MISSISSIPPI SPR-1(51)

## GENERAL COMMENTS ON RESEARCH WORK PROGRAM FOR FISCAL YEAR 2008

The SPR (Part II) research work program allocation for FY 2008 totals $1,994,762 (estimated) and includes a National Cooperative Highway Research Program (NCHRP) contribution of $109,712 (estimated) for FY 2008, a TRB Correlation Service contribution of $27,534 and pooled-fund studies totaling $510,000 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 2008. 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 2008. 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 2008 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-nine 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 2007 included:

- support for field data collection

Activities planned for FY 2008 include:

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

**Cost Estimate for FY 2008**

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|---|---|
| Salaries (Regular Employees) | $1,000 |
| Employee Benefits | $280 |
| Materials, Supplies, and Services | $400 |
| Travel and Sustenance | $320 |
| Total | $2,000 |

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 2008**

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|---|---|
| Salaries (Regular Employees) | $187,500 |
| Employee Benefits | $52,500 |
| Materials, Supplies, and Services | $15,000 |
| Travel and Sustenance | $20,000 |
| Total | $275,000 |

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)
- Producing and distributing a MDOT Research Newsletter

NOTE: The SPR WORK PROGRAM-PART I (SPR-1(47)), provides direct support to the Center for Technology Transfer ($T^2$) at Jackson State University, and those activities and funds are not included in the above line item, Technology Transfer.

**Cost Estimate for FY 2008**

| | |
|---|---|
| Salaries (Regular Employees) | $62,500 |
| Employee Benefits | $17,500 |
| Materials, Supplies, and Services | $6,000 |
| Travel and Sustenance | $12,000 |
| Conference Registrations | $2,000 |
| Total | $100,000 |

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 2008**

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|---|---|
| Salaries (Regular Employees) | $200,000 |
| Employee Benefits | $46,000 |
| Materials, Supplies, and Services | $11,000 |
| Travel and Sustenance | $18,000 |
| Total | $275,000 |

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 2008**

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|---|---|
| Salaries (Regular Employees) | $25,000 |
| Employee Benefits | $7,000 |
| Materials, Supplies, and Services | $8,000 |
| Travel and Sustenance | $10,000 |
| Total | $50,000 |

LINE ITEM 6

Information and Data Collection Technology

This activity funds Research Division activities relating to the budgeting, purchasing, managing, updating, programming and servicing of all of the equipment and software.

Examples of Information and Data Collection Technology activities are:

- Budgeting for and purchasing upgrades to existing equipment and software
- Keeping up with new technology to allow the division to stay current with industry developments
- Working with staff to resolve hardware and software issues in a timely manner
- Managing the network for the division which includes backing up servers and day-to-day, week-to-week, and month-to month maintenance
- Programming in-house applications for use in the division
- Loading pavement management condition data every two years
- Helping to diagnose and repair division nondestructive testing equipment and computers
- Maintaining Research Division intranet website and support for research related postings on MDOT's "GoMDOT" webpage

**Cost Estimate for FY 2008**

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|---|---|
| Salaries (Regular Employees) | $63,912 |
| Employee Benefit | $17,895 |
| Materials, Supplies, and Services | $3,193 |
| Travel and Sustenance | $3,000 |
| Conference Registrations | $2,000 |
| Total | $90,000 |

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| LINE ITEM NO. 7 | STATE STUDY NO. 144 |
| TOTAL STUDY BUDGET: $225,255 | TOTAL STUDY COST TO DATE: $195,255 |
| DATE STARTED: 10/01/00 | COMPLETION DATE: 09/30/08 |
| STUDY TITLE: | Profilograph Specification Study |
| RESEARCH AGENCY: | Mississippi Department of Transportation |
| PRINCIPAL INVESTIGATOR: | Jordan Whittington |

**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.

During FY 07 a new employee was introduced to the study and time was spent familiarizing him with the project and the ProVAL analysis software. Data was collected and analyzed for asphalt pavement overlay projects with an emphasis on comparing profiles for each lift of asphalt.

**Plans for FY 2008:**
Data will continue to be collected and analyzed for asphalt projects throughout the state in an effort to collect a significant enough amount of data to be compiled and used as a basis for determining an appropriate profiling strategy.

**Cost Estimate for FY 2008** $30,000

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| LINE ITEM NO. 8 | STATE STUDY NO: 157 |
| TOTAL STUDY BUDGET: $122,416 | TOTAL STUDY COST TO DATE: $112,416 |
| DATE STARTED: 03/01/02 | COMPLETION DATE: 3/31/08 |
| STUDY TITLE: | Evaluation of DRM System |
| RESEARCH AGENCY: | Mississippi Department of Transportation Research Division |
| PRINCIPAL INVESTIGATOR: | Jordan Whittington |

**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.

During FY 07, a trip was made to the site for a visual inspection of the project. Yearly performance data from throughout the life of the study was compiled and evaluated. Once this was completed, work began on the final project report.

**Plans for FY 2008:**
Work will be finalized on the final project report in FY 08.

**Cost Estimate for FY 2008** $10,000

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| LINE ITEM NO. 9 | STATE STUDY NO: 166 |
| TOTAL STUDY BUDGET: $115,089 | TOTAL STUDY COST TO DATE: $111,298 |
| 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.

During FY 2007 dynamic modulus tests were completed for all mixtures. With equipment installation problems and addition of a mixture to the test matrix an extension and expansion was request and approved. The extension is until December 31, 2007. Additionally, in conducting the dynamic modulus tests, several mixtures failed at the highest temperature. As a result, these mixtures were retesting at a lower stress level. All dynamic modulus test data was analyzed and the governing equations developed for predicting dynamic modulus. The research also included a task to fabricate specimens for APA testing. During the past FY all specimens were fabricated and tested in the APA.

**Plans for FY 2008:**
The draft and final reports will be completed

**Cost Estimate for FY 2008** $3,791

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LINE ITEM NO. 10 STATE STUDY NO: 170

TOTAL STUDY BUDGET: $307,163 (SP&R) TOTAL STUDY COST TO DATE:
$ 37,283 SP&R
$500,000 (Non SP&R) $381,865 Non-SP&R
$807,163 Total $419,148 Total

DATE STARTED: 03/01/04 COMPLETION DATE: 12/31/08

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.

During FY 07, work continued on project tasks that were not directly impacted by the delay in NCHRP 1-40. These included developing a procedure to determine the suitability of pavement performance data for local validation and calibration of MEDPG distress models. The procedure was used to determine the suitability of new pavement sections for local calibration and validation of distress models. The procedure and analysis results were documented in the form of a technical memorandum and submitted to MDOT. The project team also reviewed NCHRP 1-37A and 1-40 recommendation and current research to determine state-of-the-art in testing stabilized base/subbase materials. The review results were used to finalize the test procedure to use for testing of stabilized materials. We also continued coordinating, acquiring and reviewing pavement inventory and performance data on selected pavement sections.

Laboratory testing of candidate materials to develop material libraries continued with the assistance of Burns Cooley Dennis (BCD), Inc. During FY07, BCD completed resilient modulus testing for all subgrade samples. Tests on granular (base/subbase) materials were also initiated. Work on granular materials included coordinating with districts to select representative materials, acquiring representative materials and initiating testing. A total of fifteen material types were selected based upon comments from MDOT district materials engineers. During FY07, six of the materials were obtained and tested.

**Plans for FY 2008:**
During FY08, we will resume work on all scheduled SS170 tasks that were deferred due to NCHRP 1-40. We will use the latest MEPDG software (version 1.0) and will consider all NCHRP 1-40 recommendations while accomplishing project tasks. We will complete selecting in-service pavement sections (new and rehabilitated pavements) 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.

Laboratory testing of materials will continue with the assistance of BCD. We anticipate locating and testing remaining nine (out of total fifteen mentioned above) granular materials during FY08. Classification and Proctor tests will also be conducted in addition to the resilient modulus tests needed to populate the materials library. Limestone, granite and sandstone are regularly used as granular base materials in Mississippi and will be tested. We also anticipate testing some clay-sand-gravel and crushed gravel sources in order to provide the full spectrum of available materials for the materials library. We also anticipate that work will begin on evaluating various stabilized materials for subsequent testing.

**Cost Estimate for FY 2008** $131,865 SP&R

$118,135 Non SP&R

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PART II

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| LINE ITEM NO. 11 | STATE STUDY NO: 171 |
| TOTAL STUDY BUDGET: $200,000 | TOTAL STUDY COST TO DATE: $101,587 |
| DATE STARTED: 03/01/04 | COMPLETION DATE: 12/31/08 |
| 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

**Progress Continued:**
The work performed during FY 2007 included the development of distress data in an excel spreadsheet acceptable by ARA. The construction, traffic and materials data for many of these sections were also obtained and delivered to ARA. In addition to data collection some of the work included review of multiple reports and following recent developments in the M-E PDG software.

**Plans for FY 2008:**
The plans include continuation of data collection for analysis sections. Collection of construction, materials and pavement management data should be completed for original AC analysis sections. With completion of this, collections of data for rehabilitated sections should begin. In addition to all types of data collected on original AC sections, field testing will also have to be performed for rehabilitated sections

**Cost Estimate for FY 2008** $75,000

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| LINE ITEM NO. 12 | STATE STUDY NO: 173 |
| TOTAL STUDY BUDGET: $30,000 | 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.

Data continued to be collected on both the Tallahatchie County and Tunica County projects throughout FY 2007. Additionally District Two let to contract at the July 2007 bid letting, 52 miles of scrub sealing to be performed throughout the District. Assistance was given to both District Two and the Construction Division in the preparation of the necessary specifications for this District wide scrub sealing project.

**Plans for FY 2008:**
Research staff will be available to assist the District during the upcoming scrub sealing project. Performance data will be collected on the 52 miles of scrub seal to further refine MDOT's maintenance "decision tree" with regards to scrub sealing.

Additionally, periodic distress and smoothness measurements will continue to be made on both the Tallahatchie and Tunica County locations.

**Cost Estimate for FY 2008** $10,000

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| LINE ITEM NO. 13 | STATE STUDY NO: 180 |
| TOTAL STUDY BUDGET: $90,000 | TOTAL STUDY COST TO DATE: $23,322 |
| DATE STARTED: 10/01/05 | COMPLETION DATE: 09/30/09 |
| STUDY TITLE: | Evaluation of Pavement Marking Materials |
| RESEARCH AGENCY: | Mississippi Department of Transportation Research Division |
| PRINCIPAL INVESTIGATORS: | Jeff Wages |

**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.

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

**Progress continued:**
During FY 2007 construction was completed for three projects during this fiscal year, (I-55, SR 304, 713 Spur). The striping was tested for all of these projects along with US 61 and US 49. The final test was completed for US 61.

**Plans for FY 2008:**
Continued testing is scheduled for SR 304, 713 Spur, US 49 and I-55. There is a chance that testing for I-55 will not continue due to safety concerns.

**Cost Estimate for FY 2008** $11,000

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| LINE ITEM NO. 14 | STATE STUDY NO: 181 |
| TOTAL STUDY BUDGET: $100,000 | TOTAL STUDY COST TO DATE: $16,116 |
| DATE STARTED: 10/01/05 | COMPLETION DATE: 12/31/07 |
| 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.

During FY 2007, six aggregates were identified and sampled. These aggregates included three limestone sources, a granite source, a sandstone source and a gravel source. The limestone aggregates were from Calera, AL; Reed, KY and Vicksburg, MS. The granite is from Columbus, GA; the sandstone is from Delaware, AR; and the

**Progress continued:**
gravel is from Picayune, MS. A sample from the No. 57 stockpile was collected from each source, except for the gravel. For the gravel source, the oversize material and a ¾ screen material were blended to create a gradation that meets the No. 57 stockpile gradation. Aggregate property testing was performed on each source. After aggregate testing was completed, each source was combined with one percent lime and either 2.1 or 2.5 percent asphalt binder per the Asphalt Drainage Coarse specification found in the Mississippi Standard Specifications for Road and Bridge Construction, Section 306. Three ADC samples per aggregate were compacted using a static load to simulate the field "seating" of the ADC mixture. Each of the samples was tested for modulus at 40, 60 and 80 degrees F at a deviator stress of 2, 5, 10 and 15 psi. These stresses were chosen after analyses to determine stresses at depth on a typical MDOT pavement structures using ADC. Besides the laboratory testing, a literature review has been performed on the current state of the practice of using ADC as structural layers. The data presented from the laboratory has been organized and reduced and some analysis has been conducted.

**Plans for FY 2008:**
The analysis of the data will continue to determine the effect of the ADC on the structure of the asphalt pavement. Analysis will also be performed to determine transfer functions and correct inputs for ADC to be incorporated into ELMOD 5. Also, the final report will be completed and submitted.

**Cost Estimate for FY 2008** $83,884

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 15 | STATE STUDY NO: 183 |
| TOTAL STUDY BUDGET: 180,000 | TOTAL STUDY COST TO DATE: $42,912 |
| 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.

Identification and review of other regional mobility initiatives included regional mobility initiatives in the Greater Washington DC metropolitan area, the Jacksonville, Florida metropolitan area and the Mobile, Alabama metropolitan area. Additionally, transportation plans the for Mississippi Capital region were identified and reviewed. Economic development projects planned or underway in the Mississippi capital region were identified, reviewed and monitored.

During FY 2007 the preliminary agenda for the Mississippi Capital Region Mobility Summit was developed. Elected officials and transportation professionals from throughout the region are being contacted for their thoughts and ideas for the summit. A preliminary list of summit participants and invitees has been developed. A venue for the summit has been identified. Governor Barbour's office has been contacted about his participation in the summit.

**Plans for FY 2008:**
Mississippi Capital Region Mobility Summit will convene during the second quarter of the fiscal year. Following the summit, a working group of summit participants will identify specific options that could be developed and pursued to enhance mobility in the Mississippi Capital region. These options would be presented throughout the region for review and reaction. Those options receiving the most favorable reactions would be further developed so that strategies could be designed to implement some of the mobility enhancing options.

**Cost Estimate for FY 2008** $137,088

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 16 | STATE STUDY NO: 184 |
| TOTAL STUDY BUDGET: $218,224 | TOTAL STUDY COST TO DATE: $38,485 |
| 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.

During FY 2007 the test site was selected. A site visit was conducted to examine the initial conditions. FWD testing was performed on the road for the test sections. A crack survey was done on the existing pavement of all test sections before milling, sealing, or overlay placement. The distress data collection is generally in accordance with the "Distress Identification Manual for the Long-Term Pavement Performance Project, SHRP-P-338". Full depth coring was done on the existing pavement of all test sections before milling, sealing, or overlay placement. The specifications for the installation of the paving fabric sections were modified and finalized. The construction of the paving fabric sections included a test section, and the 12 research sections. The construction process

**Progress continued:**
was closely monitored. The monitoring including quality control during construction to ensure that the paving fabric systems have been installed in accordance with the specifications.

**Plans for FY 2008:**
A comprehensive construction report indicating the results of the test sections, the process during quality control, the equipment, and the lessons learned and recommendations will be prepared. The first annual crack survey will be conducted during this year. The distress data collection will generally be in accordance with the "Distress Identification Manual for the Long-Term Pavement Performance Project, SHRP-P-338" (SHRP, 1993). The crack data from the initial preconstruction crack survey will then be compared to the subsequent annual crack data.

**Cost Estimate for FY 2008** $44,500

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 17 | STATE STUDY NO: 185 |
| TOTAL STUDY BUDGET: $30,000 | TOTAL STUDY COST TO DATE: $4,266 |
| 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: | Jeff Wages |

**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.

During FY 2007 a crack survey was done on the existing pavement of all test sections before milling, sealing, or overlay placement. MDOT used the profiler to collect crack data and review the data. The distress data collected was in accordance with the "Distress Identification Manual for the Long-Term Pavement Performance Project, SHRP-P-338" (SHRP, 1993).

The construction process was monitored for the research sections. An initial crack survey was performed of the test sections using the MDOT profiler immediately following completion of construction.

**Plans for FY 2008:**
Perform an annual crack survey of the test sections using the MDOT profiler. The distress data collection will generally be in accordance with the "Distress Identification Manual for the Long-Term Pavement Performance Project, SHRP-P-338" (SHRP, 1993). The test sections will be surveyed annually. The first annual survey will be conducted in August. MDOT will share all crack data with JSU.

**Cost Estimate for FY 2008** $5,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 18 | STATE STUDY NO: 186 |
| TOTAL STUDY BUDGET: $20,400 | TOTAL STUDY COST TO DATE: $10,051 |
| 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.

During FY 2007 full depth coring was done on the existing pavement of all test sections before milling, sealing, or overlay placement. One full-depth core was extracted from all test sections except for the 2 control sections. 3 full depth cores were extracted from each of the 2 control sections. BCD also monitored the construction process for the research sections.

**Plans for FY 2008:**
JSU will write the construction report and BCD will review this report prior to submission to MDOT.

**Cost Estimate for FY 2008** $1,200

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 19 | STATE STUDY NO: 189 |
| TOTAL STUDY BUDGET: $24,287 | TOTAL STUDY COST TO DATE: $4,467 |
| DATE STARTED: 10/01/05 | COMPLETION DATE: 12/31/08 |
| 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.

Work performed during FY 07 included setup of instrumentation, collection of data, and the beginning of the report. Instrumentation was first set up along the asphalt pavement test section for collection of rainfall events. After each rainfall event, data was collected and analyzed. Once an adequate number of rainfall events had occurred, the instrumentation was moved to the concrete test section for the collection of more rainfall events. Once again, the data was collected and analyzed. As each rainfall event was analyzed, the data was compiled and formatted to be included in the final project report.

**Plans for FY 2008**
Proposed work includes collecting the last data, removing the instrumentation, and preparing the final project report. Drought conditions slowed the collection of rainfall data throughout the project meaning that final rainfall event collections on the concrete sections had to be completed later than anticipated. Once the sufficient data has been collected, the instrumentation will be removed from the right-of-way. All data will be analyzed, compiled, and submitted in the final project report.

**Cost Estimate for FY 2008** $19,820

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 20 | STATE STUDY NO: 190 |
| TOTAL STUDY BUDGET: $20,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/05 | COMPLETION DATE: 09/30/08 |
| STUDY TITLE: | MDOT Research Program Peer Exchange |
| RESEARCH AGENCY: | Mississippi Department of Transportation, Research Division |
| PRINCIPAL INVESTIGATOR: | James Watkins |

**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. Since MDOT Research would like to include both our updated Transportation Research Manual

**Progress continued:**
and the "Research Needs Identification" workshop in our upcoming Peer Exchange, it was decided to postpone the exchange until the Fall of 2007.

During FY 2007 the Research Division hosted a "Research Needs Identification" workshop in December of 2006. This workshop involved MDOT, FHWA, Academia & Industry personnel and identified and prioritized future transportation research needs. The results of this workshop can be found at: http://www.gomdot.com/research/pdf/ResNeeds.pdf

**Plans for FY 2008:**
Since MDOT Research would like the option to include discussion on both our updated Transportation Research Manual and the "Research Needs Identification" workshop in the next Peer Exchange, it will be held during the upcoming fiscal cycle.

**Cost Estimate for FY 2008** $20,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 21 | STATE STUDY NO: 191 |
| TOTAL STUDY BUDGET: $95,000 | TOTAL STUDY COST TO DATE: $28,527 |
| 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.

Initial meetings and interviews with key MDOT personnel, including pavement management staff, district engineers and assistants, and upper management, were held in November of 2006, to identify MDOT's goals for the new software. In January of 2007 APTech and MDOT met with potential PMS software vendors and asked them questions regarding how their software performed desired functions. APTech compiled all this information to come up with a needs assessment document, which is in the final completion stages now. Drafting of the software RFP will begin shortly.

**Plans for FY 2008:**
APTech will finalize the software RFP, and MDOT will begin the contracting process with Information Technology Services (ITS) and Consultant Contract Services Division. Once the RFP goes out, APTech will assist in selection of PMS software.

**Cost Estimate for FY 2008** $66,473

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 22 | STATE STUDY NO: 193 |
| TOTAL STUDY BUDGET: $80,000 | TOTAL STUDY COST TO DATE: $3,729 |
| 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.

**Progress:**
During FY 2007 representatives of Burns Cooley Dennis, Inc. were onsite during the construction of a 12.5mm NMAS binder layer placed on I-20 in Meridian. Two test locations were selected. The lift thickness at one location was within the MDOT specifications and one was outside the specification range. In addition to monitoring change in density and temperature during compaction, bulk specific gravity and laboratory permeability testing was conducted on cores obtained at the two test

**Progress continued:**
locations. Testing was also conducted on the 9.5mm surface mixture placed on I-20 in Meridian. The mixture was placed 1.5 inches thick, which falls within the lift thickness specification range. Four locations were selected. Density and temperature were monitored and cores were obtained at each location. Bulk specific gravity and laboratory permeability testing was conducted on each core.

**Plans for FY 2008:**
Additional projects will be visited. Analyses of the data will commence. Also, the final report will be completed and submitted.

**Cost Estimate for FY 2008** $76,271

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 23 | STATE STUDY NO: 194 |
| TOTAL STUDY BUDGET: $100,000 | TOTAL STUDY COST TO DATE: $20,087 |
| 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: | Charles Weiss |

**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

**Progress:**
During FY 2007 work began by reviewing MDOT's available data documenting damage ascribed to sulfate attack. Existing data documented by MDOT indicating sulfate deterioration to concrete elements were reviewed. A comprehensive literature review to determine the current state-of-the-art for using supplementary cementitious materials (SCM's) such as fly ash and ground granulated blast-furnace slag to control sulfate attack is continuing. Data on regional groundwater quality are being collected to determine the level of sulfate attack that can be expected across the state.

**Progress continued:**
Supplementary cementitious materials (SCM's) such as metakaolin, fly ash and ground granulated blast-furnace slag were selected and data have been gathered on their properties. Data on regional groundwater quality are being collected to determine the level of sulfate attack that can be expected across the state. A detailed test plan incorporating the materials and the collected sulfate data has been drafted.

**Plans for FY 2008**
The plan for the laboratory investigation into the use of various cements and SCMs will be implemented and a final report will be generated highlighting recommendations for use of any cement in sulfate-rich environments. A preliminary report will be generated by the end of the second quarter. Additional criteria will be used to assess performance.

**Cost Estimate for FY 2008** $70,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 24 | STATE STUDY NO: 195 |
| TOTAL STUDY BUDGET: $171,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/06 | COMPLETION DATE: 12/31/10 |
| 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.

**Progress:**
No work performed the first two quarters due to issues with resolution of contractual matters. During the third and fourth quarters work was initiated and externally supported by matching fiscal funds from other sources so that the project could proceed during continued resolution of contractual matters.

During the third quarter of FY 2007 a project orientation meeting was held with MDOT personnel. Preferred formats were identified for project deliverables, specifically user-friendly features of the computer program to be used in future designs. Mr. Wright suggested the program include a database record control that would allow users to access individual test data in addition to the “calculation” functions of the program. Mr. Wright further provided a database that was largely populated with information, so that completion of the database is anticipated to require less time. Copies of test records and field installation records associated with all but eight of the piles were obtained to be included in the study. Construction was initiated for the user interface of the database/calculation program.

**Plans for FY 2008**
Not provided by the Principal Investigator.

**Cost Estimate for FY 2008** $67,980

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 25 | 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<br>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.

**Progress:**
During FY 2007, the project got started with at kick-off meeting. During this meeting a project organizational chart was created, a work schedule was presented and possible sources of relevant information were discussed. Following the suggestions from MDOT and researchers experience, a nationwide literature review was performed on rumble stripes. The main sources of information were: TRIS, FHWA, AASHTO, NHTSA, TRB-RIP, WZSRD, and ATSSA. Upon completing the literature review, a progress meeting was held focusing on the findings from the literature review and its implications to this project.

With the help of MDOT, road segments were selected to be used for this project and the compilation of data was initiated. The list of segments to be used as part of the study included the following information: ID, Project Name, District, Route Starting Point (Mile Marker), Ending Point (Mile Marker), Description, Map, Intersecting Roads, Project Date Start, Project Date Ending, BEFORE Data Traffic Flow and Incidents, AFTER Data Traffic Flow and Incidents. Working with the MDOT personnel the research team obtained access to Mississippi historical data (traffic parameters and accident data) of the road segment selected.

**Plans for FY 2008**

The research team is planning to compile historical crash information (such as: location, time, severity, and cause of the accident). Crash information data will be arranged into a useful format for the study. Upon completing the arrangement of the data, the research team will seek from MDOT verification of completeness of the crash data compiled. The compiled historical data will be appraised to determine the needs for additional data from the field (if any) to support the assessment of the "Rumble Stripes". This will be followed by a progress report with MDOT personnel. If needed field, a data collection plan will be prepared including variables, sites, dates, measurement procedure, etc. The field data will be merged with the current data and processed.

The data will be analyzed to identify whether or not the roads with "Rumble Stripes" and without "Rumble Stripes" before construction were statistically equivalents. The data will be also analyzed to identify whether or not there is a statistically significant difference between the roads with "Rumble Stripes" and without "Rumble Stripes" after construction. Finally, the links between before and after the construction of "Rumble Stripes" impact will be established.

**Cost Estimate for FY 2008** $87,600

MISSISSIPPI SPR-1(51)

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|---|---|
| LINE ITEM NO. 26 | 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 AGENCIES: | Research Curriculum Unit, Mississippi State University and The Mississippi Department of Transportation |
| PRINCIPAL INVESTIGATORS: | Leanne Long<br>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

**Progress:**
During FY 2007 the proposal for the MDOT Grant to develop a transportation model for ninth grade students was accepted and work started. Initially, a project manager was hired for the grant and she identified five exemplary math teachers to work collaboratively face-to-face and virtually via the RCU Blackboard system. These math teachers worked with the project manager to see the vision for the project, worked with MDOT engineers, and created high-quality lessons for the project. Those lessons have

**Progress continued:**
been submitted to the RCU and they are currently in the MSU editing and art department.

**Plans for FY 2008**
The editing and art work associated with this project will be completed. Teachers have selected certain experiences to capture on video and MDOT will create those videos. Also, the project manager and five exemplary math teachers will provide training to other teachers on the materials.

**Cost Estimate for FY 2008** $60,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 27 | STATE STUDY NO: 198 |
| TOTAL STUDY BUDGET: $10,000 | TOTAL STUDY COST TO DATE: $4,237 |
| 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.

**Progress:**
During the second quarter of FY 2007 a PQI 301 Pavement Quality Indicator was loaned to the Gulfport project office. Sales and manufacturing representatives demonstrated the use of this instrument and then project office field personnel collected data with it for the balance of the FY on several project sites. Sales and manufacturing personnel were again on site July 17, 2007 to review the operating and data collecting procedures with the field personnel.

**Plans for FY 2008**
Project office field personnel will continue to collect data with the PQI 301. Based on their evaluation of its use in the field, a decision will be made whether or not to analyze the collected data following the protocol documented in the NCHRP report "Nondestructive Testing Technology for Quality Control and Acceptance of Flexible Pavement Construction." This NCHRP report will be published during FY 2008.

**Cost Estimate for FY 2008** $10,763

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 28 | STATE STUDY NO: 199 |
| TOTAL STUDY BUDGET: $150,000 | TOTAL STUDY COST TO DATE: $1,042 |
| 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.

**Progress:**
Work began in March 2007 on compilation of port-specific data. The port authorities were contacted and each one visited to gather information on sedimentation problems and existing solutions. A meeting was held with the Corps of Engineers to coordinate with their sediment studies in Federal projects.

**Plans for FY 2008**
Documentation will be completed of existing sedimentation problems in the ports by collecting data as needed. Engineered solutions will be formulated (training structures, sediment bypassing, etc.) appropriate to the problems encountered and examine environmental effects and costs. Potential solutions will be presented to MDOT and the port authorities and documented in reports.

**Cost Estimate for FY 2008** $50,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 29 | STATE STUDY NO: 200 |
| TOTAL STUDY BUDGET: $40,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 06/01/07 | COMPLETION DATE: 12/31/08 |
| STUDY TITLE: | Utilization of RAP in Construction |
| RESEARCH AGENCY: | Mississippi State University |
| PRINCIPAL INVESTIGATOR: | Isaac Howard |

**Objective:**
Recycling asphalt was initially entertained by the pavement engineering community some 30 years ago; a time when the United States was facing an energy crisis that significantly affected the price and availability of high quality asphalt binders. The atmosphere of the energy market today bears some similarities to that period. In addition, local sources of high quality aggregate (virgin or otherwise) are sparse in Mississippi, and as a result maximizing all that are currently in the state (including those within flexible pavements) should be prioritized. The use of RAP in unconventional ways shows promise of improving the state of practice within Mississippi. An example would be generating fuel savings by using warm mix asphalt (temperatures of 200-250 degrees F) containing extremely high percentages of RAP (potentially 80% or more) by incorporating an emulsion or a wax (Sasobit is an example) and using the material at moderate depths from the pavement surface. In concept, using RAP as a replacement to stabilized bases, sub-bases, and similar is very appealing. Furthermore, a full depth flexible pavement structure fits in well with the concept of perpetual pavements and provides a viable alternative for use where current methods aren't performing adequately. However, to successfully implement any unconventional form of RAP use, many parameters must be successfully identified and understood.

**Progress:**
During FY 2007 work concentrated on a literature review, obtaining preliminary samples from two sources, contacting asphalt manufacturers, and testing RAP as a function of temperature to investigate potential for blending. Testing has been completed to assess the effect of temperature on compaction of 100% RAP (12.5 mm mix), gradation of central Mississippi RAP, and moisture content of RAP from milling and from stockpiles. Manufacturers of asphalt plants have been began to be consulted to investigate options (specifically where, how, etc) of introducing high RAP concentrations into a mix and still be able to achieve the desired temperature.

**Plans for FY 2008**
All project requirements will be completed. These include a comprehensive laboratory testing program where Sasobit warm mix technology will be used to compact RAP mixes at warm temperatures to allow characterization in terms of fundamental performance properties such as permanent deformation. Additional source and consensus tests will be performed as applicable. Economic considerations of high RAP content mixes will also be considered, especially as they relate to plant production. Based on the test

**Plans for FY 2008 continued:**
results, economic analysis, and production related information, a feasibility assessment will be made for the state of Mississippi. Provided evidence of a promising result is obtained, a plan for future work will be developed.

**Cost Estimate for FY 2008** $35,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 30 | STATE STUDY NO: 201 |
| TOTAL STUDY BUDGET: $35,426 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 06/01/07 | COMPLETION DATE: 09/30/10 |
| STUDY TITLE: | Field Permeability Testing of MDOT's OGFC |
| RESEARCH AGENCY: | Mississippi State University |
| PRINCIPAL INVESTIGATOR: | Tom White |

**Objective:**
Test sections of Open Graded Friction Course (OGFC) were built in Mississippi in the 1970's with local aggregate and neat asphalt. These sections performed poorly. The mixtures exhibited stripping and sever raveling. As a result, OGFC has not been used in Mississippi.

Open Graded Friction Courses decrease hydroplaning potential, spray, noise and underlying pavement temperature. Today polymer modified asphalts are readily available and cost effective and provide an opportunity for the Mississippi Department of Transportation (MDOT) to construct successful OGFC using available aggregates. A test section of OGFC is to be constructed on Mississippi I-55 in Copiah County during the spring/summer of 2007. The OGFC will be constructed as part of an eleven mile long project on I-55 which has two lanes in each direction. A one mile section of both lanes in both directions will receive an OGFC as surfacing. A one thousand foot section of both lanes in each direction will be selected for permeability testing and evaluation during and after construction and at various times after being placed in service.

**Progress:**
During FY 2007 an OGFC test section was constructed on Mississippi I-55 in Copiah County during the spring/summer of 2007 as part of an eleven mile long project. The test section consisted of a one mile section of both lanes in both directions. A one thousand foot section of both lanes in each direction will be tested for permeability and evaluated during and after construction and at various times after being placed in service.

The OGFC was constructed but initial field testing was delayed because the research project was not approved. In preparation for testing, a falling head permeability device was constructed. In addition, a van was modified to include a power source for an electric pump, water tank and reaction frame mounted on the back of the van. Initial testing is being planned when traffic control can be scheduled. The OGFC permeability will be tested each Fall and Spring through Fall 2009.

**Plans for FY 2008**
Spring and fall testing will be conducted.

**Cost Estimate for FY 2008** $12,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 31 | STATE STUDY NO: 202 |
| TOTAL STUDY BUDGET: $80,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/07 | COMPLETION DATE: 09/30/09 |
| STUDY TITLE: | Laboratory and Field Study of Chip and Scrub Seals to Develop Asphalt Maintenance Toolbox |
| RESEARCH AGENCY: | Mississippi State University |
| PRINCIPAL INVESTIGATOR: | Isaac Howard |

**Objective:**
Chip and Scrub seals are to be tested and evaluated through field and laboratory testing. Two surface treatments have been placed by MDOT, and will be tested over time for deterioration of skidding and structural integrity. A modified *Vialit* test procedure for testing aggregate retention will also be developed. Laboratory testing of candidate materials will be performed to determine properties that can be correlated to field performance that can ultimately be used to develop performance specifications of maintenance activities.

**Cost Estimate for FY 2008** $40,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 32 | STATE STUDY NO: 203 |
| TOTAL STUDY BUDGET: $20,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/07 | COMPLETION DATE: 09/30/09 |
| STUDY TITLE: | In-House Support to State Study No. 202 |
| RESEARCH AGENCY: | Mississippi Department of Transportation Research Division |
| PRINCIPAL INVESTIGATOR: | Jeff Wages |

**Objective:**
This study will be conducted to support the proposed study "Laboratory and Field Study of Chip and Scrub Seals to Develop Asphalt Maintenance Tool Box." The required tasks include falling weight deflectometer and skid testing on three lane miles of a chip seal project in Clay County and two lane miles of a scrub seal project in Tallahatchie County. These tests will be performed on a 3-month interval and the test data provided to the Principal Investigator of State Study No. 202.

**Cost Estimate for FY 2008** $10,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 33 | STATE STUDY NO: 204 |
| TOTAL STUDY BUDGET: $21,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/07 | COMPLETION DATE: 09/30/08 |
| STUDY TITLE: | Development of HMA Mix Selection Guide for Mississippi |
| RESEARCH AGENCY: | Burns, Cooley & Dennis, Inc. |
| PRINCIPAL INVESTIGATOR: | L. Allen Cooley Jr. |

**Objective:**
During the last ten years, there have been several new or improved HMA mix types that have been introduced. Most notably of these are stone matrix asphalt (SMA) and new-generation open-graded friction courses (OGFC). These specialty types of HMA have a place in the selection of mixes in Mississippi. However, guidance is needed on the proper application of these mixes for conditions unique to Mississippi. The purpose of the guide document will be to provide designers with the needed information to make informed decisions on the selection of appropriate mix types in Mississippi. The guide will be developed based upon local practices, the literature, and experience.

**Cost Estimate for FY 2008** $21,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 34 | STATE STUDY NO: 205 |
| TOTAL STUDY BUDGET: $99,700 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/07 | COMPLETION DATE: 09/30/09 |
| STUDY TITLE: | Chemically Stabilized Soils |
| RESEARCH AGENCY: | Burns, Cooley & Dennis, Inc. |
| PRINCIPAL INVESTIGATOR: | Randy Ahlrich |

**Objective:**
Current MDOT design procedures use CBR values and unconfined compressive strength values to characterize chemically treated soils. The new Mechanistic-Empirical Pavement Design Guide (MEPDG) uses elastic modulus (E) and resilient modulus (Mr) values to characterize chemically treated soils. These strength test methods do not evaluate or quantity the effects of in-place density or various moisture conditions.

BCD proposes to conduct laboratory evaluations that will quantity the effects of compaction and moisture conditions on the strength of chemically treated soils for typical Mississippi DOT highways. This laboratory evaluation will supplement the ongoing MDOT State Study 170 “Implement the 2002 Design Guide for MDOT.”

This research will be used in conjunction with the new MEPDG to optimize pavement structural sections and to provide data to improve construction specifications. This research will enhance MDOT’s capabilities to design highways and will provide material properties that can be used to predict pavement performance.

**Cost Estimate for FY 2008** $57,500

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 35 | STATE STUDY NO: 206 |
| TOTAL STUDY BUDGET: $15,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/07 | COMPLETION DATE: 09/30/08 |
| STUDY TITLE: | Use of Maturity Meters in Construction |
| RESEARCH AGENCY: | Mississippi State University |
| PRINCIPAL INVESTIGATOR: | Isaac Howard |

**Objective:**
The proposed project aims to improve the use of maturity meters in MDOT construction activities. It is intended to be an exploratory analysis that will result in a clear direction to proceed to develop specifications for use of maturity meters. The project will leverage In-Kind data provided by *Key Constructors* and will be used to attempt to secure funds for development of a cold weather curing project being submitted to the *RMC Research & Education Foundation*. This project was also identified as a need in the recent *MDOT Research Needs Workshop* and will have a budget significantly higher than that requested for this project.

**Cost Estimate for FY 2008** $15,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 36 | STATE STUDY NO: 207 |
| TOTAL STUDY BUDGET: $135,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/07 | COMPLETION DATE: 09/30/10 |
| STUDY TITLE: | Open Graded Friction Courses for HMA Pavements |
| RESEARCH AGENCY: | Mississippi State University |
| PRINCIPAL INVESTIGATOR: | Tom White |

**Objective:**
Open Graded Friction Courses (OGFC) decrease hydroplaning potential, spray, noise and underlying pavement temperature. Because of relatively high annual rainfall in the state, use of OGFC would significantly reduce hydroplaning potential, which is a major safety issue in Mississippi. Additional beneficial functions are reduction in spray, noise and underlying pavement temperature.

Research is proposed that will provide comprehensive tests, data, material evaluation, and performance results for OGFC. As a result, MDOT will be in a position to make decisions on broad application of OGFC through out the state with respect to allowing materials, verification of mix design criteria, safety (hydroplaning and spray), noise and contribution to pavement structural capacity. Testing will be conducted in both the laboratory and the field. Field testing is proposed for test sections strategically located as to site and materials representative throughout Mississippi.

**Cost Estimate for FY 2008** $55,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 37 | STATE STUDY NO: 208 |
| TOTAL STUDY BUDGET: $275,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/07 | COMPLETION DATE: 09/30/10 |
| STUDY TITLE: | Effect of Coarse Aggregate Cleanliness and Moisture Content on Stripping Susceptibility & Long Term Performance of HMA |
| RESEARCH AGENCY: | Mississippi State University and Burns, Cooley & Dennis, Inc. |
| PRINCIPAL INVESTIGATOR: | Isaac Howard<br>L. Allen Cooley Jr. |

**Objective:**

There are two issues that are related to the use of absorptive, dirty aggregates. The first issue is the potential for moisture damage. Dirty coatings left on aggregate surfaces can prevent the asphalt binder from properly adhering to the aggregates, leading to an increased potential for moisture damage. This is especially true when clayey fines coat the aggregates. Additionally, all of the moisture from highly absorptive aggregates may not be removed during the production process. Moisture remaining within the aggregates will increase the potential for moisture damage. The second issue is that of compactibility of the HMA in the field. Moisture remaining within the aggregates will try to escape the asphalt binder coated aggregates in the form of water vapor. The water vapor acts to extend the asphalt binder making the HMA act like it is over asphalted. When this occurs, the mixture can act very tender under the roller and be difficult to compact.

In order to evaluate the effect of absorptive, dirty aggregates, field projects will be visited. Aggregates from project will be sampled and evaluated for cleanliness using a number of tests to determine the number of adhered fines as well as the activity of those fines. Mixture will be sampled and tested for moisture content and susceptibility to moisture damage. Additionally, the mixtures will be evaluated during compaction to determine the influence of aggregate moisture content on compactability.

**Cost Estimate for FY 2008** $100,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 38 | STATE STUDY NO: 209 |
| TOTAL STUDY BUDGET: $30,000 | TOTAL STUDY COST TO DATE: 0 |
| DATE STARTED: 10/01/07 | COMPLETION DATE: 09/30/09 |
| STUDY TITLE: | Support to Red Hills Fly Ash Experimental Feature |
| RESEARCH AGENCY: | Mississippi Department of Transportation Research Division |
| PRINCIPAL INVESTIGATOR: | William F. Barstis |

**Objective:**
The Red Hills Plant near Ackerman, Mississippi produces a fly ash that does not meet the ASTM specification for either Class C or F fly ash; however, this material has been successfully used by a local consultant to stabilize embankment material. The purpose of this study is to evaluate this fly ash in a lime-fly ash (LFA) stabilized subgrade application for MDOT road construction. The MDOT Central Laboratory will evaluate a LFA mix design using the Red Hills fly ash for application in a field test section.

The Central Laboratory will also evaluate a design using just this fly ash mixed with the subgrade soil to determine if it has sufficient "self-cementing" strength development for use in a stabilized subgrade application. Based on acceptable test results, a field test section will also be evaluated with only the addition of this fly ash.

A minimum of ten 4-inch diameter Proctor samples of field mixed material will be fabricated from both of these field test sections as well as a field control test section. The control section will be constructed with a Department approved source of lime and fly ash. All Proctor samples will be transported to the Central Laboratory in their Proctor mold. The samples will be extruded at the Central Laboratory and then cured under the same curing conditions as that for a LFA mix design. The samples will then be tested per the LFA mix design protocol. Analyses of these test results will allow evaluation of the Red Hills fly ash for use in MDOT stabilized soil applications as well as indicate the in-situ variability of this material in the road bed.

Six of the nine Red Hills fly ash laboratory test results provided by HEADWATERS Resources reported the sample Sulfur Trioxide ($SO_3$) content exceeding the ASTM limit of 5 percent. Sulfate ions in combination with aluminum and calcium ions can, under certain conditions, produce the mineral ettringite. The production of this mineral and its subsequent hydration has been documented to produce heave in the stabilized material. Cementitiously stabilized soil experts will be consulted to determine if additional laboratory testing will be required by the MDOT Central Laboratory to determine if significant heave potential exists with the use of this fly ash.

**Cost Estimate for FY 2008** $30,000

MISSISSIPPI SPR-1(51)

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| LINE ITEM NO. 39 | STATE STUDY NO: N/A |
| TOTAL STUDY BUDGET: $25,000 | TOTAL STUDY COST TO DATE: $0 |
| DATE STARTED: 10/01/06 | COMPLETION DATE: 09/30/08 |
| STUDY TITLE: | Minor Research Studies |
| RESEARCH AGENCY: | Mississippi Department of Transportation<br>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 2008** $25,000

## 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 2008 of Part II funds is $109,712.

## 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 2008 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 2008 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: ***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. Due to delays within the FHWA contracting process MDOT's final annual contribution will be delayed until FY 2009.

FY 2006 - $25,000 FY 2007 - $25,000 FY 2009 - $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. Not enough partners have been identified to date; therefore, MDOT has been unable to commit funding to this project. Funds in FY 08 will be budgeted in the event the requisite partners are obtained.

FY 2008 - $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. Not enough partners have been identified to date; therefore, MDOT has been unable to commit funding to this project. Funds in FY 08 will be budgeted in the event the requisite partners are obtained.

FY 2008 - $20,000 FY 2009 - $20,000 FY 2010 - $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: ***Updating U.S. Precipitation Frequency Estimates for the Southeastern Region***

Host Agency – FHWA

In some parts of the country, rainfall maps have not been updated for approximately 50 years. This particular project is for the Southeastern Region and is of interest to the following States: Alabama, Florida, Georgia and Mississippi. This study will determine the annual exceedance probabilities (AEP) and average recurrence intervals (ARI) for durations ranging from 5 minutes to 60 days and for ARIs from 1 to 1,000 years. The point estimates will be spatially interpolated to a resolution of 4km x 4km. The study results will be published as volumes of NOAA Atlas 14, a wholly web based publication available at www.nws.noaa.gov/ohd/hdsc. The total project budget is $670,000, with Mississippi's portion costing $158,000 over 3 years.

FY 2008 - $50,000 FY 2009 - $50,000 FY 2010 - $58,000

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 - $20,000FY 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. Not enough partners have been identified to date; therefore, MDOT has been unable to

commit funding to this project. Funds in FY 08 will be budgeted in the event the requisite partners are obtained.

FY 2008 - $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 2002 - $20,000(Non-SPR) FY 2003 - $20,000 FY 2007 - $20,000
FY 2009 - $20,000

Pooled Fund Study: ***SafetyAnalyst***

Host Agency – FHWA

The objective of this study is to develop SafetyAnalyst, a software package for use in the decision-making process to identify and manage a system wide program of site-specific improvements to enhance highway safety by cost-effective means. The analytical tools being developed as part of the software package include:

1. Network screening to identify sites with promise
2. Diagnoses of safety programs at specific sites
3. Selection of appropriate countermeasures
4. Economic appraisal of candidate improvements
5. Priority rankings of candidate improvements
6. Evaluation of safety improvements

This project has two phases. Phase 1 was completed in December 2006 with distribution of an interim version of SafetyAnalyst software to participating pooled-fund States for testing and evaluation. During Phase 2 testing of the interim tools will be completed and user experience with the tools will be assessed. A final version of the software will be released. The total project budget is $5,301,023.

FY 2008 - $40,000 FY 2009 - $40,000

Pooled Fund Study: ***Transportation Library Connectivity***

Host Agency – Wisconsin Department of Transportation

Accessible, reliable, and timely information is central to quality performance for all transportation agencies and stakeholders. Yet, a vast amount of transportation-related information is neither collected nor made available for use by others. This project will focus on making the transfer of information an integral part of transportation library and information services. Under the guidance of a full-time staff person contracted for the project, and with the support of a comprehensive marketing plan and materials, pooled fund participants will work to implement a national transportation technology transfer program for information and knowledge management. Guidance will be provided for cataloguing documents into the Online Computer Library Center and converting them to online format and network development. The total project budget is $345,000.

FY 2008 - $15,000

Pooled Fund Study: ***Evaluation of Non Intrusive Traffic Detection Technologies (Phase III)***

Host Agency – Minnesota Department of Transportation

“Non-intrusive” sensors are defined as those sensors that can be installed, calibrated and used without disruption to traffic. The most common non-intrusive technologies (NIT) used for traffic detections include: passive or active infrared, magnetic, microwave or radar, ultrasonic, passive acoustic, and video. Other, more recent applications use infrared technology to classify vehicles by counting each vehicle’s axles from the side of the road. The proposed study includes field testing of the latest generation of non-intrusive traffic sensors. The field tests will assess the capabilities and limitations in detecting traffic under a variety of conditions. Specific test conditions will be driven by the needs of participating state agencies. The total project budget is $225,000.

FY 2008 - $15,000

Pooled Fund Study: ***Construction of Crack-Free Bridge Decks (Phase II)***

Host Agency – Kansas Department of Transportation

Cracks in concrete bridge decks provide easy access for water and deicing chemicals that shorten the life of the deck. Concrete bridge deck cracking research over the past 40 years has resulted in an accumulation of knowledge regarding the causes of this cracking. However, only a small number of findings from this research have been used to implement changes in bridge deck design and construction procedures. Phase I work, being accomplished under TPF-5(051), is utilizing this accumulated knowledge in the design and construction of 20 low-cracking, high-performance bridge decks for comparison with an equal number of control decks. The purpose of this Phase II study is to apply the knowledge gained in Phase I to the construction of 20 additional bridges and evaluate their performance. The original total project budget was $980,000; however, the KU Transportation Research Institute has committed an additional $500,000 so the total project budget will be $1,480,000.

FY 2008 - $15,000 FY 2009 - $15,000 FY 2010 - $15,000 FY 2011 - $15,000
FY 2012 - $15,000

Pooled Fund Study: ***Improving Resilient Modulus Test Procedures for Unbound Materials***

Host Agency – FHWA

The Mechanistic-Empirical Pavement Design Guide requires that the resilient modulus of the subgrade be used to design the pavement thickness for both asphalt and Portland cement concrete pavements. Due to the complexity of the test, test results have been inconsistent. This study includes three primary goals:

1. To reduce the variability currently associated with resilient modulus testing of unbound materials
2. To conduct a precision and bias study of the test procedure
3. Provide assistance to states to properly equip and setup a laboratory for successful $M_R$ testing

The total project budget is $400,000.

FY 2008 - $15,000 FY 2009 - $15,000 FY 2010 - $15,000

Pooled Fund Study: ***Traffic Control Device (TCD) Consortium***

Host Agency – FHWA

The objective of this study is to assemble a consortium composed of regional, State, local entities, appropriate organizations and the FHWA to accomplish the following:

1. establish a systematic procedure to select, test, and evaluate approaches to novel TCD concepts as well as incorporation of results into the MUTCD
2. select novel TCD approaches to test and evaluate
3. determine methods of evaluation for novel TCD approaches
4. initiate and monitor projects intended to address evaluation of the novel TCDs
5. disseminate results
6. assist MUTCD incorporation and implementation of results

The total project budget is $675,000.

FY 2008 - $15,000 FY 2009 - $15,000

100% State Funded Research for FY 08

| | |
|---|---|
| LINE ITEM NO. N/A | STATE STUDY NO. 146 |
| TOTAL STUDY BUDGET: $220,000 | TOTAL COST TO DATE: $80,000 SP&R<br>$120,000 Non-SP&R<br>$200,000 Total |
| DATE STARTED: 10/01/00 | COMPLETION DATE: 09/30/08 |
| 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 8-year project will begin October 1, 2000, and will end September 30, 2008. The total estimated cost of the project is $440,000 distributed over eight Federal Fiscal years (October 1 to September 30) as follows:

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | Total |
|---|---|---|---|---|---|---|---|---|---|
| MDOT | $20,000 | $30,000 | $30,000 | $30,000 | $30,000 | $30,000 | $30,000 | $20,000 | $220,000 |
| USGS | $20,000 | $30,000 | $30,000 | $30,000 | $30,000 | $30,000 | $30,000 | $20,000 | $220,000 |
| Total | $40,000 | $60,000 | $60,000 | $60,000 | $60,000 | $60,000 | $60,000 | $40,000 | $440,000 |

**Note that MDOT utilized SP&R Part II monies to fund our FY 2001 – FY 2003 commitment to this project. FY 2004 – FY 2008 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 2008** $20,000 (Non-SP&R funds)

# Mississippi
# Department of Transportation

# RESEARCH WORK PROGRAM
# SPR-1(51), Part II
# L56

**For the Fiscal Period**
**October 1, 2007 to September 30, 2008**

**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(51), Part II
# L56

**For the Fiscal Period**
**October 1, 2007 to September 30, 2008**