriptions of scope, objectives and anticipated activities along with a cost estimate. These tabulations and renewal statements constitute the FY 2007 research work program.

The pooled fund studies, the TRB Correlation Service and NCHRP as described herein are funded with 100% SPR Part II funds (no state match). The thirty-four line items in the tabulation mentioned above includes only those items for which there is a state match (80/20) in the funding.

Additional projects utilizing either 100% Federal non-SPR funds or 100% State funds that are administered by the Research Division are also described within this document.

State study numbers in this work program are the same as those currently being used, and they will remain the same in all correspondence. Study proposals for future submissions will be numbered sequentially.

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LINE ITEM 1

Long-Term Pavement Performance

This line item is for support of the Long-Term Pavement Performance (LTPP) program begun under the Strategic Highway Research Program (SHRP) and now a part of the Federal Highway Administration (FHWA). Activities covered include site nomination, site verification, historic data searches, support for material sampling and field-testing, construction supervision, and technology transfer activities associated with LTPP and SHRP product implementation. Activities associated with the new SHRP II program as outlined in the current SAFETEA-LU legislation will also be supported by this line item.

Activities conducted in FY 2006 included:

- support for field data collection

Activities planned for FY 2007 include:

- maintaining pavement marking for existing LTPP sites
- support for all LTPP activities & SHRP II activities

Cost Estimate for FY 2007

Salaries (Regular Employees)	\$500
Employee Benefits	\$140
Materials, Supplies, and Services	\$200
Travel and Sustenance	<u>\$160</u>
Total	\$1,000

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LINE ITEM 2

Implementation of Research Projects

This line item funds Research Division activities relating to implementation of research studies.

Implementation Activities consist of field and office activities that apply research results to the solution of operational problems in the transportation area. Examples of these activities are:

1. Applying new products and/or procedures in the field to specific field problems.
2. Short-term field and/or office technical support in trouble-shooting and design.
3. Assistance in development of specifications and tests to implement new products or procedures.
4. Identifying areas in which research is required.
5. Initial preparation costs associated with proposed research.

Research information for implementation may originate from MDOT's Research Program (in-house and Contract), including both completed and ongoing studies; from other state transportation agencies' experiences and research; from national and international sources, from the FHWA; and from major research sources such as NCHRP, Corps of Engineers, etc.

Cost Estimate for FY 2007

Salaries (Regular Employees)	\$187,500
Employee Benefits	\$52,500
Materials, Supplies, and Services	\$15,000
Travel and Sustenance	<u>\$20,000</u>
Total	\$275,000

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LINE ITEM 3

Technology Transfer

This activity funds Research Division activities relating to the distribution of information about transportation technologies to any of MDOT Research Division's transportation customers.

Examples of technology transfer activities are:

- making presentations of research results to various groups such as universities and technical societies
- participation in user group meetings, conferences, seminars and training courses
- distribution of research results
- inputting research and research-in-progress (RIP) results into the Transportation Research Information Service (TRIS)
- maintaining Research Division intranet website and support for research related postings on MDOT's "GoMDOT" webpage.
- Producing and distributing a MDOT Research Newsletter twice annually

NOTE: The SPR WORK PROGRAM-PART I (SPR-1(47)), provides direct support to the Center for Technology Transfer (T²) at Jackson State University, and those activities and funds are not included in the above line item, Technology Transfer.

Cost Estimate for FY 2007

Salaries (Regular Employees)	\$62,500
Employee Benefits	\$17,500
Materials, Supplies, and Services	\$6,000
Travel and Sustenance	\$12,000
Conference Registrations	<u>\$2,000</u>
Total	\$100,000

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LINE ITEM 4

Pavement Management

This item covers the activities of the Research Division relating to the development, implementation, maintenance and operation of the Department's Pavement Management System. The Pavement Management System database serves as an important resource for Departmental sponsored pavement related research.

Activities include awareness of national pavement management state-of-the-art and practice, administration of field data collection and statewide database development, administration of pavement condition survey contracts, quality assurance for condition surveys, in-house software development, administration of contract software development, planning and conducting in-house training, administration of contract pavement management research, implementation of pavement management research and annual distress surveys associated with MDOT's maintained pavement projects.

Cost Estimate for FY 2007

Salaries (Regular Employees)	\$210,000
Employee Benefits	\$58,800
Materials, Supplies, and Services	\$12,500
Travel and Sustenance	<u>\$18,700</u>
Total	\$300,000

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LINE ITEM 5

Network Level Pavement Friction Data Collection

This item covers the friction data collection activities of the Research Division to ensure that MDOT provides acceptable surface skid resistance for the traveling public.

MDOT currently tests the surface friction of the entire highway network on a 3 year cycle. Areas of low surface friction are identified and submitted for immediate surface treatment to improve surface friction. This line item funds the surface friction data collection on 1/3rd of the network annually and includes periodic calibration of equipment.

Cost Estimate for FY 2007

Salaries (Regular Employees)	\$25,000
Employee Benefits	\$7,000
Materials, Supplies, and Services	\$8,000
Travel and Sustenance	<u>\$10,000</u>
Total	\$50,000

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LINE ITEM NO. 6	STATE STUDY NO. 144
TOTAL STUDY BUDGET: \$192,082	TOTAL STUDY COST TO DATE: \$165,082
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/07
STUDY TITLE:	Profilograph Specification Study
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Milady Howard

Objective:

The current roughness specification utilized by the MDOT was developed over 10 years ago and there have been no significant changes since. The specification was developed based on the manual profilograph, which has since been replaced by the automatic unit. Also, unlike 10 years ago, industry is now utilizing high frequency rollers to compact their hot mix asphalt pavements. These rollers have a propensity for creating small scallops in the pavement surface, which due to the blanking band requirement in the current roughness specification are not taken into account when computing a profile index. However, these scallops are certainly felt by the traveling public and create a rougher ride quality. Based on the current specification, industry is not being penalized for a rough ride quality and in some instances contractors are being rewarded with incentive pays for a rough final ride surface. Most states have removed the blanking band from their roughness specification for this very reason. Many of the states have gone to the light weight profiler for their QC/QA of ride quality. The MDOT intends on utilizing the light weight profiler, which instead of producing a profile index value measures the International Roughness Index (IRI). This transition will take some time with undoubtedly a period of time where a dual specification (light weight profiler and profilograph) is in place. If the MDOT is to ever successfully make this transition, the current profilograph specification must be "tightened up" and data must be gathered comparing profile index values to IRI for Mississippi pavements.

Progress:

Roughness data has been gathered from approximately twenty (20) projects utilizing the "California type" profilograph, South Dakota type road profiler and the AARB walking profiler. Using this information the department has tentatively revised the current 907-403-12 and the 907-401-22 specifications with regards to surface smoothness. The major change involved in this proposed update is the removal of the .2" blanking band for Profile Index computation. The bump requirement has also been changed from .4" per 25' to .3" per 25' for all pavements.

The department has purchased a lightweight profiler capable of collecting both PI and IRI. Project funds were not utilized to purchase this equipment. Proof testing of the newly acquired lightweight profiler has begun.

Progress Continued:

Data was gathered from throughout the State on calibration sections to develop the new IRI specification. The data has been compiled to give an initial best fit correlation between current PI acceptance values and collected IRI values. This initial IRI acceptance correlation data was compared to IRI specifications in other states such as Texas and Virginia.

James Watkins initiated and is continuing development of a software package that will be capable of identifying bumps and dips, as well as being universal to all inertial profiler manufacturers.

Steve Karamihas from the University of Michigan Transportation Institute visited with MDOT Research and Construction Division staff members to assist with the ongoing research effort.

Data was gathered from throughout the State on new construction projects.

During FY 2005 some data was collected using both the AMES Profilograph and the ICC Lightweight Profiler.

Data was collected using the ICC lightweight profiler at various sites including new construction, one and two-lift overlay construction and reconstructed projects. Attendance to a ProVAL seminar during March 2006 occurred to better understand the latest software used for analyzing smoothness data. This software was used to analyze the collected data. Tests were performed to determine the lead-in distance required by, and the repeatability of, the ICC lightweight profiler.

A comparative analysis was conducted of specifications used by other states. Began writing the final report.

Plans for FY 2007:

Collect data on PCC and/or asphalt pavements using the profilograph, lightweight profiler and high speed profiler for comparison purposes. Analyze the data collected with the lightweight profiler using ProVAL software. Perform a grind simulation using ProVAL and grind accordingly. Re-test the pavement using the three pieces of equipment to determine the exact grind results. This information will be used to provide tangible evidence of the benefits (or not) of using IRI and ProVAL. Finalize the project and submit final report.

Cost Estimate for FY 2007 \$25,000

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LINE ITEM NO. 7	STATE STUDY NO: 157
TOTAL STUDY BUDGET: \$150,000	TOTAL STUDY COST TO DATE: \$111,915
DATE STARTED: 03/01/02	COMPLETION DATE: 3/31/07
STUDY TITLE:	Evaluation of DRM System
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	Randy Battey

Objective:

Reflective cracking in flexible pavements is a primary form of distress found in Mississippi highway pavements. To date, few if any, fail safe preventative measures to prevent this distress have been discovered.

The objective of this project is to evaluate an interlayer system, DRM™ (Distress Resistant Membrane), as a preventative treatment for reflective cracking in HMA pavements. (More information on the DRM™ system can be found at <http://www.highwaypreservation.com>) A seven mile long project on MS4 near the community of Galena in Marshall County will be utilized for the evaluation. MS4 near Galena was originally constructed in 1981 and is comprised of 6" of asphalt pavement on top of a soil cement base. Reflective cracking from the soil cement base has caused the pavement condition to become unacceptable.

The study will compare 3½ miles of DRM™ with a subsequent 4" overlay to 3½ miles of no DRM™ with a 4" overlay. A comparison will be made between the amount of reflective cracking in the new 4" overlay between the sections with and without the DRM™ system.

Progress:

The performance of the sections continued to be monitored in FY 06. All field data associated with this project has been collected. This project was extended by six months to allow additional time to complete the final report.

Plans for FY 2007:

Prepare and distribute the final report documenting the performance of the test sections.

Cost Estimate for FY 2007 \$10,000

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LINE ITEM NO. 8	STATE STUDY NO: 166
TOTAL STUDY BUDGET: \$110,000	TOTAL STUDY COST TO DATE: \$78,417
DATE STARTED: 10/01/02	COMPLETION DATE: 12/31/07
STUDY TITLE:	Hot Mix Asphalt (HMA) Characterization for the 2002 AASHTO Design Guide
RESEARCH AGENCY:	Mississippi State University
PRINCIPAL INVESTIGATOR:	Tom White

Objective:

MDOT currently uses the AASHTO Guide for the Design of Pavement Structures for structural pavement design. This guide is empirically based and utilizes the concept of structural numbers (SN) to determine the overall required thickness of varying pavement layers. These structural numbers were determined from the AASHTO road test in the 1950's.

Currently the AASHTO 2002 Guide for Design of New and Rehabilitated Pavement Structures is being developed. This guide will have three design levels (Level 1,2 and 3) all based on mechanistic-empirical design principles and will potentially replace the existing guide as the structural design guide for MDOT.

The researchers working on the flexible pavement component of the 2002 guide have evaluated many test methods to determine the best relationship between observed HMA mix lab performance and field performance with respect to rutting, fatigue cracking, etc. Currently, the dynamic modulus test will be used to characterize HMA mixes for input into the 2002 design guide. The test is run in accordance with ASTM D 3497 Standard Test Method for Dynamic Modulus of Asphalt Concrete Mixtures.

Mississippi HMA mixes need to be characterized using dynamic modulus testing in preparation for the future implementation of the 2002 design guide. In this study a range of HMA mixes will be characterized using the dynamic modulus testing. Any proposed evaluation will initially be focused on materials and mixes that are currently being used in the state.

Selected mixes will also be evaluated using the asphalt pavement analyzer (APA) and confined repeated deformation testing for comparison purposes. MDOT has performed APA testing on many mixes and a side-by-side comparison of the dynamic modulus and the APA would be very useful.

Progress:

A determination was made regarding which HMA mix design variables to include in the study. Discussions were made with personnel from NCAT, the University of Arkansas and Advanced Asphalt Technologies regarding the testing equipment and protocols used for dynamic modulus testing.

Appropriate literature involving the dynamic modulus test and the 2002 design guide was obtained and reviewed and mix design work was conducted during FY 2004.

Mix design work was performed.

Final purchase arrangements for the necessary testing equipment were made during August 2004.

During FY 2005 sample coring was conducted to determine an appropriate procedure for test specimen preparation and a new saw was procured to cut the ends of the cored specimens. Sawing is required to ensure that the two ends of each core meet the tolerance as parallel planes. Additional stockpile materials were obtained and stored. Tests for all materials and mix designs were completed.

Bids were received for the procurement of the required servohydraulic testing equipment. The bids exceeded the anticipated costs, therefore, it was decided to refine the bid specifications and re-advertise. New bids were received and one of the bids was selected for this new equipment. The bid and supporting documentation was submitted to IHL for approval. Approval was granted in June, 2005 with an anticipated equipment delivery date of October 1, 2005.

The graduate student working on the project is leaving MSU. In preparation for that a new graduate student has been recruited. The new student worked with the outgoing student to become familiar with all material tests and mix design steps. Provisions were made for this new student to visit a laboratory with similar test equipment and observe or assist in tests of the type being utilized in the current project.

During FY 06 all components of the new electro-hydraulic test system was received, installed and training was conducted for its operation. Various system operating software and hardware issues were resolved. A check of the HMA mix designs was conducted for all aggregates, asphalt grades and design gyration levels. Techniques were developed to produce HMA dynamic modulus test specimens within the required air void tolerance. Dynamic modulus testing was initiated.

Plans for FY 2007:

The remaining mixes will be tested for dynamic modulus. HMA specimens will be prepared and tested in the APA. A report will be prepared that will include all test results. Due to difficulties regarding the purchase and set up of the requisite test equipment, and time required to develop a satisfactory procedure to fabricate test specimens, the consultant was granted a zero cost one year extension of time to complete this study.

Cost Estimate for FY 2007 \$29,583

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LINE ITEM NO. 9

STATE STUDY NO: 170

TOTAL STUDY BUDGET: \$307,163 (SP&R)	TOTAL STUDY COST TO DATE: \$0 SP&R
<u>\$500,000 (Non SP&R)</u>	<u>\$367,868 Non-SP&R</u>
\$807,163 Total	\$367,868 Total

DATE STARTED: 03/01/04

COMPLETION DATE: 03/01/08

STUDY TITLE:

Implement the 2002 Design Guide for MDOT
(Phase II)

RESEARCH AGENCY:

ERES Consultants Division of ARA, Inc.

PRINCIPAL INVESTIGATOR:

Athar Saeed

Objective:

ERES Consultants Division of Applied Research Associates, Inc. is finalizing the development of the 2002 Guide for Design of New and Rehabilitated Structures through NCHRP Project 1-37A. The 2002 Guide incorporates mechanistic-empirical pavement design principles and allows highway agencies to develop cost-effective and reliable designs by systematically considering climate, material properties, construction variability, and traffic to predict pavement performance. This design process is a total departure from the process utilized in the current AASHTO design procedure, requiring the designer to make trial selection of materials and layer thicknesses and evaluating their performance under projected loadings over the design life of the pavement.

The objective of this study is to implement the 2002 Design Guide for Mississippi DOT. The following issues will be addressed in this study:

- Provide for training of Design Guide users and other stakeholders
- Develop and execute a plan for securing the appropriate design input data on material and traffic characterization, and other design inputs
- Conduct sensitivity analyses and make comparisons of 2002 designs with current procedure
- Develop and execute a plan for calibration of Guide performance and distress models

Progress:

- A technical memorandum describing the ME PDG inputs for new and rehabilitated pavement design was submitted to Mississippi DOT.
- A three-day meeting was held with Mississippi DOT personnel from July 12 through July 14, 2004 to discuss and review PDG inputs.

Progress Continued:

During FY 05 work on project tasks was slowed at MDOT's request in anticipation of recommendations from NCHRP Project 1-40 which is reviewing NCHRP 1-37A deliverables. However, work continued, especially on those tasks not affected by NCHRP 1-40. The following tasks have either been completed or progress made during this FY:

- Preliminary sensitivity analysis is completed
- Completed establishment of materials and traffic estimation procedures and default values
- Progress made on performing detailed sensitivity analysis of Design Guide software
- Progress made on setting up a laboratory and field testing program
- Progress made on finalizing the selection of pavement sections for use in calibrating/validating the design guide performance models
- Progress made on preparing a Phase II Interim report that documents the research results for FYs 04 and 05 and will provide a detailed research plan for the next 24 months.

The following tasks have either been completed or progress made during FY 06:

- Project staff attended the December 2005 NCHRP 1-40 meeting in Washington, D.C.
- Subgrade material tests were completed including tests on materials sampled for MDOT SS 179 and ARA reviewed the resulting test results.
- Continued to coordinate and acquire pavement inventory and performance data for subsequent calibration/validation of the MEPDG performance models. Work directly related to actual calibration/validation of these models has been suspended/slowed at the request of MDOT to ensure incorporation of the latest NCHRP 1-40 results.

Plans for FY 2007:

- Resume work on all scheduled SS170 tasks that were deferred due to NCHRP 1-40.
- Initiate and complete the detailed sensitivity analysis of the MEPDG software. This work will cover the full range of inputs required in the design process. The latest MEPDG software (version 1.0) will be used and due consideration will be given to all NCHRP 1-40 recommendations while accomplishing this task.
- Continue selecting in-service pavement sections for use in the distress model calibration and validation and obtain and review data related to pavement structure, construction materials, current and design traffic, and climate. Data from these pavement sections will be used to carry out the calibration and validation of the Design Guide performance models including performance prediction of each section using the MEPDG software and a comparison with the measured/observed field performance.
- Work on laboratory testing will continue with the assistance of Burns Cooley Dennis, Inc. The goal is to locate and test 15 - 18 granular base materials. Testing in some cases will involve classification and Proctor tests in addition to

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PART II

LINE ITEM NO. 10	STATE STUDY NO: 171
TOTAL STUDY BUDGET: \$200,000	TOTAL STUDY COST TO DATE: \$66,253
DATE STARTED: 03/01/04	COMPLETION DATE: 03/01/08
STUDY TITLE:	In-House Support to State Study 170
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	William F. Barstis

Objective:

This study will be conducted to support the proposed study “Implement the 2002 Design Guide for Mississippi DOT.” The construction, traffic and materials data will be obtained for approximately 132 existing pavement sections. In addition to this data, pavement coring and FWD testing will be required for 24 of these pavement sections. Coordination between the six District Materials Engineers, the MDOT Central Laboratory and the private testing firm will be required to ensure that the requisite materials testing is conducted on representative samples of subgrade soils, crushed rock base course materials and chemically stabilized soil materials. Review the input/output data related to the customized 2002 Design Guide software as well as the developed training materials including courses, seminars and manuals that will be delivered to MDOT as a result of the referenced study.

Progress:

The PI of SS No. 170, the MDOT Technical Advisory Committee members and PIs of support studies were coordinated to facilitate the implementation of the new MEPDG.

The technical memorandum provided by the PI of SS No 170 was reviewed and the NHI Course No. 131064 “Introduction to Mechanistic-Empirical Pavement Design” workbook was reviewed for general background regarding the new MEPDG and material property and traffic inputs for the new design procedure.

A list of roads was supplied to ERES Consultants to be reviewed as candidates for the test sections to be included in the factorial experiment design.

During FY 2005 pavement performance data was provided to the principal investigator of SS No. 170 for numerous pavement sections located throughout the state. Collection of requisite MDOT construction and materials data for several of these pavement sections was performed and the data submitted to the principal investigator. Several coordination meetings were held to support this data retrieval and submission process.

During FY 2006 continued to collect requisite data for calibration/validation of performance models

Plans for FY 2007:

Continue coordination activities. Continue process of collecting requisite MDOT data for calibration of performance models. Perform FWD testing and coring operations on rehabilitated pavement sections selected for calibration/validation of performance models.

Cost Estimate for FY 2007 \$75,000

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LINE ITEM NO. 11	STATE STUDY NO: 173
TOTAL STUDY BUDGET: \$90,000	TOTAL STUDY COST TO DATE: \$15,912
DATE STARTED: 10/01/03	COMPLETION DATE: 09/30/08
STUDY TITLE:	Evaluation of Preventive Maintenance Treatments
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	Randy L. Battey

Objective:

Preventive maintenance is the planned treatment of pavements which provides protection, decreases the rate of deterioration and adds 5 to 10 years to the service life of the pavement. Agencies must determine which of the many treatments that are available provides the most benefit for the various stages of a pavements life. In this study an evaluation will be performed of two seal treatments to provide cost/benefit data and assist in the updating of Mississippi DOT's "decision trees" that are utilized to determine which preventive maintenance treatment provides the most benefit for each pavement condition.

Progress:

The initial project evaluating a scrub seal treatment was constructed on MS 35 in Tallahatchie County from logmile 18.773 to 19.773 was constructed in March of 2005. Distress and smoothness measurements were taken both before and after construction.

A second location to evaluate a microsurfacing treatment was identified on US 61 in Tunica County. This second location had pre-rehabilitation distress and smoothness measurements performed. During FY 2006 a comparison was constructed on US 61 in Tunica County to evaluate the performance of a microsurfacing treatment vs. a thin (1") conventional SuperPave asphalt overlay.

Data continued to be collected on both the Tallahatchie County and Tunica County projects.

Plans for FY 2007:

Periodic distress and smoothness measurements will be made on both of the project locations. The feasibility of incorporating a third evaluation into this project will be explored.

Cost Estimate for FY 2007 \$25,000

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LINE ITEM NO. 12	STATE STUDY NO: 175
TOTAL STUDY BUDGET: \$92,222	TOTAL STUDY COST TO DATE: \$3,425
DATE STARTED: 10/01/04	COMPLETION DATE: 07/31/07
STUDY TITLE:	Effectiveness of Increased Highway Patrol Surveillance on Work Zone Safety in Mississippi
RESEARCH AGENCY:	The University of Southern Mississippi
PRINCIPAL INVESTIGATOR:	Tulio Sulbaran & David Marchman

Objective:

Among the MDOT work zone safety initiatives, MDOT has established an agreement with the Mississippi Highway Patrol (MHP). As part of the agreement, MDOT has provided funds to the MHP to increase surveillance in high profile work zones. The objective of this project is to evaluate the safety impact of this increased surveillance. This will be achieved by the following means:

- Collecting historical and field data from selected Mississippi work zones before, during and after the increased highway patrol surveillance
- Reviewing nationwide literature of increased highway patrol surveillance in work zones
- Analyzing the compiled Mississippi data and the nationwide literature search findings

The data collection in Mississippi work zones will begin by consolidating MDOT and other government entities historical data. The data consolidation will include:

- Characteristics of work zones (i.e. locations, safety programs, conditions before, during and after construction)
- Traffic parameters (such as traffic volume before, after and during construction)
- Accident information (location, time, severity and cause of accident)

Once the historical consolidation has been performed, similar information will be gathered on projects currently under construction.

Ultimately correlations will be established to relate traffic parameters such as volume and speed to accidents in work zones. A second correlation between increased highway patrol surveillance, traffic parameters and accident rate will be established. Using these correlations the impact of increased highway patrol surveillance on accident reduction will be identified.

Progress:

Progress during FY 05 includes:

- A literature search was performed to review previous work of the effect of increased highway patrol surveillance on work zone safety.
- Established highway patrol surveillance effectiveness measurement criterion and variables for Mississippi based on the literature review.
- Interacted with MDOT to select highway work zones to be used for this project and completed the compilation of information regarding several Mississippi work zone projects.
- Obtained MDOT approval for the specific study parameters.
- Obtained access to Mississippi historical data regarding work zones, traffic parameters and accident data.
- Analyzed current traffic parameter and incident/crash data
- Made initial correlation based on current data and identified need for collection of additional data.
- Identified field plan to collect data

Progress during FY 06 included preparation of a draft of the final report. Due to delays related to Hurricane Katrina, a zero cost time extension until July 31, 2007 was granted.

Plans for FY 2007:

Complete final report.

Cost Estimate for FY 2007 \$88,797

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LINE ITEM NO. 13	STATE STUDY NO: 177
TOTAL STUDY BUDGET: \$89,808	TOTAL STUDY COST TO DATE: \$52,353
DATE STARTED: 10/01/04	COMPLETION DATE: 09/30/07
STUDY TITLE:	Inputs of Portland Cement Concrete Parameters Needed for the Design of New and Rehabilitated Pavements in Mississippi
RESEARCH AGENCY:	University of Mississippi
PRINCIPAL INVESTIGATOR:	Ahmed Al-Ostaz

Objective:

MDOT is implementing the mechanistic-empirical pavement design methodology developed under NCHRP 1-37A. This pavement design method characterizes the pavement materials by fundamental properties such as modulus and Poisson's Ratio. For rigid pavement design the Portland Cement Concrete (PCC) is characterized by:

- Modulus of Rupture
- Compressive Strength
- Modulus of Elasticity
- Tensile Strength
- Coefficient of Thermal Expansion
- Concrete Shrinkage
- Unit Weight
- Poisson's Ratio

In this study PCC mixes encompassing a range of aggregate types with various blends of Type I cement, Class F or C fly ash and slag that are typically encountered in Mississippi will be evaluated for these parameters.

Progress:

Requisite laboratory equipment was procured for determining PCC coefficient of thermal expansion, elastic modulus, shrinkage and tensile strength. Initiated testing of PCC samples.

The FHWA Mobile Concrete Laboratory (MCL) was set up at the University of Mississippi and a workshop was conducted by the FHWA Office of Pavement Technology to introduce engineers to the new MEPDG rigid pavement design test protocols and design procedure. An interlaboratory comparison of test results was conducted with replicate samples tested in the University of Mississippi laboratory and the MCL.

Progress continued:

During FY 06 completed preparation of all test samples. Initiated shrinkage/expansion and coefficient of thermal expansion (CTE) testing and continued to collect requisite data. Continued collecting strength and modulus data of all 20 mixes.

Plans for FY 2007:

Measure modulus of rupture, compressive strength, modulus of elasticity, tensile strength, and Poisson's ratio for concrete specimens manufactured from PCC mixes encompassing a range of aggregate types with various blends of Type I cement, Class F or C fly ash and slag that are typically encountered in Mississippi at the age of two years.

Continue evaluating concrete shrinkage and coefficient of thermal expansion for PCC mixes encompassing a range of aggregate types with various blends of Type I cement, Class F or C fly ash and slag that are typically encountered in Mississippi.

Write and submit final report. A zero cost time extension until September 30, 2007 was granted to allow completion of shrinkage testing of requisite test specimens. This test procedure requires testing of some specimens after two years of curing.

Cost Estimate for FY 2007 \$37,455

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LINE ITEM NO. 14	STATE STUDY NO: 178
TOTAL STUDY BUDGET: \$195,000	TOTAL STUDY COST TO DATE: \$36,511
DATE STARTED: 10/01/04	COMPLETION DATE: 09/30/07
STUDY TITLE:	Cogongrass Inventory and Management
RESEARCH AGENCY:	Mississippi State University
PRINCIPAL INVESTIGATOR:	John Byrd

Objective:

MDOT is faced with the control and management of a very aggressive grass known as "Cogongrass" (*Imperata cylindrica*). Cogongrass is an invasive weed which continues to spread along MDOT right of ways, as well as to adjacent properties. Because it is so hardy, it colonizes on a site and quickly becomes the dominant vegetation. No other plant species can compete with the extensive root system. It is a threat to both the local plant community and the native wildlife because it displaces all native plant materials, resulting in a near sterile monoculture. Neither wild nor domestic animals can digest the leaf tissue because of the high silica content.

The proposed research will be a three-phase approach. A comprehensive inventory will be completed which identifies colony locations on a regional and then state wide basis. This inventory will also identify adjacent land uses and the level of threat the cogongrass poses to particular areas. From this information, a priority system will be developed which identifies the areas most in need of treatment. This treatment may be one of two types, management or eradication. Due to the extensive spread of this plant in south Mississippi, it will have to be managed in some areas while eradication efforts are conducted in the high need areas.

Progress:

During FY 05 eight populations of cogongrass along MDOT rights of way were selected and the boundaries and center point latitude and longitude coordinates determined. Aerial images of all populations were collected in the fall of 2004. Several long-term cogongrass management studies have been established. One study site is on the west bound right of way of highway 63 just north of Interstate 10, and other sites are located in Jackson, George and Hancock counties. These studies evaluate various management tactics such as application of various rates of glyphosate imazapyr and imazapic, which are herbicides for cogongrass control. Two studies were established to evaluate tank additives to enhance the activity of these herbicides. Another study was established to evaluate the potential to use a plant pathogen biocontrol agent along the right of way of highway 90 in Jackson County.

During FY 06 cogongrass images were collected for fall 2005, and winter, spring and summer of 2006. Areal expansion rates of the colonies of cogongrass were monitored via these images using Erdos Imagine and ArcView software programs.

Plans for FY 2007:

Principal investigator was requested to provide this information, but failed to do so.

Cost Estimate for FY 2007 \$158,489

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 15	STATE STUDY NO: 180
TOTAL STUDY BUDGET: \$90,000	TOTAL STUDY COST TO DATE: \$3,234
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/08
STUDY TITLE:	Evaluation of Pavement Marking Materials
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATORS:	Jeff Wages & Milady Howard

Objective:

Current MDOT policy requires that products to be used on construction and maintenance projects come from the Departmental "Approved Products List". Additionally in order for the Department to obtain Federal participation on projects, all products must have an approved equal (i.e. no sole source products).

Safety has long been a priority for MDOT and with that in mind the Department is constantly exploring methods and products that will improve visibility for motorists both at night and during wet conditions. In order to evaluate new striping materials, MDOT has received formal experimental feature approval (in accordance with 23 CFR 635.411(a)(3)) from the Mississippi Division Office of FHWA on the following four projects to date:

1. MS 304 from US 61 to I-55 and Spur (MS 713), Desoto & Tunica Counties
2. US 49 from US 98 South to Black Creek, Forrest County
3. Interchange at US 61 and Liberty Road, Adams County
4. I-55 from Pearl Street to I-220, Hinds & Madison Counties

The performance of each of the experimental features incorporated in these projects (and any future approved pavement marking evaluations) will be separately documented and reported to interested agencies as well as the AASHTO Product Evaluation Listing (APEL) through technology transfer procedures already in place within MDOT's Research Division. This study will fund the collection and dissemination of data resulting from these evaluations. Additionally should these evaluations prove to be successful it will enable the approval of more products for the Departmental "Approved Product List" and enable Federal participation on more projects utilizing these products.

Progress:

During FY 06 the Adams County (Liberty Road Interchange) project had the 3M temporary tape applied and MDOT Research Division documented the application of this tape and began monitoring the retroreflectivity and durability of this tape.

Progress continued:

Measured the retroreflectivity and durability of previously placed inverted profile stripe (Gulflite) on concrete pavements throughout the state.

Plans for FY 2007:

Use a retroreflectometer to dry and wet test remaining Gulflite (8) and 3-M (4) striping projects. Testing includes initial testing that will occur prior to the end of this calendar year. Re-test will occur in 6 months. Evaluation of the striping product includes a visual inspection. Tabulate test results and submit report.

Cost Estimate for FY 2007 \$30,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 16	STATE STUDY NO: 181
TOTAL STUDY BUDGET: \$100,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/07
STUDY TITLE:	Structural Characterization of Asphalt Drainage Course Layers
RESEARCH AGENCY:	Burns, Cooley & Dennis, Inc.
PRINCIPAL INVESTIGATOR:	L. Allen Cooley, Jr.

Objective:

Asphalt Drainage Courses (ADCs) are generally required under all 4-lane facility flexible pavements in Mississippi. Within typical pavement sections, ADCs are placed over a stabilized granular soil base layer. MDOT is currently funding studies to implement the new Mechanistic-Empirical Pavement Design Guide (MEPDG). Within this new design guide all layers of the pavement structure are evaluated for fundamental engineering properties such as modulus and Poisson's Ratio. The proposed study includes three objectives:

1. Properly characterize the stiffness (modulus) of ADC materials.
2. Develop appropriate transfer functions for ADC materials. MDOT uses the Falling Weight Deflectometer (FWD) to characterize the structural capacity of in-place pavements that are scheduled for overlay. Data developed from FWD testing is input into ELMOD 5 for evaluating determining required thickness of overlay. To facilitate analysis using ELMOD 5 typical moduli values of ADC materials (objective 1) are required along with appropriate transfer functions.
3. The current MDOT flexible pavement design procedure does not assign a structural value (layer coefficient) to ADCs. The new MEPDG allows the contribution of the 4 inches of asphalt binder stabilized aggregates to the overall structural integrity of the pavement. Possible elimination of the underlying chemically stabilized soil base course could be realized if the drainage layer is shown to be structurally equivalent to the stabilized base layer, leading to a savings in pavement construction. The results from the first two objectives will be used in the MEPDG to perform this evaluation.

Progress:

Work was initiated and continued to identify the best method for characterizing the stiffness of asphalt drainage courses via literature reviews and consultation with recognized experts in this field of study.

Plans for FY 2007:

Continue to evaluate different methods for characterizing asphalt drainage layers by assessing papers, articles and reports on asphalt drainage layers. Interviewing of experts in the area of fundamental testing of pavement materials will also continue. Samples of aggregates that can be utilized within an asphalt drainage layer will be obtained. These aggregates and asphalt binder will be combined in order to create specimens for laboratory stiffness testing. Once laboratory testing is completed, the researchers will evaluate asphalt drainage layers within pavement structures using mechanistic-empirical methods. Finally, results of the laboratory stiffness testing will be used to evaluate transfer functions for use with ELMOD 5.

Cost Estimate for FY 2007 \$95,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 17	STATE STUDY NO: 183
TOTAL STUDY BUDGET: 180,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/08
STUDY TITLE:	Enhancing Mobility to Improve the Quality of Life in the Mississippi Capitol Region
RESEARCH AGENCY:	Jackson State University
PRINCIPAL INVESTIGATOR:	Emmett Crockett

Objective:

Jackson State University (JSU) has established an initiative entitled the University and Urban Mobility Initiatives to continuously assess mobility in the Greater Capitol Region and design and implement strategies to better ensure ease of movement throughout the metro area. This program will identify the regions strengths and shortcomings in the areas of transportation and mobility with the goals of continuing to maintain residents and viable commercial entities. The proposal provides for joint funding by JSU, MDOT and the City of Jackson to accomplish these goals. A budget of \$205,630 is proposed for the first year with JSU providing 42%, and MDOT and the City of Jackson respectively providing 29 percent of the cost of the program.

Progress:

Identified and performed preliminary review of regional transportation and development plans in the Jackson area and other regions to plan and/or conduct a regional mobility summit. Began planning for this summit.

Plans for FY 2007:

The Regional Mobility Summit for the Greater Mississippi Capital Region is tentatively scheduled for late February. Following the Summit, efforts will be devoted to identifying specific strategies that could be conducted to enhance mobility in the Greater Mississippi Capital Region. These strategies will be identified and explored among the various municipalities that comprise the region. Key business and community leaders in the region will be consulted in order to identify and pursue mobility enhancement strategies.

Cost Estimate for FY 2007 \$60,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 18	STATE STUDY NO: 184
TOTAL STUDY BUDGET: \$218,224	TOTAL STUDY COST TO DATE: \$3,887
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/14
STUDY TITLE:	Long-Term Field Monitoring and Performance of Paving Fabric Interlayer Systems to Reduce Reflective Cracking
RESEARCH AGENCY:	Jackson State University
PRINCIPAL INVESTIGATOR:	Farshad Amini

Objective:

The conclusions and recommendations from Phase I State Study No. 174, Potential Applications of Paving Fabrics to Reduce Reflective Cracking, substantiated the development of this project. The primary objective is to conduct long-term monitoring of the performance of a flexible pavement which includes a paving fabric between the in-situ pavement and an HMA overlay. A comprehensive testing, monitoring, and analysis program is proposed, where twelve 500-ft pavement test sections are constructed on an existing two-lane highway, and then monitored for seven years. Particular attention is directed towards investigating the influence of overlay thickness on long-term performance. A comparison between the performance of paving fabric treatment systems for milled and non-milled surfaces, as well as a comparison between the performance of paving fabrics on sealed and non-sealed surfaces will be reported. In addition, a cost-benefit analysis will be performed to develop total life cycle costs for each section. This project, by accomplishing the above objectives, will provide a fundamental understanding of the behavior of paving fabric systems to reduce reflective cracking, and will offer practicing engineers a valuable alternative for more effective schemes during pavement rehabilitation strategies.

Progress:

A literature review was performed relative to the use of paving fabrics to reduce reflective cracking with particular emphasis on the type of fabric and the relevant physical properties of such fabrics. Paving fabric installation specifications were developed. A site visit of the original test location was performed, but the construction of the project was delayed until the spring 2007 due to funding limitations.

Plans for FY 2007:

FWD testing will be performed on the proposed segment of road for the test sections. The data will be analyzed using ELMOD version 5 software to ensure that the existing pavement will require no more than 3-inch overlay to carry the design traffic loading. A crack survey will be done on the existing pavement of all test sections before milling, sealing, or overlay placement. The distress data collection will generally be in accordance with the "Distress Identification Manual for the Long-Term Pavement Performance Project, SHRP-P-338". The distress data will then be documented in a report for comparison with subsequent years and for further analysis. Full depth coring

Plans for FY 2007 continued:

will be done on the existing pavement of all test sections before milling, sealing, or overlay placement. The construction process for the ten sections will be closely monitored. A construction report will be provided at the end of the construction.

Cost Estimate for FY 2007 \$33,027

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 19	STATE STUDY NO: 185
TOTAL STUDY BUDGET: \$30,000	TOTAL STUDY COST TO DATE: \$1,178
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/14
STUDY TITLE:	In-House Support to State Study No. 184 - Long-Term Field Monitoring and Performance of Paving Fabric Interlayer Systems to Reduce Reflective Cracking
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	Milady Howard

Objective:

This study will be conducted to support the proposed study “Long-Term Field Monitoring and Performance of Paving Fabric Interlayer Systems to Reduce Reflective Cracking.” The required tasks include:

1. FWD field testing and evaluation of requisite overlay of proposed pavement for inclusion in Phase II study.
2. Operation of the MDOT profiler to obtain video images of the pavement surface one time prior to construction of the twelve test sections and nine times subsequent to construction.
3. Mapping of cracks on the video logs for submission to Jackson State University.
4. Traffic control will be required to facilitate FWD testing by MDOT and pavement coring operations by Burns, Cooley, & Dennis, Inc.
5. Review of one construction report, three progress reports, and one final report.

Progress:

A candidate project was selected and Petromat was selected as the paving fabric for this project. Pavement data on the U.S. 80 project was recorded and a crack survey was conducted for the proposed test section. Due to money and time constraints, the project was declined; therefore, the study has been delayed.

Plans for FY 2007:

A new candidate project will be selected this fall. FWD testing to include ELMOD analysis and a crack survey to include crack mapping will be performed by MDOT and submitted to JSU for analysis. Coring of the existing pavement will be done by BCD. Construction, by others, will occur during the spring of 2007. Monitoring of the project by JSU and BCD will start after completion of construction phase.

Cost Estimate for FY 2007 \$9,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 20	STATE STUDY NO: 186
TOTAL STUDY BUDGET: \$20,400	TOTAL STUDY COST TO DATE: \$2,200
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/14
STUDY TITLE:	Consultant Support to State Study No. 184 - Long-Term Field Monitoring and Performance of Paving Fabric Interlayer Systems to Reduce Reflective Cracking
RESEARCH AGENCY:	Burns, Cooley, Dennis, Inc.
PRINCIPAL INVESTIGATOR:	Randy Ahlrich

Objective:

This project will provide consultant support to the proposed study “Long-Term Field Monitoring and Performance of Paving Fabric Interlayer Systems to Reduce Reflective Cracking.” The required tasks include:

1. Provide guidance on selection of paving fabric.
2. Provide guidance regarding paving fabric construction for inclusion in construction bid documents.
3. Monitor construction of test sections.
4. Perform requisite coring of pavement test sections.
5. Review the construction report, three progress reports and the final report.

Progress:

Provided guidance on selection of paving fabric type and installation for inclusion in contract bid documents. Inspected the Highway 80 proposed test site location.

Plans for FY 2007:

BCD plans to support MDOT and JSU in selecting a possible alternate site for the paving fabric interlayer test section. Prior to construction of the test section, BCD will conduct full-depth asphalt coring within each test section area to determine thickness of asphalt layers and to visually inspect stripping characteristics of each asphalt layer. BCD also will support JSU during construction and monitor the installation of the paving fabric and placement of the asphalt overlay. BCD will also provide technical review of the construction phase report prepared by JSU.

Cost Estimate for FY 2007 \$9,200

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 21	STATE STUDY NO: 187
TOTAL STUDY BUDGET: \$60,612	TOTAL STUDY COST TO DATE: \$3,327
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/06
STUDY TITLE:	Effect of Moisture Content on the Thermal Coefficient of Expansion of Concrete
RESEARCH AGENCY:	University of Mississippi
PRINCIPAL INVESTIGATOR:	Ahmed Al-Ostaz

Objective:

Portland cement concrete experiences a change in volume due to a change in temperature, and this dependency is described in terms of coefficient of thermal expansion (CTE). A test method to test the CTE of concrete was recently developed by AASHTO as test number TP60-00, "Standard Test Method for the Coefficient of Thermal Expansion of Hydraulic Cement Concrete." This method has been recommended and adopted by FHWA as an input in the new Mechanistic-Empirical Pavement Design Guide. However, the method suggests that the concrete is fully saturated in all occasions which is, generally speaking, not true. In this study the effect of moisture content on the CTE of concrete will be evaluated and the results correlated to the type of aggregate used in the mix.

Progress:

Purchased requisite laboratory test equipment. A Matlab program was written to continuously collect LVDT readings using MP 2000. Cast specimens needed for evaluating CTE using AASHTO TP 60 and strain gaging technique. A one year time extension and an increase in funding of \$7,074.00 were granted by MDOT. The researcher encountered unforeseen challenges dealing with the control of moisture content and making accurate measurements of both moisture content and temperature in test specimens. The additional funding will cover the cost of purchasing gages and sensors for installation in the test specimens.

Plans for FY 2007:

- Continue evaluation of the effect of moisture content on CTE of Concrete using AASHTO TP60-00.
- Continue evaluation of the effect of moisture content on CTE of Concrete using Strain Gaging Technique utilizing moisture sensors.
- Evaluation of CTE of Concrete according to Danish Standard T1-B.
- Write and submit final report.

Cost Estimate for FY 2007 \$57,285

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 22	STATE STUDY NO: 188
TOTAL STUDY BUDGET: \$174,997	TOTAL STUDY COST TO DATE: \$15,191
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/07
STUDY TITLE:	Development of Mississippi DOT's Advanced Traffic Loading Analysis System (MS-ATLAS) to Support MEPDG Implementation
RESEARCH AGENCY:	ERES Consultants Division of ARA, Inc.
PRINCIPAL INVESTIGATORS:	Athar Saeed & Jane Jiang

Objective:

The current MDOT flexible pavement design method utilizes 4 input values: AADT, % Trucks, ESALS for 10 or 20 year, and Flexible factor. The new Mechanistic-Empirical Pavement Design Guide utilizes a significant amount of additional traffic information in the form of load spectra to support a given pavement design. SS No. 165 "Traffic Load Spectra Development for the 2002 AASHTO Design Guide" included the following recommendation:

"Use of automated software that processes, checks, analyzes and prepares traffic data in the format required for input into the design guide would greatly reduce time and result in more accurate and efficient use of the guide. Manual processing of the large volume of traffic data can be accomplished, but will be labor intensive and subject to increased mistakes."

The objective of the current proposed study is to utilize the existing ATLAS prototype software to develop and implement an automated custom software system for processing and analysis of MDOT traffic data in support of the MEPDG implementation effort. In addition to the software, ARA will provide support in the form of technical documentation, user's guide, on-site software installation, and training.

Progress:

Work was initiated and continued to customize the ATLAS software to accommodate processing of MDOT traffic data for MEPDG analysis. Completed an analysis of Mississippi DOT's traffic data processing protocols and data formats.

Plans for FY 2007:

Continue customization of MS-ATLAS software. This includes the design/development of a database structure (internal to MS-ATLAS) to house processed historical MDOT traffic data necessary for pavement design. Further review of MDOT's traffic data processing quality control/quality assurance practices will be performed for inclusion into MS-ATLAS. Assist MDOT with reviewing and integrating into MS-ATLAS the truck weight road group (TWRG) categories developed under State Study 165. For each TWRG category, a database library of default axle load spectra (by axle type and vehicle class) and vehicle class distributions to aid in Level 2 and 3 traffic analyses for pavement design, will be created.

Plans for FY 2007 continued:

Upon completion of integrating research results and packaging the MS-ATLS software, the software will be tested using MDOT data. The consultant will request and incorporate information on location (global positioning system [GPS] coordinates) and physical characteristics of the unique road segments (county sequence numbers), along with information about the location of traffic monitoring sites. This will help create interactive GIS maps and interactive forms that would provide access to traffic information for different sites and aid the user in selection of default or regional traffic parameters necessary for Level 2 and 3 traffic analyses for the sites with limited traffic data.

Cost Estimate for FY 2007 \$154,806

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 23	STATE STUDY NO: 189
TOTAL STUDY BUDGET: \$24,287	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/07
STUDY TITLE:	Evaluation of the Effectiveness of Drainage Layers
RESEARCH AGENCY:	Mississippi Department of Transportation, Research Division & Mississippi State University
PRINCIPAL INVESTIGATOR:	Jordan Whittington

Objective:

MDOT currently is sponsoring a graduate student, Jordan Whittington, at Mississippi State University. In order to meet the thesis requirements for his Masters degree, Mr. Whittington will examine the effectiveness of and “value” that MDOT is realizing from providing positive drainage in pavement structures. Critics of the drainage layer claim that when not maintained the layers actually are a detriment to the pavement structure and due to this lack of maintenance, MDOT would be wise to omit the drainage layer in our new pavement designs. This project will support Mr. Whittington’s research.

Progress:

Five project locations were identified for this research. Provided support to the Principal Investigator as needed.

Plans for FY 2007

The five project locations will have the moisture measurement devices (tipping buckets) installed. Data will be collected and documented.

Cost Estimate for FY 2007 \$24,287

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 24	STATE STUDY NO: 190
TOTAL STUDY BUDGET: \$20,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/05	COMPLETION DATE: 09/30/07
STUDY TITLE:	MDOT Research Program Peer Exchange
RESEARCH AGENCY:	Mississippi Department of Transportation, Research Division
PRINCIPAL INVESTIGATOR:	Randy L. Battey

Objective:

The State Planning and Research Program Administration regulations (23 CFR Part 420) became effective on August 22, 1994. Subpart B requires the States to conduct a peer exchange of their research and technology (R & T) management process on a periodic basis. Mississippi's first round peer exchange was held in June of 1998 and the second was held in September of 2002. The program is designed to send an outside team of invited top level managers to meet with the host agency to discuss and review its RD&T management processes. Information on the host agency and team members' RD&T policies and procedures are exchanged with the intent to improve the overall RD&T management process. Peer exchanges provide an opportunity for participants to share best practices and management innovations with each other. The information gathered from the exchange is presented to agency management.

An in-state University to be determined later will provide assistance to MDOT in conducting this required peer exchange program. Specifically, the University will be reimbursed for the following functions related to this line item:

- Organizing the Event
- Reimbursing the Peer Exchange Participants Travel Cost
- Providing Lodging, Meals and Meeting Space for the Participants
- Preparing and Distributing a Final Report
- Providing Ground Transportation for Participants

Progress:

During FY 2006 the MDOT Research Division updated their *Manual for Transportation Research for the State of Mississippi*. This manual covers the complete process used by the Research Division, from program development through program evaluation, including technology transfer and the management requirements needed to maintain an effective research program.

Additionally, plans were made to host a "Research Needs Identification" workshop in December of 2006. This workshop will involve MDOT, FHWA, Academia & Industry personnel and will identify and prioritize future transportation research needs.

Progress continued:

Since MDOT Research would like to include both our updated Transportation Research Manual and the “Research Needs Identification” workshop in our upcoming Peer Exchange, it was decided to postpone the exchange until the Fall of 2007.

Plans for FY 2007:

Host both the “Research Needs Identification” workshop and the Research Program Peer Exchange.

Cost Estimate for FY 2007 \$20,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 25	STATE STUDY NO: 191
TOTAL STUDY BUDGET: \$95,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 8/01/06	COMPLETION DATE: 09/30/08
STUDY TITLE:	Feasibility Study for the Redesign of MDOT's Pavement Management System Software
RESEARCH AGENCY:	Applied Pavement Technology, Inc.
PRINCIPAL INVESTIGATOR:	Katie Zimmerman

Objective:

MDOT's current Pavement Management Data portal, TMIS, is unable to support many functional needs. In addition, TMIS is not an Oracle based software system. This feasibility study will define the Department's needs with regard to a new system. The following tasks will be addressed:

- Finalize the list of desired pavement management capabilities
- Evaluate feasible software strategies
- Develop an implementation plan and cost estimate
- Assist with the software selection process

Progress:

The necessary contractual agreements were finalized to enable project activities to begin at the start of FY 2007.

Plans for FY 2007:

Complete the first three tasks listed above. Begin work on the final listed task.

Cost Estimate for FY 2007 \$76,137

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 26	STATE STUDY NO: 192
TOTAL STUDY BUDGET: \$129,350	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/06	COMPLETION DATE: 09/30/07
STUDY TITLE:	U.S. 90 Harrison County Pavement Analysis
RESEARCH AGENCIES:	Fugro BRE, Inc., Electronic Pavement and Infrastructure Charting, Inc. and Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Randy Battey

Objective:

Hurricane Katrina struck the Mississippi Gulf Coast in August 2005 resulting in extensive damage to Mississippi's coastal infrastructure. Based on past experience with hurricane Camille, it is anticipated that erosion of the pavement foundation occurred under U.S. Hwy 90 resulting in the development of voids under the pavement structure. This study employs the services of two consulting firms in conjunction with the Mississippi Department of Transportation to locate and evaluate the impact of any pavement foundation problems existing under 116 lane miles of the referenced highway. Electronic Pavement and Infrastructure Charting (EPIC), Inc. will utilize its Hyper Optics Pavement Analysis System to scan the asphalt overlaid concrete jointed pavement and provide Pavement Void Analysis (PVA), Pavement Thickness Analysis (PTA) and water content of the base utilizing Pavement Composition Analysis (PCA).

Fugro BRE, Inc. will employ the company's Falling Weight Deflectometer (FWD) to perform in-situ testing of the pavement structure and provide analyses of the resulting test data to ascertain the in-situ engineering properties of the given pavement structure. Fugro BRE, Inc. will provide lane closure services to facilitate the FWD test efforts.

The Mississippi Department of Transportation (MDOT) is responsible for coring the pavement and then providing, in electronic format, both the core logs and pavement layer thickness data, to both EPIC and Fugro BRE. Traffic control for these coring operations will be the responsibility of MDOT.

Cost Estimate for FY 2007 \$129,350

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 27	STATE STUDY NO: 193
TOTAL STUDY BUDGET: \$80,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/06	COMPLETION DATE: 09/30/08
STUDY TITLE:	Evaluation of HMA Lift Thickness
RESEARCH AGENCY:	Burns, Cooley & Dennis, Inc.
PRINCIPAL INVESTIGATOR:	L. Allen Cooley Jr.

Objective:

Proper compaction of hot mix asphalt (HMA) mixtures is vital to ensuring that a stable and durable pavement is constructed. There are many factors that can affect the compaction of HMA. One of these factors is lift thickness. Previous work by the Florida DOT and the National Center of Asphalt Technology showed that for a given compactive effort, an increase in lift thickness results in an increase in compacted density.

MDOT's current lift thickness requirements for a single lift of HMA is based on nominal maximum aggregate size (NMAS), with maximum lift thickness limited to generally 4 times the NMAS. Most current gravel sources in Mississippi are producing particle sizes that are in the range of 1 ½ to 2 inches. Once crushed to provide the needed particle angularity for HMA, most of the aggregate particles are less than ½ inch in diameter. This means that the most rut resistant mixes (mixtures containing the most angular aggregates) have a relatively small NMAS. Under the current Mississippi aggregate requirements, the highest quality HMA mix used in Mississippi, a 9.5 mm NMAS, can not be used in 2 inch mill and fill overlay projects, and a high quality 12.5 mm NMAS mix cannot be utilized in a 2 ½ or 3 inch upper binder layer.

The proposed research evaluates the use of 9.5 mm NMAS aggregate HMA in a 2-inch maximum lift thickness and a 12.5 mm NMAS aggregate HMA in a 3-inch maximum lift thickness in a total of 12 field projects. For each of these projects the compaction process will be monitored for roller types and pavement temperature and pavement density between roller passes. The collected data will be used to estimate the relative ability to compact the lift and provide information on whether the thicker lifts result in better density using a typical compactive effort. Uniformity of compaction throughout the depth of the compacted layer and the permeability of the layer will also be addressed. Based upon the research findings, MDOT would be provided with the requisite information to modify the current allowable lift thickness for HMA.

Cost Estimate for FY 2007 \$50,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 28	STATE STUDY NO: 194
TOTAL STUDY BUDGET: \$100,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/06	COMPLETION DATE: 12/31/08
STUDY TITLE:	Controlling Sulfate Attack in MDOT Structures
RESEARCH AGENCY:	Engineer Research & Development Center
PRINCIPAL INVESTIGATOR:	W. Allen Roberson

Objective:

Due to what has historically been considered relatively low concentrations of sulfate in Mississippi, sulfate attack on concrete structures has not been of significant concern in the concrete industry. The Mississippi Department of Transportation (MDOT) has historically required the use of ASTM C150 Type II cement and determined this measure to provide adequate control of concrete deterioration from any sulfates that might be present. However, two events have occurred that have created a need to re-examine this problem:

1. One of the principal portland cement producers used by MDOT has ceased production of ASTM C150 type II cement
2. Evidence has recently been discovered that indicates higher concentrations of sulfates may be present at depth in some areas of Mississippi. This creates concern for the long-term durability of concrete pilings.

The following research is proposed to evaluate and suggest solutions for this issue:

- Review MDOT's available data documenting damage ascribed to sulfate attack
- Determine the level of protection that is needed for concrete elements
- Perform literature review
- Assess the potential for sulfate attack of Portland cements available in Mississippi
- Make preliminary recommendations for prevention of sulfate attack based upon currently available data
- Conduct laboratory research

Cost Estimate for FY 2007 \$50,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 29

STATE STUDY NO: 195

TOTAL STUDY BUDGET: \$171,000

TOTAL STUDY COST TO DATE: \$0

DATE STARTED: 10/01/06

COMPLETION DATE: 12/31/09

STUDY TITLE:

Evaluation of Load-Deflection Behavior
of Drilled, Cast-In-Place Concrete Shafts
in Mississippi

RESEARCH AGENCY:

Mississippi State University

PRINCIPAL INVESTIGATOR:

Chris L. Saucier

Objective:

Over the past decade, the Mississippi Department of Transportation (MDOT) has performed approximately sixty load tests on straight-sided, drilled, cast-in-place concrete shafts (drilled shafts). Each of these load tests was well instrumented and included an Osterberg load cell and several strain gauges at critical locations along the shaft length.

Data in the MDOT drilled shaft load test database is currently employed in a qualitative form to support engineering judgment of the behavior of new shafts being completed in proximity to a project where an instrumented load test exists. To date, however, the data has not been integrated into a quantitative procedure that could readily be employed in design. The objective of this study is to develop the necessary correlations between design strength parameters and model soil response using the existing MDOT database of load tests on drilled shafts. These correlations would form the basis of a new method of design of drilled shafts for locations other than those constructed to date, reduce the amount of conservatism relative to that employed in the current design method, and result in a reduction of construction costs.

Cost Estimate for FY 2007 \$67,980

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 30	STATE STUDY NO: 196
TOTAL STUDY BUDGET: \$158,954	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/06	COMPLETION DATE: 12/31/08
STUDY TITLE:	Effectiveness of Rumble Stripes on Roadway Safety in Mississippi
RESEARCH AGENCY:	The University of Southern Mississippi
PRINCIPAL INVESTIGATORS:	Tulio Sulbaran David Marchman

Objective:

Although traffic deaths are caused by an array of factors, in the United States more than half of all roadway fatalities are caused by roadway departures. The Mississippi Department of Transportation (MDOT) has invested valuable resources to implement a series of safety improvement programs. One of these programs is entitled “Rumble Stripes.” The current research will quantify the effectiveness of this program by:

- Collecting historical and field data from selected Mississippi roadways, before and after the construction of “Rumble Stripes.”
- Reviewing nationwide literature on “Rumble Stripes” effectiveness
- Analyzing the compiled Mississippi data and the nationwide literature findings

This research will also provide a framework for assessing other safety programs implemented by MDOT.

Cost Estimate for FY 2007 \$65,238

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 31	STATE STUDY NO: 197
TOTAL STUDY BUDGET: \$60,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/06	COMPLETION DATE: 12/31/07
STUDY TITLE:	Development of a Transportation Model for Ninth Grade Students
RESEARCH AGENCY:	Mississippi State University and The Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Danada McMurtry

Objective:

Employment in the transportation industry is expected to increase by 914,000 jobs from 2002 to 2012. In order to keep pace with the workforce demands, the U.S. Department of Labor has developed the report "Innovative Workforce Solutions to Help the Transportation Industry Address Hiring, Training, and Retention Challenges." In this report, the workforce solution, based on the transportation industry's priorities, lists "Helping high school, technical school, and community college graduates successfully enter the transportation industry."

Utilizing ideas from this Department of Labor report, this research encompasses the following:

- Develop a model program to introduce ninth grade students to the careers available in the transportation industry
- Develop a training program for ninth grade students which teaches them to utilize GPS, GIS, and remote sensing through real world activities based on the MDOT in-the-field research.
- Align all activities with the state framework and national standards in math, science and technology.
- Develop a teachers' guide with sample lesson plans which have the core objectives listed at the top for easy referral.
- Develop a transportation model kit which includes GIS, GPS, and remote sensing equipment and activities based on the use of this equipment at MDOT.
- Produce a video which features MDOT workers using the referenced technology

Cost Estimate for FY 2007 \$60,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 32	STATE STUDY NO: 198
TOTAL STUDY BUDGET: \$10,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/06	COMPLETION DATE: 12/31/07
STUDY TITLE:	Quality Verification of PQI 301 Asphalt Density Device
RESEARCH AGENCY:	Mississippi Department of Transportation
PRINCIPAL INVESTIGATOR:	Paula Wiles

Objective:

Nuclear density gages are currently used by the Mississippi Department of Transportation (MDOT) to determine the in-situ density of hot mix asphalt (HMA) layers. These devices include radioactive sources which require:

- MDOT must have a special license and follow regulatory controls
- Each user must be specially trained and certified
- Each user must wear a badge which is periodically tested to ensure that the employee has not been exposed to an excessive amount of radiation
- Designated special storage areas

The 6th District will purchase a PQI 301 Pavement Quality Indicator. This device is advertised to provide accurate density measurements of HMA while eliminating every negative aspect of the use of the nuclear density gage. The Gulfport Project Office will use this device in conjunction with the nuclear density gage on upcoming projects to provide comparison test results. These results will be evaluated to determine if the PQI 301 can be used in lieu of the nuclear density gage.

Cost Estimate for FY 2007 \$10,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 33	STATE STUDY NO: 199
TOTAL STUDY BUDGET: \$150,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/06	COMPLETION DATE: 12/31/09
STUDY TITLE:	Port Sedimentation Solutions – Gulf Coast
RESEARCH AGENCY:	Mississippi State University
PRINCIPAL INVESTIGATOR:	William H. McAnally

Objective:

Public ports on the Mississippi Gulf coast suffer sedimentation problems that limit ship access or draft. Port sedimentation causes two major problems – the expense of dredging and disposing of sediment, and friction with shippers, who cannot transit and/or berth vessels in areas where sedimentation has reduced the depth available for navigation and loading/unloading. These sedimentation problems can be reduced or eliminated via the use of designs and procedures that keep sediment out, keep sediment moving, or remove sediment that deposits in navigation facilities.

The proposed research will identify engineered solutions to reduce or eliminate the need for maintenance dredging at public ports on the Mississippi Gulf coast. This will be accomplished with site visits and inspections of each port, compilation of data and analysis of this data.

Cost Estimate for FY 2007 \$50,000

MISSISSIPPI SPR-1(49)

LINE ITEM NO. 34	STATE STUDY NO: N/A
TOTAL STUDY BUDGET: \$25,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/06	COMPLETION DATE: 09/30/07
STUDY TITLE:	Minor Research Studies
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division
PRINCIPAL INVESTIGATOR:	Randy L. Battey

Low cost/short duration projects may be done without being put into a process of clearances and competing with other programs. An example of such a project is an experimental feature evaluation.

The Research Advisory Committee will establish a resource threshold to be met before requiring any project be put into a centralized clearinghouse/priority setting process. Current operating procedures are to conduct research projects where the expenditure ceiling is expected to be under \$10,000 and the project duration is expected to be one year or less.

These are based on selection and approval by the Research Engineer, following an appropriate review of District needs and literature review.

These research projects are short-term, and will employ only MDOT personnel in the research project. Brief, concise work plans will be developed for each of these projects.

Cost Estimate for FY 2007 \$25,000

MISSISSIPPI SPR-1(49)

MISSISSIPPI PARTICIPATION IN NCHRP

The Mississippi Department of Transportation contributes to the National Cooperative Highway Research Program (NCHRP). NCHRP is a special-purpose program administered by the Transportation Research Board (TRB) under a three-way agreement among the National Academy of Sciences, AASHTO, and the FHWA. Funding is provided by state highway and transportation agencies at a rate of 5.5% of the agencies' SPR (both Part I & II) funds. Funds for this participation are 100% Federal and thus contain no state match. These pooled funds are used to fund research aimed at solving national or regional problems and can only be spent on problems approved by at least two-thirds of the states. Formal solicitations are made from the states, AASHTO committees, TRB committees and FHWA to develop problem statements. MDOT's annual contribution is paid utilizing both SPR Part I & Part II funds. The amount of funding from each part is based on the 75/25 split (i.e. 75% of the annual NCHRP contribution is funded from Part I funds and 25% of the contribution is funded from Part II funds). Estimated contribution for FY 2007 of Part II funds is \$96,630.

MISSISSIPPI SPR-1(49)

TRANSPORTATION RESEARCH BOARD CORRELATION SERVICE

This service provides for subscription to a "Research Correlation Service" from the Transportation Research Board, a service established and operated in accordance with the recommendation of the Executive Committee of AASHTO. The activities supported by this subscription include the collection of available information concerning past, current and proposed research related to transportation from all sources including federal, state and other government agencies, colleges and universities, research and planning organizations, transport operators and industry, as well as the TRB Annual Meeting and conference programs; the study and correlation of this information through the work of the committees of the Board and dissemination of the useful findings of research and other information by all feasible means including the several TRB publication series, the output of the Transportation Information Services, and through personal contacts during scheduled field visits by the TRB professional staff. The FY 2007 TRB Correlation Service is funded for \$110,136, which corresponds to the current annual subscription cost for Mississippi. Funding for the TRB Correlation Service is also shared by both Part I & Part II SPR funds and is based on the 75/25 split (i.e. 75% of the annual TRB Correlation Service is funded from Part I funds and 25% of the Service is funded from Part II funds).

Cost Estimate for FY 2007 SPR Part II funds \$27,534

POOLED FUND STUDIES

Pooled Fund Study: ***Auburn University Accelerated Pavement Test Facility - Round 3***

Host Agency - Alabama Department of Transportation

The objective of this pooled-fund study is to construct, operate, and analyze the data from Mississippi's two new sections on the NCAT test track. At the time of this printing, mix designs for each of the sections have not been finalized. Ten states (Alabama, Florida, Georgia, Indiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, and Tennessee) are currently participating in this study that will evaluate hot mix asphalt pavement under a traffic loading of 10 million equivalent single axle load (ESALs) over a three year period. Each participating state was responsible for the pavement design for any new test sections. The National Center for Asphalt Technology (NCAT) will be responsible for monitoring the experiment to include periodic data collection and data analysis. The MDOT has committed to the third round of test section construction, trafficking and analysis. This commitment will be for fiscal years 2006 through 2008 in the following amounts:

FY 2006 - \$200,000 FY 2007 - \$200,000 FY 2008 - \$200,000

Pooled Fund Study: ***Evaluation of the Safety Edge***

Host Agency – FHWA

The goal of the proposed pooled fund study is to evaluate the effectiveness of using the Safety Edge (edge wedge) to help prevent and reduce severity of pavement edge drop-off related crashes. A before and after evaluation (Emperical Bayes method) will be performed on sites with upcoming installations of the safety edge in the U.S. FHWA is spending a total of \$150,000 to support this project.

MDOT will contribute a total of \$45,000 during the fiscal years 2005 through 2007 to support this effort.

FY 2005 - \$15,000 FY 2006 - \$15,000 FY 2007 - \$15,000

Pooled Fund Study: ***Development of Performance Properties of Ternary Mixes***

Host Agency – Iowa DOT

The purpose of this research project is to make a comprehensive study of how supplementary cementitious materials (SCMs) such as fly ash, slag, and silica fume can be used to improve the performance of concrete mixtures. The total project budget is estimated at \$1.8 million. .

FY 2006 - \$15,000 FY 2007 - \$15,000 FY 2008 - \$15,000 FY 2009 - \$15,000
FY 2010 - \$15,000

Pooled Fund Study: ***Evaluation of Low Cost Safety Improvements***

Host Agency – FHWA

The goal of the proposed research is to develop reliable estimates of the safety effectiveness of safety improvements identified as strategies in the NCHRP Report 500 Guidebooks. The scope of this study is to conduct a research project of priority strategies from all of the NCHRP Report 500 Guidebooks. A target of 24 strategies totaling \$6 million over three years is planned, but this will vary depending on the level of support.

FY 2006 - \$30,000 FY 2007 - \$30,000 FY 2008 - \$30,000

Pooled Fund Study: ***Accelerated Implementation of Intelligent Compaction Technology for Embankment Subgrade Soils, Aggregate Base and Asphalt Pavement Material***

Host Agency – FHWA

Currently used compaction equipment and processes can too often result in inadequate and/or non-uniform material density, which can contribute in short embankment and/or pavement service life. Compaction rollers with intelligent compaction (IC) capabilities have been developed and are routinely used in parts of Europe and Asia. The primary outcomes of this pooled fund project include the accelerated development of IC QC/QA specifications for subgrade soils, aggregate base and asphalt pavement materials and the development of an experienced and knowledgeable IC expertise base within pool fund participating state DOTs. The total cost of this study is \$350,000.

FY 2006 - \$25,000 FY 2007 - \$25,000 FY 2008 - \$25,000

Pooled Fund Study: ***Transportation Security and Emergency Preparedness Professional Capacity Building (PCB)***

Host Agency – FHWA

The objective of this study is to develop a suite of training materials for state DOTs to enhance their capacity in emergency transportation operations, infrastructure risk management, and evacuation planning. For each of up to four courses, participating states will receive instructor manuals, student workbooks' and a train-the-trainer session (web enabled audio conference) for their agency staff. The total cost for this study is \$550,000.

FY 2007 - \$25,000 FY 2008 - \$25,000

Pooled Fund Study: ***Engineers Estimates for Design-Build Projects***

Host Agency – North Carolina Department of Transportation

This project expands on the efforts presented in the recently released “Design-Build Effectiveness Study” prepared for the FHWA by focusing on the procedures used for cost estimating Design-Build projects. This project will provide a synthesis of current practices for determining the Engineers’ Estimates for Design-Build projects in use across the country. The project will highlight best practices and formulate the most appropriate method for cost estimating on Design-Build projects. The total cost for this study is \$200,000.

FY 2007 - \$15,000

Pooled Fund Study: ***Subsurface Drainage for Landslide and Slope Stabilization***

Host Agency – Washington State Department of Transportation

There are two objectives to this study. The first objective is to provide best practices and guidance for subsurface drainage applications for slope stabilization, including subsurface investigation and testing, groundwater-flow characterization, analysis, drain configurations and design, installation methods, monitoring and maintenance. The second objective is to evaluate new applications of existing materials and technologies, such as trenchless technologies (horizontal directional drilling, micro tunneling, guided boring, etc.) and other innovative technologies and materials, for stabilizing slopes using subsurface drainage. The total cost for this study is \$300,000.

FY 2007 - \$10,000 FY 2008 - \$10,000 FY 2009 - \$10,000 FY 2010 - \$10,000

Pooled Fund Study: ***Analysis of MnROAD Whitetopping Performance data for a Module in the Design Guide***

Host Agency – Minnesota Department of Transportation

The primary purpose of this project is to create a tenable national design procedure for whitetopping. The performance of whitetopping will be studied based on the forensic report from the previous ultra thin white topping cells in MnROAD. These cells were loaded to destruction in an accelerated loading scenario. Performance data from sensors and distress surveys of the current white topping test cells 60-63 at MnROAD will be analyzed and interpreted as well as from other white topping initiatives. This data analysis will be collated into a design procedure that will be a module in the new Mechanistic-Empirical Pavement Design Guide. The total cost for this study is \$600,000.

FY 2007 - \$20,000 FY 2008 - \$20,000 FY 2009 - \$20,000

Pooled Fund Study: ***Recycled Asphalt Pavements***

Host Agency – Minnesota Department of Transportation

The main idea of this project is to monitor several sections built at the Minnesota Road Research Facility specifically to study RAP under controlled testing conditions. The sections may contain identical structural designs and hot mix asphalt mix designs, with the only variable being the percentage of RAP in each of the mixes. Currently the Minnesota DOT specifies the maximum amount of RAP allowed in a mix based on pavement layer and traffic level. One objective of MnDOT is to determine if the present limits on RAP are justified. The final scope and work plan for the study will be developed by the participating states. The total cost for this study is \$525,000.

FY 2007 - \$15,000 FY 2008 - \$15,000 FY 2009 - \$15,000
FY 2010 - \$15,000 FY 2011 - \$15,000

Pooled Fund Study: ***Impact of New Seismic Design Provisions on Bridges in Mid-America: A Pilot Pooled Funds Project***

Host Agency – FHWA

The objectives of this research project are to apply a comprehensive methodology to design bridges in the Central and Southeastern United States (CSUS) – using the NCHRP 12-49 as a basis. The methodology would address:

- The current source models and maps used for ground motion in the CSUS
- Current site response models
- Fragility models and network assessment to determine required level of seismic protection
- Detailed analysis to derive retrofit design forces and deformations

The ground motion characteristics, site response models and bridge performance fragility curves will be developed for representative states in the CSUS. Additional investigation into advanced analysis methods for bridges before and after retrofitting, and the use of network models will also be performed. It is believed that by addressing these four components using the latest tools and knowledge in seismology, geotechnical engineering, transportation and structural engineering, the impact of the codes on seismic design might, in fact, be minimal. The total cost for this study is \$350,000.

FY 2007 - \$30,000

Pooled Fund Study: ***Technology Transfer Toolbox: A Research Implementation How-To Guide***

Host Agency – Washington State Department of Transportation

The main objective of the project is to develop an application-oriented, results-driven Interactive Systematic Approach to support the implementation of research results. This will be accomplished through the development of an Implementation Planning Tool, which will include 4 modules (implementation plan module, marketing module, executive briefing module, and a scheduling/tracking module) with a shared body of knowledge of user needs. The total cost for this study is \$600,000.

FY 2007 - \$20,000 FY 2008 - \$20,000

Pooled Fund Study: ***Pavement Surface Properties Consortium: A Research Program***

Host Agency – Virginia Department of Transportation

The objective of the proposed pool fund is to establish a research program focused on enhancing the level of service provided by the roadway transportation system through optimized pavement surface texture characteristics. The initial focus of the program will be the application of inertial and laser-based equipment for measuring these properties. Other questions and issues will be identified in cooperation with the pool fund participants. An interactive project solicitation process will be used to request feedback from all participants. The total cost for this study is \$700,000.

FY 2007 - \$20,000 FY 2008 - \$20,000 FY 2009 - \$20,000
FY 2010 - \$20,000

Pooled Fund Study: ***Transportation Management Plan (TMP) Effectiveness Study***

Host Agency – California Department of Transportation

The objective is to develop a process to analyze the effectiveness of TMPs and then use this process to select TMP strategies that provide the most efficient use of agency dollars while minimizing the delay to the traveling public. Analysis of strategies should encompass large as well as small-scale highway activities, rural as well as urban areas. This research should focus on key strategies including, but not limited to, use of work zone enforcement, changeable message signs, highway advisory radio, full freeway versus night closures, short-term daily vs. extended closures, freeway service patrol, public information and k-rail placement. The total cost for this study is \$375,000.

FY 2007 - \$25,000

Pooled Fund Study: Long-Term Maintenance of Load and Resistance Factor Design Specifications

Host Agency – Iowa Department of Transportation

On April 21, 2002, the AASHTO Board of Directors approved policy resolution PR-4-02 endorsing the project “Long-Term Maintenance of Load and Resistance Factor Design (LRFD) Specifications. Subsequent to the development of the new LRFD specifications, FHWA announced that all state bridge projects using federal funding must use the new and superior code. The implementation date for the switch to LRFD was set for October 31, 2007. In June 2003, the NCHRP 12-42 project to provide maintenance and enhancements to LRFD ended. Because of the continued need for maintenance of the code and implementation of new research in these areas, AASHTO took over the contract with the original consultant used for the NCHRP project. At this time, the LRFD Oversight committee oversees this maintenance contract and initiates special studies with this consultant as they are needed to enhance the code. Funds to support this maintenance contract and special studies have been provided by a current pooled fund study which has been in place since 2003. MDOT originally committed \$40,000 to this effort (\$20K of SPR in FY 2003 & \$20K of Non-SPR funds in FY 2005). These funds are nearly depleted, thus necessitating the need to resolicit for funding commitments to continue this program. The total cost for this study is \$1,500,000.

FY 2003 - \$20,000 FY 2005 - \$20,000(Non-SPR) FY 2007 - \$20,000
FY 2009 - \$20,000

Plans for FY 2007:

The final report will be written and distributed.

Cost Estimate for FY 2007: \$10,000

100% State Funded Research for FY 07

LINE ITEM NO. N/A	STATE STUDY NO. 146
TOTAL STUDY BUDGET: \$200,000	TOTAL COST TO DATE: \$80,000 SP&R \$120,000 Non-SP&R \$200,000 Total
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/07
STUDY TITLE:	Updating Mississippi Flood Frequency Reports
RESEARCH AGENCY:	United States Geological Survey
PRINCIPAL INVESTIGATOR:	K. Van Wilson

Objective:

Knowledge of magnitude and frequency of floods is essential to the design of bridges, highway embankments, culverts, levees, dams, and other structures near streams. Effective flood-plain management and determination of flood insurance rates require accurate information on magnitude and frequency of floods.

The statewide flood-frequency reports by Landers and Wilson (1991) and Wilson and Landers (1991) provided estimates of magnitude and frequency of floods at gaging stations and provided techniques for estimating magnitudes and frequency of floods at ungaged sites in Mississippi. Observed annual peak-flow data collected through 1988 at 358 gaging stations were used in the analyses. Since the 1991 statewide flood-frequency reports, an additional 11 years of observed annual peak-flow data has become available and data have been collected on several large floods. Also, the 1991 regional flood-frequency equations were developed using generalized least-squares (GLS) regression (Stedinger and Tasker, 1985; and Tasker and Stedinger, 1989). GLS regression had and still has advantages over the ordinary least-squares and weighted least-squares regression, but since the 1991 reports, Tasker and Slade (1994) demonstrated that GLS regression coupled with a site-specific approach [referred to as "interactive" by Tasker and Slade (1994) and as "region-of-influence" by Hodge and Tasker (1995)] had smaller root-mean-square errors than the traditional geographic regional approach. Analyses of flood frequency using these additional data with a site-specific approach may substantially change and improve the accuracy of techniques for estimating magnitudes and frequencies of floods in Mississippi.

Estimated Costs:

The project will be done in cooperation with the MDOT, Research Division. The 7-year project will begin October 1, 2000, and will end September 30, 2007. The total estimated cost of the project is \$400,000 distributed over seven Federal Fiscal years (October 1 to September 30) as follows:

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>Total</u>
MDOT	\$20,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$200,000
USGS	<u>\$20,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$200,000</u>
Total	\$40,000	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$400,000

Note that MDOT utilized SP&R Part II monies to fund our FY 2001 – FY 2003 commitment to this project. FY 2004 – FY 2007 were funded with 100% state funds.

Products:

Reports will be published that contain maximum known flood data, annual peak-flow data, flood-frequency estimated at gaging stations, and equations and (or) computer programs for estimating the magnitude and frequency of annual floods in Mississippi.

The reports will be provided in paper form (with a diskette or CD) and will also be made available in digital form on the Internet.

Cost Estimate for FY 2007 \$30,000 (Non-SP&R funds)

Mississippi
Department of Transportation

RESEARCH WORK PROGRAM
SPR-1(49), Part II
L56

For the Fiscal Period
October 1, 2006 to September 30, 2007



Prepared by the
Mississippi Department of Transportation
RESEARCH DIVISION

In Cooperation with the
U.S. Department of Transportation
Federal Highway Administration

**Mississippi
Department of Transportation**

**RESEARCH WORK PROGRAM
SPR-1(49), Part II
L56**

**For the Fiscal Period
October 1, 2006 to September 30, 2007**