



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

**MISSISSIPPI DIVISION**

September 18, 2009

86-01  
666 North Street, Suite 105  
Jackson, MS 39202-3199  
601-965-4215  
601-965-4231 FAX  
In Reply Refer To:  
POST-MS

Mr. Larry L. Brown, Executive Director  
Mississippi Department of Transportation (MDOT)  
Post Office Box 1850  
Jackson, Mississippi 39215-1850

Subject: SPR Part II Research Work Program (SPR-1(56)) for the Fiscal Period  
FY 2010, October 1, 2009 to September 30, 2010

Dear Mr. Brown:

In response to the September 8, 2009 request, we have reviewed the Department's SPR Part II Research Work Program (SPR-1(56)) for the Fiscal Period FY 2010, and have determined that the Department is in compliance with the requirements of 23 CFR 420, Subpart B. Approval of the SPR Part II Research Work Program (SPR-1(56)) for the Fiscal Period FY 2010 the State of Mississippi is granted.

If you have any questions, please contact Mr. Jeffrey Schmidt at 601-965-4222.

Sincerely yours,

Jeffrey A. Schmidt  
Andrew H. Hughes  
Division Administrator

cc: Ms. Melinda McGrath, 65-01

Mr. Randy Battey, 71-01

Mr. James Watkins, 86-01 ✓



L. McGrath  
Executive Director/  
Senior Engineer

Brenda Znachko  
Deputy Executive Director/  
Administration



Steven K. Edwards  
Director  
Office of Intermodal Planning

Willie Huff  
Director  
Office of Enforcement

Larry L. "Butch" Brown  
Executive Director

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P. O. Box 1850 / Jackson, Mississippi 39215-1850 / Telephone (601) 359-7001 / FAX (601) 359-7110 / GoMDOT.com

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September 8, 2009

**Mr. Andrew H. Hughes**  
**Division Administrator**  
**Federal Highway Administration**  
**666 North Street, Suite 105**  
**Jackson, MS 39202-3199**

**Dear Mr. Hughes:**

**SUBJECT: SPR Part II Research Work Program (SPR-1(56)) for the Fiscal  
Period FY 2010, October 1, 2009 to September 30, 2010**

The Research Division met with the MDOT Research Advisory Committee (RAC) on September 3, 2009 to discuss and approve the FY 2010 research budget. Mr. Jeff Schmidt and Doug MacDonald from your office attended this meeting. Three (3) copies of the MDOT RAC approved Research Work Program for FY 2010 is attached for your information and approval. This proposed program includes an estimated FHWA SPR Part II funding allocation for FY 2010. Your prompt review and approval of this document is requested.

If there are any questions concerning the program, please contact me at telephone number 359-7650.

Sincerely,

James C. Watkins, P.E.  
State Research Engineer

Attachment

pc: Central File w/attachment  
FY 2009 Work Program file w/attachment

I:\Research\Work Program\2010\FY10 Submittal of Work Program.doc



**Mississippi  
Department of Transportation**

**RESEARCH WORK PROGRAM  
SPR-1(56), Part II  
L560**

**For the Fiscal Period  
October 1, 2009 to September 30, 2010**

*RESEARCH DIVISION*



**Mississippi  
Department of Transportation**

**RESEARCH WORK PROGRAM  
SPR-1(56), Part II  
L560**

**For the Fiscal Period  
October 1, 2009 to September 30, 2010**



**Prepared by the  
Mississippi Department of Transportation  
*RESEARCH DIVISION***

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

Melinda L. McGrath  
Deputy Executive Director/  
Chief Engineer

Brenda Znachko  
Deputy Executive Director/  
Administration



Steven K. Edwards  
Director  
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September 8, 2009

**Mr. Andrew H. Hughes**  
**Division Administrator**  
**Federal Highway Administration**  
**666 North Street, Suite 105**  
**Jackson, MS 39202-3199**

Dear Mr. Hughes:

**SUBJECT: Certification of SPR-1(56) Research Work Program (FY 2010) in  
Accordance with 23 CFR 420.209(c)**

In accordance with 23 CFR 420.209(c), the following certification is submitted to assist in your approval of MDOT's Research Work Program for FY 2010:

**"I, Randy L. Battey, State Research Engineer of the State of Mississippi, do hereby certify that the State is in compliance with all requirements of 23 U.S.C. 505 and its implementing regulations with respect to the research, development, and technology transfer program and contemplate no changes in statutes, regulations or administrative procedures which would affect such compliance."**

Sincerely,

James C. Watkins, P.E.  
State Research Engineer  
Mississippi Department of Transportation

I:\Research\Work Program\2010\FY10 Certification.doc



**MISSISSIPPI PROJECT SPR-1(56)  
WORK PROGRAM - PART II (80%/20%)  
FY 2010 (L560)**

LINE ITEM	STDY NO.	STUDY TITLE	BUDGET PROGRAM / EXPENDITURES LAST YR	TOTAL EXPENDITURES TO DATE / TOTAL STUDY BUDGET	STARTED / COMPLETION DATE	PRINCIPAL INVESTIGATOR FTC
1	N/A	LONG-TERM PAVEMENT PERFORMANCE (LTPP)	\$3,000 \$0			JAMES C. WATKINS
2	N/A	IMPLEMENTATION OF RESEARCH PROJECTS	\$220,000 \$210,705			JAMES C. WATKINS
3	N/A	TECHNOLOGY TRANSFER	\$90,000 \$74,025			JAMES C. WATKINS
4	N/A	PAVEMENT MANAGEMENT	\$270,000 \$263,713			CINDY DRAKE
5	N/A	NETWORK LEVEL PAVEMENT FRICTION DATA COLLECTION	\$100,000 \$60,137			GARY BROWNING
6	N/A	INFORMATION AND DATA COLLECTION TECHNOLOGY	\$90,000 \$85,782			REGINALD JENKINS
7	144	PROFILOGRAPH SPECIFICATION STUDY	\$29,967 \$40,086	\$276,384 \$300,000	10/01/00 09/30/10	JORDAN WHITTINGTON
8	170	IMPLEMENT THE 2002 DESIGN GUIDE FOR MDOT (PHASE II)	\$150,000 \$96,998	\$186,438 \$407,663	03/01/04 06/30/10	CHETANA RAO
9	171	IN-HOUSE SUPPORT TO STATE STUDY 170	\$50,000 \$58,632	\$224,517 \$350,000	03/01/04 06/30/10	WILLIAM F. BARSTIS
10	180	EVALUATION OF PAVEMENT MARKING MATERIALS	\$10,000 \$10,530	\$67,182 \$90,000	10/01/05 12/31/10	CINDY DRAKE
11	181	STRUCTURAL CHARACTERIZATION OF ASPHALT DRAINAGE COURSE LAYERS	\$26,324 \$0	\$73,676 \$100,000	10/01/05 06/30/10	L. ALLEN COOLEY JR.
12	183	ENHANCING MOBILITY TO IMPROVE THE QUALITY OF LIFE IN THE MISSISSIPPI CAPITAL REGION	\$35,992 \$24,780	\$144,008 \$180,000	10/01/05 12/31/09	EMMETT CROCKETT
13	184	LONG-TERM FIELD MONITORING AND PERFORMANCE OF PAVING FABRIC INTERLAYER SYSTEMS TO REDUCE REFLECTIVE CRACKING	\$7,500 \$16,598	\$67,008 \$218,224	10/01/05 09/30/14	FARSHAD AMINI
14	185	IN-HOUSE SUPPORT TO STATE STUDY NO. 184	\$10,000 \$455	\$10,242 \$30,000	10/01/05 09/30/14	CINDY DRAKE
15	186	CONSULTANT SUPPORT TO STATE STUDY NO. 184	\$0 \$0	\$19,251 \$20,400	10/01/05 09/30/14	RANDY AHLRICH
16	190	MDOT RESEARCH PROGRAM PEER EXCHANGE	\$21,371 \$77	\$34,788 \$56,169	10/01/05 10/31/09	JAMES C. WATKINS
17	195	EVALUATION OF LOAD-DEFLECTION BEHAVIOR OF DRILLED, CAST-IN-PLACE CONCRETE SHAFTS IN MS	\$70,000 \$22,126	\$92,985 \$171,000	10/01/06 12/31/10	CHRIS SAUCIER

**MISSISSIPPI PROJECT SPR-1(56)  
WORK PROGRAM - PART II (80%/20%)  
FY 2010 (L560)**

LINE ITEM	STDY NO.	STUDY TITLE	BUDGET PROGRAM / EXPENDITURES LAST YR	TOTAL EXPENDITURES TO DATE / TOTAL STUDY BUDGET	STARTED / COMPLETION DATE	PRINCIPAL INVESTIGATOR FTC
18	196	EFFECTIVENESS OF RUMBLE STRIPES ON ROADWAY SAFETY IN MS	\$3,378 \$61,812	\$155,576 \$158,954	10/01/06 12/31/09	TULIO SULBARAN DAVID MARCHMAN
19	198	QUALITY VERIFICATION OF PQI 301 ASPHALT DENSITY DEVICE	\$10,000 \$665	\$17,187 \$45,000	10/01/06 12/31/10	PAULA WILES
20	199	PORT SEDIMENTATION SOLUTIONS - GULF COAST	\$3,363 \$59,023	\$146,637 \$150,000	10/01/06 12/31/09	WILLIAM MCANALLY
21	201	FIELD PERMEABILITY TESTING OF MDOT'S OGFC	\$1,418 \$17,284	\$34,008 \$35,426	06/01/07 09/30/10	TOM WHITE
22	202	LABORATORY AND FIELD STUDY OF CHIP AND SCRUB SEALS TO DEVELOP ASPHALT MAINTENANCE TOOLBOX	\$1,522 \$35,714	\$78,478 \$80,000	10/01/07 12/31/09	ISAAC HOWARD
23	205	CHEMICALLY STABILIZED SOILS	\$4,805 \$53,214	\$94,895 \$99,700	10/01/07 12/31/09	RANDY AHLRICH
24	206	PERFORMANCE SPECIFICATION FOR CHEMICALLY STABILIZED LAYERS	\$30,000 \$0	\$0 \$239,703	10/01/07 12/31/11	ISAAC HOWARD
25	207	OPEN GRADED FRICTION COURSES FOR HMA PAVEMENTS	\$51,000 \$18,630	\$27,056 \$135,000	10/01/07 09/30/11	TOM WHITE
26	208	EFFECT OF COARSE AGGREGATE CLEANLINESS AND MOISTURE CONTENT ON STRIPPING SUSCEPTIBILITY & LONG TERM PERFORMANCE OF HMA	\$150,000 \$7,981	\$18,420 \$275,000	10/01/07 09/30/10	ISAAC HOWARD L. ALLEN COOLEY JR.
27	209	SUPPORT TO RED HILLS FLY ASH EXPERIMENTAL FEATURE	\$7,000 \$2,612	\$4,247 \$30,000	10/01/07 12/31/10	BILL BARSTIS
28	210	EMERGENCY EVACUATION STUDY FOR THE GREATER JACKSON AREA (DYNASMART-P DEPLOYMENT)	\$55,158 \$3,655	\$4,386 \$59,544	10/01/08 06/30/10	FENG WANG
29	211	LABORATORY TESTING AND EVALUATION OF NEAR SURFACE PROPERTIES OF FLEXIBLE PAVEMENTS DUE TO BITUMINOUS SURFACE TREATMENTS	\$125,000 \$5,775	\$13,799 \$330,000	10/01/08 03/31/13	ISAAC HOWARD
30	212	UTILIZATION OF RAP IN CONSTRUCTION (PHASE II - HIGH RAP SURFACE COURSE)	\$70,000 \$11,168	\$24,489 \$115,000	10/01/08 09/30/10	ISAAC HOWARD
31	213	PERFORMANCE EVALUATION OF ROUNDABOUTS FOR TRAFFIC DELAY AND CRASH REDUCTION IN OXFORD, MS	\$46,000 \$0	\$0 \$70,920	10/01/08 12/31/10	WAHEED UDDIN
32	214	MDOT IMPLEMENTATION PLAN FOR GPS TECHNOLOGY IN PLANNING, DESIGN, AND CONSTRUCTION DELIVERY	\$172,988 \$0	\$0 \$172,988	10/01/08 03/31/11	JOHN HANNON
33	215	INTEGRATED KUDZU CONTROL ON MISSISSIPPI ROADSIDES	\$16,900 \$0	\$2,224 \$50,215	10/01/08 03/30/12	MARK WEAVER
34	216	SHRINKAGE AND DURABILITY STUDY OF BRIDGE DECK CONCRETE	\$7,098 \$64,902	\$64,902 \$72,000	10/01/08 09/30/10	ROBERT VARNER
35	217	STRAIN RESISTANT, EXTENDED PERFORMANCE PAVEMENTS, AN ALTERNATE TO SUBDRAINAGE	\$78,000 \$0	\$0 \$225,000	10/01/08 03/30/12	TOM WHITE
36	218	IN-HOUSE SUPPORT TO STATE STUDY NO. 217	\$17,380 \$457	\$549 \$40,000	10/01/08 03/30/12	JORDAN WHITTINGTON

**MISSISSIPPI PROJECT SPR-1(56)  
WORK PROGRAM - PART II (80%/20%)  
FY 2010 (L560)**

LINE ITEM	STDY NO.	STUDY TITLE	BUDGET PROGRAM / EXPENDITURES LAST YR	TOTAL EXPENDITURES TO DATE / TOTAL STUDY BUDGET	STARTED / COMPLETION DATE	PRINCIPAL INVESTIGATOR FTC
37	219	DEVELOPMENT OF A METHOD FOR ESTIMATING LATERAL EARTH PRESSURES FOR RETAINING STRUCTURES SITED IN EXPANSIVE CLAY DEPOSITS	\$0 \$0	\$0 \$290,000	10/01/08 03/30/12	CHRIS SAUCIER MIRIAM SMITH
38	220	FRAMEWORK OF CALCULATING THE MEASURES OF RESILIENCE (MOR) FOR INTERMODAL TRANSPORTATION SYSTEMS	\$16,318 \$0	\$9,544 \$25,862	10/01/08 03/30/10	LI ZHANG
<b>FY 2010 NEW STATE STUDIES</b>						
39	221	EVALUATION OF MDOT'S DISTRESS THRESHOLDS FOR MAINTAINED PAVEMENT PROJECTS	\$60,211 \$0	\$0 \$120,422	10/01/09 12/31/11	FENG WANG
40	222	BEST PRACTICE OF MDOT'S SURVEY OPERATION, ORGANIZATION & TECHNOLOGY IMPLEMENTATION	\$91,197 \$0	\$0 \$131,217	10/01/09 06/30/11	TULIO SULBARAN ANDREW STRELZOFF
41	223	I55 INTEGRATED DIVERSION TRAFFIC MANAGEMENT BENEFIT STUDY	\$74,699 \$0	\$0 \$152,810	10/01/09 12/31/11	LI ZHANG
42	224	SUMMARY OF LESSONS LEARNED FROM THE MDOT MEPDG MATERIALS LIBRARY STUDY	\$30,000 \$0	\$0 \$30,000	10/01/09 6/30/10	RANDY AHLRICH
43	225	TURBIDITY MONITORING AT SELECT CONSTRUCTION SITES	\$99,999 \$0	\$0 \$99,999	10/01/09 12/31/10	BOBBY MOSELY
44	226	ENVIRONMENTAL MANAGEMENT PLAN DEVELOPMENT FOR MDOT LABORATORIES	\$80,000 \$0	\$0 \$99,999	10/01/09 12/31/10	BOBBY MOSELY
45	227	VARIABILITY OF CEMENT TREATED LAYERS IN MDOT ROAD PROJECTS	\$80,000 \$0	\$0 \$80,000	10/01/09 12/31/10	ROBERT VARNER
46	228	EVALUATING ALTERNATIVE MOWING REGIMEN AND THE USE OF NATIVE GRASSES & WILDFLOWERS ON ROADSIDE RIGHT-OF-WAYS	\$49,359 \$0	\$0 \$135,045	10/01/09 12/31/12	JOHN GUYTON JEANNE JONES
47	229	INSTRUMENTATION & COMPUTATIONAL MODELING FOR EVALUATION OF BRIDGE SUBSTRUCTURE ACROSS WATERWAYS	\$65,246 \$0	\$0 \$150,000	10/01/09 12/31/11	WEI ZHENG
48	231	OPTIMIZING MISSISSIPPI AGGREGATES FOR CONCRETE BRIDGE	\$80,000 \$0	\$0 \$97,500	10/01/09 06/30/11	ROBERT VARNER
49	N/A	MINOR RESEARCH STUDIES	\$25,000	\$0	10/01/09	JAMES C. WATKINS

**MISSISSIPPI PROJECT SPR-1(56)  
WORK PROGRAM - PART II (80%/20%)  
FY 2010 (L560)**

	<u>FY 2009</u>	<u>FY 2010</u>
FY 2009 & 2010 SPR PART II ALLOCATION (2010 Estimated)	\$1,502,257	\$1,502,257
less 25% NCHRP (2010 Estimated)	\$109,056	\$109,056
less 25% TRB Correlation Service	\$27,534	\$27,534
less POOLED-FUND STUDIES	\$525,000	\$463,000
plus FY 2008 Carryover	<u>\$2,024,419</u>	
SPR AVAILABLE FOR FY 2009 & 2010 PART II WORK PROGRAM	\$2,865,086	\$902,667
plus STATE MATCH	<u>\$716,271</u>	<u>\$225,667</u>
TOTAL AVAILABLE FROM SPR PART II	\$3,581,357	\$1,128,334
less EXPENDITURES THRU 08/04/09	\$1,307,537	
less ESTIMATED EXPENDITURES 8/04/09 THRU 9/30/09	\$200,000	
less PROJECTS THAT CLOSED OUT DURING FY 2009	<u>\$69,110</u>	
ESTIMATED FY 2009 CARRYOVER	\$2,004,710	<u>\$2,004,710</u>
TOTAL FUNDS AVAILABLE		\$3,133,044
LESS FY 2010 PROJECTS		<u>\$2,787,192</u>
BALANCE		\$345,851

**MISSISSIPPI PROJECT SPR-1(56)  
WORK PROGRAM - PART II (80%/20%)  
FY 2010 (L560)**

**NCHRP, TRB & POOLED FUND PROJECTS WITH 100% FEDERAL FUNDING FOR FY 2010 (L56)**

	<u>FY 2009</u>	<u>FY 2010</u>	
NCHRP ALLOCATION (2009 Estimated)	\$109,056	\$109,056	JAMES C. WATKINS
TRB COORELATION SERVICE (2009 Estimated)	\$27,534	\$27,534	JAMES C. WATKINS
<b><u>POOL FUND STUDIES</u></b>			
AUBURN UNIVERSITY ACCELERATED PAVEMENT LOADING FACILITY (ROUND 4 in FY 09)	\$175,000	\$175,000	ALABAMA DOT (NCAT)
DEVELOPMENT OF PERFORMANCE PROPERTIES OF TERNARY MIXES	\$15,000	\$15,000	IOWA DOT
EVALUATION OF LOW COST SAFETY IMPROVEMENTS		\$30,000	FHWA
ACCELERATED IMPLEMENTATION OF INTELLIGENT COMPACTION TECHNOLOGY FOR EMBANKMENT SUBGRADE SOILS, AGGREGATE BASE AND ASPHALT PAVEMENT MATERIALS	\$25,000		FHWA
SUBSURFACE DRAINAGE FOR LANDSLIDE AND SLOPE STABILIZATION	\$10,000	\$10,000	WASHINGTON STATE C
ANALYSIS OF MNROAD WHITETOPPING PERFORMANCE DATA FOR A MODULE IN THE ME DESIGN GUIDE	\$20,000	\$20,000	MINNESOTA DOT
UPDATING U.S. PRECIPITATION FREQUENCY ESTIMATES FOR THE SOUTHEASTERN REGION	\$50,000	\$58,000	FHWA
PAVEMENT SURFACE PROPERTIES CONSORTIUM	\$20,000	\$20,000	VIRGINIA DOT
AASHTO LRPD SPECIFICATION MAINTENANCE SAFETYANALYST	\$40,000		FHWA
TRANSPORTATION LIBRARY CONNECTIVITY	\$15,000	\$15,000	WISCONSIN DOT
CONSTRUCTION OF CRACK-FREE BRIDGE DECKS (PHASE II)	\$15,000	\$15,000	KANSAS DOT
IMPROVING RESILIENT MODULUS TEST PROCEDURES FOR UNBOUND MATERIALS	\$15,000	\$15,000	FHWA
TRAFFIC CONTROL DEVICE (TCD) CONSORTIUM	\$15,000		FHWA
SOUTHEAST TRANSPORTATION RESEARCH CONSORTIUM	\$5,000	\$5,000	LOUISIANA DOTD
ANALYTICAL REVIEW OF CHILD MOBILITY ASSESSMENTS FOR SCHOOL SITE PROGRAMS	\$10,000	\$10,000	WASHINGTON STATE I
CONCRETE PAVEMENT ROAD MAP OPERATIONAL SUPPORT	\$25,000		FHWA
EXTENSION OF TPF-5(039) FWD CALIBRATION CENTER & OPERATIONAL IMPROVEMENTS		\$10,000	FHWA
<b><u>FY 2010 NEW POOLED FUND</u></b>			
ACCOMODATING OVERSIZE/OVERWEIGHT VEHICLES AT ROUNDABOUTS		\$15,000	KANSAS DOT
DARWIN-ME COOPERATIVE SOFTWARE DEVELOPMENT	\$50,000	\$50,000	AASHTO
<b>TOTALS</b>	<b>\$661,590</b>	<b>\$699,590</b>	

**MISSISSIPPI PROJECT SPR-1(56)  
 WORK PROGRAM - PART II (80%/20%)  
 FY 2010 (L560)**

**MISSISSIPPI PARTICIPATION IN OTHER RESEARCH PROJECTS  
 100% STATE FUNDED FY 2010 (NON-SPR)**

STUDY TITLE	BUDGET PROGRAM- YEAR/ EXPENDITURES LAST YEAR	TOTAL EXPENDITURES TO DATE /TOTAL STUDY BUDGET	STARTED/ COMPLETION DATE	PRINCIPAL INVESTIGATOR FTC
UPDATING MISSISSIPPI FLOOD FREQUENCY REPORTS (\$80,000 TOTAL OF SP&R FUNDS WERE USED DURING FY'S 01 THROUGH 03) (Added year to study)	\$0 \$0	\$220,000 \$220,000	10/01/00 09/30/10	K. VAN WILSON
IMPLEMENT THE 2002 DESIGN GUIDE FOR MDOT (NON-SP&R FUNDED PORTION)	\$0 \$0	\$502,297 \$500,000	10/01/99 06/30/10	CHETANA RAO

MISSISSIPPI SPR-1(56)

GENERAL COMMENTS ON RESEARCH WORK PROGRAM  
FOR FISCAL YEAR 2010

The SPR Part II research work program allocation for FY 2010 totals \$1,502,257 (estimated) and includes a National Cooperative Highway Research Program (NCHRP) contribution of \$109,056 (estimated) for FY 2010, a TRB Correlation Service contribution of \$27,534 and pooled-fund studies totaling \$463,000 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(52)) 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 2010. 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 2010. 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 2010 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 forty-nine (49) 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.

MISSISSIPPI SPR-1(56)

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 2009 included:

- no work performed

Activities planned for FY 2010 include:

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

**Cost Estimate for FY 2010**

Salaries (Regular Employees)	\$1,500
Employee Benefits	\$420
Materials, Supplies, and Services	\$600
Travel and Sustenance	<u>\$480</u>
Total	\$3,000

MISSISSIPPI SPR-1(56)

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 2010**

Salaries (Regular Employees)	\$150,040
Employee Benefits	\$42,011
Materials, Supplies, and Services	\$12,772
Travel and Sustenance	<u>\$15,377</u>
Total	\$220,000

MISSISSIPPI SPR-1(56)

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 include:

- 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(52)), provides direct support to the Center for Technology Transfer (T<sup>2</sup>) at Jackson State University, and those activities and funds are not included in the above line item, Technology Transfer.

**Cost Estimate for FY 2010**

Salaries (Regular Employees)	\$56,250
Employee Benefits	\$15,750
Materials, Supplies, and Services	\$5,400
Travel and Sustenance	\$10,800
Conference Registrations	<u>\$1,800</u>
Total	\$ 90,000

MISSISSIPPI SPR-1(56)

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 2010**

Salaries (Regular Employees)	\$196,364
Employee Benefits	\$45,164
Materials, Supplies, and Services	\$10,800
Travel and Sustenance	<u>\$17,673</u>
Total	\$270,000

MISSISSIPPI SPR-1(56)

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 1/3<sup>rd</sup> of the network annually and includes periodic calibration of equipment.

**Cost Estimate for FY 2010**

Salaries (Regular Employees)	\$52,000
Employee Benefits	\$14,560
Materials, Supplies, and Services	\$12,000
Travel and Sustenance	<u>\$21,440</u>
Total	\$100,000

MISSISSIPPI SPR-1(56)

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 include:

- 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 2010**

Salaries (Regular Employees)	\$63,912
Employee Benefit	\$17,895
Materials, Supplies, and Services	\$3,193
Travel and Sustenance	\$3,000
Conference Registrations	<u>\$2,000</u>
Total	\$90,000

MISSISSIPPI SPR-1(56)

LINE ITEM 7	STATE STUDY NO. 144
TOTAL STUDY BUDGET: \$300,000	TOTAL STUDY COST TO DATE: \$276,384
DATE STARTED: 10/01/00	COMPLETION DATE: 09/30/10
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. The final report has been started.

**FY 2007:**

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.

**FY 2008:**

More data was collected on paving projects that will be used to determine smoothness specifications. Work continued on the final report for this project. MDOT is still awaiting new updates in ProVal software that are considered extremely important for implementing new smoothness specifications.

**FY 2009:**

Work continued on the final report for this project. Suggested revisions were made to MDOT's asphalt smoothness specifications in order to change them from a PRI based specification to an IRI specification. Construction Division reviewed the updates and began working in conjunction with Research Division to collect more field data to verify that the updated asphalt specifications are acceptable.

**Plans for FY 2010:**

Data will continue to be collected on paving projects as needed to verify the new asphalt smoothness specifications. A concrete smoothness specification will be developed and evaluated this year. Once Research and Construction Divisions agree that all new

**Progress Continued:**

smoothness specifications are acceptable; these new specifications will be implemented. The final report for this project will be completed once approved specifications are included.

**Cost Estimate for FY 2010 \$29,967**



## **Progress Continued:**

### **FY 2005:**

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.

### **FY 2006:**

Either the following tasks have 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 or slowed at the request of MDOT to ensure incorporation of the latest NCHRP 1-40 results.

### **FY 2007:**

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.

**Progress Continued:**

Fifteen material types were selected based upon comments from MDOT district materials engineers. During FY07, six of the materials were obtained and tested.

**FY 2008:**

A majority of the project activities was related to task 7 and task 9, which have been defined as:

- Task 7: Select pavement sections to be used in the validation and local calibration process,
- Task 9: Assemble data for validation and calibration of MEPDG performance prediction models

These tasks are being conducted simultaneously for efficiency and have involved a great deal of coordination and communication with MDOT staff. ARA reviewed the distress data elements in the MDOT pavement condition databases and provided a format for MDOT to provide pavement performance, layer design, and construction activity schedules. ARA received and organized MDOT data for new flexible pavements; new rigid pavements, composite overlay flexible pavements, and overlay rigid pavements. By the end of FY 2008, ARA will complete the following:

1. Review the data for completeness and quality.
2. Prepare list of sections that show reliable, consistent, and predictable performance data trends over time (i.e., distress does not decrease with time or waver over time) so that MDOT can retrieve materials and construction data for sections in the list.
3. Evaluate materials and construction data received and exclude sections without vital materials data will be excluded for further data collection.

In addition other administrative issues were addressed including the transition to the new key project staff from ARA.

**FY 2009:**

A majority of the project activity was related to the following tasks of the project:

- Task 7: Select pavement sections to be used in the validation and local calibration process,
- Task 9: Assemble data for validation and calibration of MEPDG performance prediction models
- Task 12: Recommend input levels needed for design inputs
- Task 15: Prepare final project report and design manual

These tasks are being conducted simultaneously for efficiency and have involved a great deal of coordination and communication with MDOT staff. ARA reviewed the distress data elements in the MDOT pavement condition databases and selected candidate sections that cover all the pavement types identified for use in the calibration of the distress models.

1. Review the data for completeness and quality.
2. Prepare list of sections that show reliable, consistent, and predictable performance data trends over time (i.e., distress does not decrease with time or



MISSISSIPPI SPR-1(56)

LINE ITEM 9 STATE STUDY NO: 171  
TOTAL STUDY BUDGET: \$350,000 TOTAL STUDY COST TO DATE: \$224,517  
DATE STARTED: 03/01/04 COMPLETION DATE: 06/30/10  
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.

**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.

**FY 2006:**

We continued to collect requisite data for calibration/validation of performance models.

**Progress Continued:**

**FY 2007:**

The work performed 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.

**FY 2008:**

MDOT completed submission of current and historical data from relevant pavement condition surveys to ARA. Construction records were sent for many original asphalt pavement structures for review by ARA. Work also included the review of multiple reports and studies pertaining to the development, calibration and implementation of the ME-PDG.

**FY 2009:**

The work completed by MDOT included the submission of data from relevant pavement condition surveys to ARA. Much of this year's efforts revolved around extracting relevant data from microfilm records. All currently available microfilm has been scanned. In addition to these roadway sections, multiple PCC sections located outside the state of Mississippi were reviewed for use in the calibration effort. MDOT also began efforts in obtaining traffic data for the relevant sections located throughout the State.

**Plans for FY 2010:**

Work for the next FY shall include the continuation of submitting construction and traffic records for all pavement structures. In addition, MDOT will begin to conduct field testing of rehabilitated pavement structures throughout the state. Work may also include the submission of more data from condition surveys as more become available.

**Cost Estimate for FY 2010 \$50,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 10 STATE STUDY NO: 180  
TOTAL STUDY BUDGET: \$90,000 TOTAL STUDY COST TO DATE: \$67,182  
DATE STARTED: 10/01/05 COMPLETION DATE: 12/31/10  
STUDY TITLE: Evaluation of Pavement Marking Materials  
RESEARCH AGENCY: Mississippi Department of Transportation  
Research Division

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PRINCIPAL INVESTIGATORS: Cindy Drake

**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:**

**FY 2006:**

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.

The division measured the retroreflectivity and durability of previously placed inverted profile stripe (Gulflin) on concrete pavements throughout the state.

**Progress continued:**

**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.

**FY 2008:**

MDOT continued to monitor the reflectivity and durability of the pavement marking material on the following projects:

- MS 304 from US 61 to I-55 and Spur (MS 713), Desoto & Tunica Counties
- US 49 from US 98 South to Black Creek, Forrest County
- I-55 from Pearl Street to I-220, Hinds & Madison Counties

All projects were tested twice during the past year. In addition to these projects, the striping material on US 82 on Oktibbeha County was tested at the request of Melinda McGrath.

**FY 2009:**

MDOT continued to monitor the reflectivity and durability of the pavement marking material on the following projects:

- MS 304 from US 61 to I-55 and Spur (MS 713), Desoto & Tunica Counties
- US 49 from US 98 South to Black Creek, Forrest County
- I-55 from Pearl Street to I-220, Hinds & Madison Counties

All projects were tested during the past year. In addition to these projects, the striping material on US 82 on Oktibbeha County was tested at the request of Linda McGrath. Testing was completed for the US 49 test section.

**Plans for FY 2010:**

The proposed work for FY 2010 is the continued testing of the following projects:

- MS 304 from US 61 to I-55 and Spur (MS 713), Desoto & Tunica Counties
- I-55 from Pearl Street to I-220, Hinds & Madison Counties

This study should be completed within this fiscal year.

**Cost Estimate for FY 2010 \$10,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 11 STATE STUDY NO: 181  
TOTAL STUDY BUDGET: \$100,000 TOTAL STUDY COST TO DATE: \$73,676  
DATE STARTED: 10/01/05 COMPLETION DATE: 06/30/10  
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.

**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

**Progress continued:**

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 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  $\frac{3}{4}$ -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.

**FY 2008:**

Modulus testing of all asphalt drainage course materials was completed. Also during the last year, the scope of the project was modified slightly. Instead of targeting a transfer function to be used with ELMOD5, analyses will be conducted in order to develop remaining service lives for asphalt drainage course materials based upon results of falling weight deflectometer testing.

The initial contract expired for the project on December 31, 2007 due to an oversight by the consultant; therefore, the project deliverables were not completed by this date. No additional work was completed during the last three quarters of FY 08.

**FY 2009:**

No work was performed during the first three quarters of FY 09 because no contract was in place. A new contract was developed to complete this study with a Notice to Proceed (NTP) issued during the fourth quarter of FY 09.

From the NTP date to the end of the fourth quarter computer based mechanistic analyses were performed to determine the range of vertical stresses expected at the top of the asphalt drainage course under normal traffic loadings. Researchers worked with MDOT to locate pavement sections for coring to obtain samples of in-place asphalt drainage courses.

**Plans for FY 2010:**

The researchers will core the selected pavements to obtain samples of asphalt drainage courses. Repeated load triaxial tests will be conducted on selected field and laboratory samples to compare results between the field and laboratory test values. The researchers will analyze the data to determine whether a relationship exists between applied vertical stresses and the onset of permanent deformation. This relationship will then be utilized in an effort to develop remaining service life estimates for use with FWD results. The laboratory modulus values will also be utilized for use with FWD results within the Mississippi ELMOD 5 program for backcalculating in-place modulus values. A

**Progress continued:**

final report will be compiled following MDOT guidelines that document the findings, conclusions and recommendations generated from this study.

**Cost Estimate for FY 2010 \$26,324**

MISSISSIPPI SPR-1(56)

LINE ITEM 12

STATE STUDY NO: 183

TOTAL STUDY BUDGET: \$180,000

TOTAL STUDY COST TO DATE: \$144,008

DATE STARTED: 10/01/05

COMPLETION DATE: 12/31/09

STUDY TITLE:

Enhancing Mobility to Improve the Quality of Life in the Mississippi Capital 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 Capital 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. I started planning for the 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.

**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.

**FY 2008:**

Jackson State University focused efforts on increasing awareness throughout the Mississippi Capital Region of the importance of mobility as a key factor in communities' quality of life. These efforts were undertaken in conjunction with JSU's actions to

**Progress continued:**

optimize interest in a regional mobility summit and refine topical areas to be addressed during a summit of transportation stakeholders in the Mississippi Capital Region.

JSU broadened its network and contacts among transportation stakeholders locally, regionally, statewide and nationally. JSU received two appointments to two prominent committees of the American Public Transportation Association (APTA). Those committees are:

Bus and Paratransit Operations  
Transportation and University Communities

JSU also participated in the workshops and seminars conducted during the annual meeting of the Transportation Research Board (TRB). JSU serves on two TRB panels. JSU was one only four universities from the Federal Transit Administration (FTA) Region IV invited to address the agency's Annual Conference "The Road to Success...Today and Beyond" in Atlanta.

A comparative analysis was conducted of selected characteristics of municipal transit systems operating in the southeast region of the U.S. Those cities are Jackson, MS; Baton Rouge LA; Birmingham, AL; Chapel Hill, NC; Cocoa, FLA; Durham, NC; Fort Myers, FL; Gulfport, MS; Little Rock, AR; Mobile, AL; Montgomery, AL; Savannah, GA; and Tallahassee, FL. Municipal transit systems play a major in addressing mobility in major metropolitan areas.

**FY 2009:**

Reviewed long and short-ranged capital region transportation plans for the Mississippi Capital Region. Identified and monitored major development in the Mississippi Capital Region. Reviewed challenges to mobility in selected metropolitan areas of the country. I conducted a comparative analysis of mass transit systems operating in capital regions in the southeastern part of the country. I engaged transportation stakeholders in a dialogue on mobility in the Mississippi Capital Region. I developed plans for the Mississippi Capital Region Mobility Summit and identified Summit Invitees and Speakers as well as the venue for the Summit.

I began monitoring transportations programs in the Obama Administration's American Recovery and Reinvestment Act (ARRA) for funding opportunities to enhance mobility in the Mississippi Capital Region. I developed a strategic approach to designing and implementing strategies to enhance movement throughout the Mississippi Capital Region.

**Plans for FY 2010:**

Conduct the Mississippi Capital Region Mobility Summit. Pursue a consensus among Mississippi Capital Region Transportation Stakeholders on challenges to mobility in the region. Identify strategies to address challenges to mobility in the Mississippi Capital Region. Select best strategies to enhance seamless mobility throughout the Mississippi Capital Region. Develop a plan to fund and implement best strategy/strategies to enhance mobility in the Mississippi Capital Region. Present final conclusions and recommendations to MDOT.

**Cost Estimate for FY 2010 \$35,992**

MISSISSIPPI SPR-1(56)

LINE ITEM 13	STATE STUDY NO: 184
TOTAL STUDY BUDGET: \$218,224	TOTAL STUDY COST TO DATE: \$67,008
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.

**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

**Progress continued:**

sections were modified and finalized. The construction of the paving fabric sections included a test section, and the 12 research sections. The construction process 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.

**FY 2008:**

A comprehensive construction report indicating the results of the test section, the 12 research sections, process during quality control, the equipment, testing, and the lessons learned and recommendations was prepared. The initial crack survey analysis was also completed during this year.

**FY 2009:**

The first annual survey was completed. One paper titled "Lessons Learned from Construction of Paving Fabric Systems to Reduce Reflective Cracking in Pavements" was presented at the Mississippi Transportation Institute (MTI) Conference held in Choctaw, MS in October 2008.

**Plans for FY 2010:**

The second annual crack survey will be completed and analyzed 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 be compared to the subsequent annual crack data. This will be done to evaluate the effectiveness of the paving fabric systems to reduce reflective cracking. Quarterly progress reports will be prepared.

**Cost Estimate for FY 2010 \$7,500**

MISSISSIPPI SPR-1(56)

LINE ITEM 14 STATE STUDY NO: 185  
TOTAL STUDY BUDGET: \$30,000 TOTAL STUDY COST TO DATE: \$10,242  
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: Cindy Drake Smith

**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.

**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.

**Progress continued:**

**FY 2008:**

MDOT collected data for the third survey of the research sections. In addition to collecting the third set of data, MDOT continued to map all distresses from the first, second and third surveys and submitted the results to JSU. The first draft of the construction report was completed by JSU and reviewed by MDOT during the past fiscal year.

**FY 2009:**

MDOT collected data for the third survey of the research sections. In addition to collecting the third set of data, MDOT continued to map all distresses from the surveys and submitted the results to JSU.

**Plans for FY 2010:**

Collect the data for the annual survey and submit same to JSU.

**Cost Estimate for FY 2010 \$10,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 15 STATE STUDY NO: 186  
TOTAL STUDY BUDGET: \$20,400 TOTAL STUDY COST TO DATE: \$19,251  
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:**

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

**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.

**FY 2008:**

BCD reviewed draft of construction report prepared by JSU. No other work was performed this year.

**FY 2009:**

No work performed during FY 09.

**Plans for FY 2010:**

No work is scheduled for this upcoming year.

**Cost Estimate for FY 2010 \$0**

MISSISSIPPI SPR-1(56)

LINE ITEM 16	STATE STUDY NO: 190
TOTAL STUDY BUDGET: \$56,159	TOTAL STUDY COST TO DATE: \$34,788
DATE STARTED: 10/01/05	COMPLETION DATE: 10/31/09
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, development and technology (RD & 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 costs
- Providing lodging, meals and meeting space for the participants
- Preparing and distributing a final report
- Providing ground transportation for participants

**Progress:**

**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 involved MDOT, FHWA, academia, and industry

**Progress continued:**

personnel and identified and prioritized future transportation research needs. Since MDOT Research wanted to include both our updated Transportation Research Manual and the "Research Needs Identification" workshop in our upcoming Peer Exchange, it was decided to postpone the exchange until the fall of 2007.

**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>

**FY 2008:**

The division developed a list of issues facing the Research Division now and in the future. These issues were condensed down to the most pressing for the division. From the condensed list three topics were selected to discuss at the Peer Exchange for Mississippi. These topics include the following:

- Standardizing the proposal process
- Criteria used to evaluate a researcher's qualifications and experience
- Proposal evaluation

An agenda was developed for the conference. A facilitator was selected to perform the administrative duties for the project. This facilitator worked closely with Outreach Division to provide lodging, meals, travel, and a meeting space to hold the Peer Exchange. From the above activities, an agenda for the conference was developed. Research Division selected five Research Administrators, which included four from Departments of Transportation and one FHWA representative. Because of a conflict with the facilitator, the Department was unable to hold the conference during FY 2008.

**FY 2009:**

The Peer Exchange was held between September 21<sup>st</sup> and 25<sup>th</sup> at the Hard Rock Casino in Biloxi, Mississippi as the result of a joint effort between the MDOT Outreach and Research Divisions, and Mississippi State University (MSU). The State representatives and FHWA representative for the event were:

Dr. Mrinmay "MOY" Biswas, P.E.	North Carolina Department of Transportation
Gary Frederick	New York Department of Transportation
Susan Barker	Kansas Department of Transportation
Donald L. Williams PE	West Virginia Department of Transportation
Robert (Bob) L. Orthmeyer, P.E.	FHWA – Resource Center

**Plans for FY 2010:**

Reimburse MSU.

**Cost Estimate for FY 2010 \$21,371**

MISSISSIPPI SPR-1(56)

LINE ITEM 17 STATE STUDY NO: 195  
TOTAL STUDY BUDGET: \$171,000 TOTAL STUDY COST TO DATE: \$92,985  
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

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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:**

**FY 2007:**

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.

**Progress continued:**

**FY 2008:**

In accordance with the proposed research plan, we have collected all field data associated with the dataset of Osterberg load tests (e.g., partial topographic data, ground water data, soil boring logs, laboratory test summaries, available installation records, load test summaries, and raw data). Also in accordance with the proposed plan, we have delineated geologic units associated with each load test. Beyond that, we selected a subset of the overall database to provide "proof of concept" for the project's objectives. For this subset of data, corresponding to the Laurel I-59 Bridge Site tests, we have successfully developed soil response curves for the geologic units at that site. The "back analysis" of the furnished data was completed via a Windows-based computer program developed during the first nine months of the project for specific use with this project. Successful completion of these steps, which was essentially a full completion of the proposed research plan on a reduced scale, is a strong indicator that the project can be fully achieved for the larger dataset. Completion of these steps nine months into the project appears to indicate that progress is ahead of schedule at the moment.

**FY 2009:**

We focused on developing all necessary computer tools to speed the process of further data reduction and upon repetition of the data reduction technique on the entire database of load tests. The first of these two objectives was successfully completed with development of an operating computer program for data analysis. The second objective is not complete, but is thought to be on schedule, with approximately two-thirds of the data reduced to its final form.

**Plans for FY 2010:**

Make comparisons of the various observations of axial load transfer curves between sites having similar geologic units and for synthesis of the study into a report. These activities were partially initiated in Year Two (by necessity, to ensure consistency in results as test data was reduced). The effort at producing a consistent means of estimating load transfer curves from existing site strength data across similar geologic units will continue as previously planned. Several important geologic formations are represented in the remaining one-third of the database, as well as important confirming data for several geologic formations which have been generally characterized already. Data analyses for the entire database should be completed within the first six months of Year Three. Finally, the computer program developed for data analysis will be modified to incorporate a "design" mode to complement the "back-analysis" mode for which the program is currently being used. Synthesis of the report should commence on schedule for completion of the project within the remaining 18-month timeline.

**Cost Estimate for FY 2010 \$70,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 18 STATE STUDY NO: 196  
TOTAL STUDY BUDGET: \$158,954 TOTAL STUDY COST TO DATE: \$155,576  
DATE STARTED: 10/01/06 COMPLETION DATE: 12/31/09  
STUDY TITLE: Effectiveness of Rumble Stripes on Roadway  
Safety in Mississippi  
RESEARCH AGENCY: The University of Southern Mississippi  
PRINCIPAL INVESTIGATORS: Tulio Sulbaran  
David Marchman

**Objective:**

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

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

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

**Progress:**

**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.

**Progress continued:**

**FY 2008:**

The research team focused on structuring the data for statistical analysis. This was followed by a progress meeting held on October 26, 2007 where MDOT Planning Division, District 6 Office, District 5 Office and the Traffic Engineering Division provided additional input. Then, descriptive statistical analyses were performed to the structured data and followed by a progress meeting held on April 25, 2008, where MDOT personnel provided additional input. Finally, inferential statistical analyses were performed and a round table discussion was held on August 5, 2008, to evaluate the results.

**FY 2009:**

A consolidated second final draft report was prepared and presented to MDOT personnel. The report included the following elements: 1- Executive Summary, 2- Background of Rumble Stripes On Highway Safety, 3- State-Of-The Art: Effectiveness Of Rumble Stripes On Highway Safety, 4- Agencies And Their Data To Assess Effectiveness Of Rumble Stripes On Highway Safety, 5- Data Structuring For Statistical Analysis Of: Effectiveness Of Rumble Stripes On Highway Safety, 6- Statistical Analysis Of The Impact Of: Effectiveness Of Rumble Stripes On Highway Safety, 7- Summary Of: Effectiveness Of Rumble Stripes On Highway Safety. Also per request of MDOT personnel, a no-cost time extension was submitted to allow MDOT personnel to provide feedback.

**Plans for FY 2010:**

Receive feedback from MDOT, incorporate feedback from MDOT into final report and prepare bond copies for MDOT.

**Cost Estimate for FY 2010 \$3,378**

MISSISSIPPI SPR-1(56)

LINE ITEM 19	STATE STUDY NO: 198
TOTAL STUDY BUDGET: \$45,000	TOTAL STUDY COST TO DATE: \$17,187
DATE STARTED: 10/01/06	COMPLETION DATE: 12/31/10
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 6<sup>th</sup> 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:**

**FY 2007:**

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.

**FY 2008:**

The data collected by Sixth District personnel were reviewed by MDOT Research Division. After a meeting of interested parties it was decided that MDOT would purchase two PQI devices and evaluate further.

**Progress continued:**

**FY 2009:**

Two PQI devices were used on various paving projects to collect density data. Collected data was recorded in a worksheet developed by District 6 personnel so that the data will be organized for future analysis.

**Plans for FY 2010:**

The two PQI devices will continue to be used on paving projects to collect density data. Collected data will be analyzed in an effort to verify if the PQI device will be acceptable for use by MDOT in measuring asphalt density. Work will be conducted on the final report for this project.

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**Cost Estimate for FY 2010 \$10,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 20	STATE STUDY NO: 199
TOTAL STUDY BUDGET: \$150,000	TOTAL STUDY COST TO DATE: \$146,637
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:**

**FY 2007:**

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.

**FY 2008:**

The preliminary information obtained from original visits to the ports was compiled into a series of draft reports. Past Landsat imagery was retrieved of the region to assist in identifying sources of sediment to the ports.

Extensive information was obtained regarding bathymetry, tidal data, and side scan sonar and multibeam depth data amounts and composition of the dredged material for the Port of Bienville and began analyses of those data. Detailed bathymetric surveys of the Port of Pascagoula were obtained and analyzed to locate shoaling zones. Those locations were sampled twice in order to characterize the shoal material and suspended sediment supply. Laboratory analysis of the samples was performed. Work began on formulation of recommended solutions for the Port of Pascagoula and preparing the draft report. The investigators visited the Engineer Research and Development Center in Vicksburg to review material they have on sediments in Pascagoula and Gulfport and discuss strategies for control of fluid mud.

**Progress continued:**

**FY 2009:**

We completed drafts of the Port of Pascagoula and Port Bienville reports, including recommended solutions to sedimentation problems. Collected and analyzed data from the ports of Gulfport and Biloxi and then formulated proposed solutions.

**Plans for FY 2010:**

All reports and deliverables will be completed and provided to MDOT as described in our proposal.

**Cost Estimate for FY 2010 \$3,363**

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MISSISSIPPI SPR-1(56)

LINE ITEM 21 STATE STUDY NO: 201  
TOTAL STUDY BUDGET: \$35,426 TOTAL STUDY COST TO DATE: \$34,008  
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 severe 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:**

**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.

**FY 2008:**

The falling head device was fabricated using a design from previous work. In application, the device worked well. After the first field trial, modifications were made to the reaction beam mounted on the van used. Those modifications were effective. Field

**Progress continued:**

permeability tests were conducted in the fall and spring. Observations are also made on the condition of the OGFC.

**FY 2009:**

The field permeability tests were conducted in the fall and spring. Observations are also made on the condition of the OGFC.

From observations, the OGFC section is in good condition. Permeability measurements were made at 10 longitudinal stations in each wheel path (OWP and IWP) as well as between the wheel paths (BWP) Averages of measurements for all stations for each location indicate OWP, BWP, and IWP permeability's are becoming asymptotic. In addition, the average permeability values are ten to forty percent higher than a target as constructed permeability adopted by White, *ibid*.

**Plans for FY 2010:**

The last set of measurements will be made in the fall of 2009. Subsequently, a data report will be prepared.

**Cost Estimate for FY 2010 \$1,418**

MISSISSIPPI SPR-1(56)

LINE ITEM 22 STATE STUDY NO: 202  
TOTAL STUDY BUDGET: \$80,000 TOTAL STUDY COST TO DATE: \$78,478  
DATE STARTED: 10/01/07 COMPLETION DATE: 12/31/09  
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.

**Progress:**

**FY 2008:**

Two test sections were planned, constructed, and two of the four test phases were conducted. The test sections are chip and scrub seal treatments. Testing is being conducted to compare the treatments and their effect on the pavement. Aggregate retention, visual assessment, profile, FWD, and skid testing is being performed on dozens of sub sections within the two test sections. A method to use FWD data for assessment of the seal treatments was developed.

Data was obtained from MDOT related to a field trial in Lincoln County in the late 1980's pertaining to polymer modified chip seal field trails. No formal report was generated as a result of this effort, so the data was taken, interpreted, and a report generated. The report is currently under review by MDOT.

**FY 2009:**

The remaining field-testing on Hwy 17 and Hwy 35 was completed. The testing consisted of skid resistance, aggregate retention, falling weight deflectometer, and profile data. Hwy 17 was also cored for layer thicknesses and for samples to determine near surface characteristics. FWD data analysis was completed to compare the behavior of chip seals, scrub seals, and no seal treatment. Aggregate retention data was also fully analyzed alongside skid resistance data. Literature review was essentially completed and the writing of the final report was commenced.

**Progress continued:**

**Plans for FY 2010:**

The draft final report should be to MDOT shortly after the beginning of FY 2010. Minor analysis, evaluation of profile data, minor amounts of laboratory testing of field samples (depending on the analysis) and completion of the report are all that will remain.

**Cost Estimate for FY 2010 \$1,522**

MISSISSIPPI SPR-1(56)

LINE ITEM 23	STATE STUDY NO: 205
TOTAL STUDY BUDGET: \$99,700	TOTAL STUDY COST TO DATE: \$94,895
DATE STARTED: 10/01/07	COMPLETION DATE: 12/31/09
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 (M<sub>r</sub>) values to characterize chemically treated soils. These strength test methods do not evaluate or quantify the effects of in-place density or various moisture conditions.

BCD proposes to conduct laboratory evaluations that will quantify 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.

**Progress:**

**FY 2008:**

Burns Cooley Dennis, Inc. located six of the seven-subgrade soils. Approximately 400 pounds of each of the materials were properly sampled, processed and labeled for future testing. Atterberg limits, gradation and moisture density relationship (Proctor) testing has been performed on these samples. Initial California Bearing Ratio (CBR) testing has been performed to establish the procedure for which the treated subgrade soils will be tested.

**FY 2009:**

We completed all materials laboratory testing and draft of final report.

**Plans for FY 2010:**

MDOT will review report and BCD, Inc. will complete final report.

**Cost Estimate for FY 2010 \$4,805**

MISSISSIPPI SPR-1(56)

LINE ITEM 24 STATE STUDY NO: 206  
TOTAL STUDY BUDGET: \$239,703 TOTAL STUDY COST TO DATE: \$0  
DATE STARTED: 10/01/07 COMPLETION DATE: 12/31/11  
STUDY TITLE: Performance Specification for Chemically Stabilized Layers  
RESEARCH AGENCY: Mississippi State University

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PRINCIPAL INVESTIGATOR: Isaac Howard

**Objective:**

The proposed project will develop a performance specification for chemically treated pavement layers (lime, fly ash, and cement). A significant amount of laboratory testing of stabilized soils will be utilized, including previous stabilization research performed for MDOT. Numerical analysis will be performed using the finite element method to determine thresholds for the performance specification. MEPDG software will also be used to perform a sensitivity analysis.

**Progress:**

During FY 2008 no meaningful activities were performed on this project. Recent events have caused significant priority shifts within MDOT related to new construction, primarily material costs. This project requires a full scale test section, and therefore has been temporarily tabled at the consent of the MDOT Research Division.

Work accomplished during FY 09 dealt with planning of test data to be collected in companion studies. This project is intended to use data collected by other entities and use the data toward the goal of development of a draft performance specification. Other efforts focused on literature review and preliminary investigation.

**Plans for FY 2010:**

Continue to work with the entities that will be generating needed test data. Once sufficient test data is collected analysis will commence. Preliminary investigation efforts will continue in the context of literature and practice review.

**Cost Estimate for FY 2010 \$30,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 25 STATE STUDY NO: 207  
TOTAL STUDY BUDGET: \$135,000 TOTAL STUDY COST TO DATE: \$27,056  
DATE STARTED: 10/01/07 COMPLETION DATE: 09/30/11  
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.

**Progress:**

**FY 2008:**

There was finalization of the technical advisory committee and coordination with the committee on scope of work. A preliminary review of literature was accomplished to identify material types, specifications and mix design methods for open-graded friction courses (OGFC) coarser than used by the Mississippi Department of Transportation (MDOT) and for OGFC with rubber added to the mixture. The Florida Department of Transportation (FLDOT) was identified as having significant experience with a coarser OGFC and OGFC with rubber added.

Contact has been made with the FLDOT State Materials Engineer to clarify several points relative to their use of OGFC. These discussions are continuing. Aggregates and gradations have been identified for laboratory testing and mix designs. Sources of asphalt and rubber have also been identified. Bulk samples of all materials have been requested. Mix designs were initiated.

**Progress continued:**

**FY 2009:**

A literature review was initiated and contacts made with other state DOTs and industry representatives to gather information on OGFC aggregate gradations, binder specifications and construction standard practice.

Current literature has been reviewed relative to scales of noise and equipment for noise measurement. This review indicated there has been significant advancement in equipment for measuring and recording noise and software for noise analysis. As a result, a number of vendors have been contacted to obtain information and specifications on appropriate equipment and software. Prices for equipment purchase or rental have been requested. A request is being prepared to modify the project budget to rent or purchase the equipment.

Target OGFC gradations have been met with stockpile aggregates obtained for the study. Binder samples have also been obtained. Inquiry was made with MDOT as to possible test sections for this calendar year.

**Plans for FY 2010:**

Report chapter on literature review will be essentially completed. Mix designs for fine and coarse OGFC gradations and with polymer modified asphalt binder and rubber-asphalt binder will be completed. Noise measuring equipment will be obtained and baseline noise measurements obtained for conventional HMA pavement surfaces as well as for an existing OGFC test section on I-55. Based on completion of proposed test section, field permeability, noise, skid, friction, texture, and NDT measurements will be made.

**Cost Estimate for FY 2010 \$51,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 26	STATE STUDY NO: 208
TOTAL STUDY BUDGET: \$275,000	TOTAL STUDY COST TO DATE: \$18,420
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 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.

**Progress:**

The researchers initiated the research project. An e-mail survey of District Materials Engineers was conducted to identify aggregate sources that could potentially be included within the research. Aggregate properties that were important in selecting appropriate materials included cleanliness and absorption. Samples of various aggregates were obtained and tested. Based upon the recommendations of the District Materials Engineers and the test results, four aggregate sources were selected. The PURWheel was re-furbished into nearly operational condition.

**Progress continued:**

**FY 2009:**

Work accomplished was in a variety of areas including working on development and calibration of laboratory equipment, literature review, identifying suitable aggregate quarries, and sampling materials from one paving project.

Arrangements commenced for testing of adhered fines and scanning electron microscope testing. Preliminary laboratory work was also performed with respect to laboratory measured properties.

**Plans for FY 2010:**

All paving projects are scheduled to be sampled prior to the end of FY-10. The majority of all laboratory testing (including scanning electron microscope testing) should be complete depending on the dates of sampling the last paving project. Essentially all field and laboratory work should be complete, the literature review is well underway, and the final report generation initiated.

**Cost Estimate for FY 2010 \$150,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 27	STATE STUDY NO: 209
TOTAL STUDY BUDGET: \$30,000	TOTAL STUDY COST TO DATE: 4,247
DATE STARTED: 10/01/07	COMPLETION DATE: 12/31/10
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<sub>3</sub>) 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.

**Progress:**

**FY 2008:**

The MDOT Central Laboratory completed all requisite lime-fly ash and soil cement mix designs for the Hwy. 63 project. A site visit was made to obtain preliminary information to develop a sampling and test specimen preparation plan for use when the contractor constructs the test and control sections.

The MDOT Materials Division reviewed the laboratory test data provided by HEADWATERS Resources regarding the SO<sub>3</sub> content and determined that the levels present are not sufficiently high to be of concern.

**FY 2009:**

Meetings were held between District 6, Research, and Materials Division personnel to discuss plans and layout for the research test section. The designed plan was put into action in July when the contractor reached the test section. The section was constructed and all soil samples were collected and compacted in the field. These samples were taken to the lab where they were cured and evaluated for strength and moisture content data.

**Plans for FY 2010:**

The results of the lab testing of the field prepared samples will be organized into a report. Using this report Materials and Research Divisions will be able to make a recommendation regarding the use of Red Hills Fly Ash as an approved product with MDOT.

**Cost Estimate for FY 2010 \$7,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 28	STATE STUDY NO: 210
TOTAL STUDY BUDGET: \$59,544	TOTAL STUDY COST TO DATE: \$4,386
DATE STARTED: 10/01/08	COMPLETION DATE: 06/30/10
STUDY TITLE:	Emergency Evacuation Study for the Greater Jackson Area (DYNASMART-P Deployment)
RESEARCH AGENCY:	Jackson State University
PRINCIPAL INVESTIGATOR:	Feng Wang

**Objective:**

The proposed research will address the possible emergency evacuation needs for the greater Jackson area of Mississippi. This research will study the feasibility of applying the new generation dynamic traffic assignment (DTA) based traffic-network planning and simulation model, DYNASMART-P, in developing and evaluating emergency evacuation strategies to assist implementation of intelligent transportation system (ITS) functionalities. These functionalities will improve emergency preparedness, mitigation, response and recovery capabilities for this area of Mississippi. This study will also enable MDOT to verify viable emergency traffic control strategies and facilitate the implementation of ITS technologies in major highway corridors in the state.

**Progress:**

**FY 2009:**

A project kick-off meeting was held for the researchers to talk with MDOT engineers who are familiar with emergency evacuation management, highway construction project, and intelligent transportation system. We inquired for the freeway network and traffic demand data from the Central Mississippi Planning & Development District (CMPDD). Using the transportation software TransCAD, the GIS dataset for three counties of Rankin, Hinds, and Madison obtained from MDOT Transportation Planning Division was converted from its original format to the format that can be used in the DynaSmart program. The highway network models for the above three counties then were established in the DynaSmart program. 24-hour traffic volume data on different highways were provided by MDOT and some other important traffic volumes were manually counted using MDOT camera video information on web. Using the "Jackson 2010 Phase Final Origin-Destination Matrix" data provided by MDOT, simulation runs on normal condition were conducted and the simulation results were compared with observed traffic flow data in order to calibrate the network model and traffic demand. Manual examinations were made according to MDOT published highway maps, information from Google Earth/Maps, and data collected in field trips in order to ensure the accuracy and validity of road networks built in the DynaSmart program. Based on assumed evacuation scenario, the classic gravity model was chosen and applied to distribute evacuation production/attraction trips on the network model by the program TransCAD in order to calculate evacuation OD demand matrix. Initial simulation results

were shown to MDOT traffic engineers and emergency evacuation experts in project meetings, and feedbacks obtained accordingly.

**Plans for FY 2010:**

Plan to achieve the simulation runs for other different evacuation scenarios. Find the most congested road segments and analyze the causes for the congestions. In response to the identified congestion causes, plan to conduct more simulations using DynaSmart to evaluate the effects of potential traffic control strategies such as lane closure, and contra-flow of traffic on emergency evacuation performance and the effects of implementation of intelligent transportation system (ITS) strategies such as by deploying dynamic message signs and vehicle detectors to provide real-time traveler information on traffic delay, queue length, and evacuation clearance time. Develop the project report.

**Cost Estimate for FY 2010 \$55,158**

MISSISSIPPI SPR-1(56)

LINE ITEM 29

STATE STUDY NO: 211

TOTAL STUDY BUDGET: \$330,000

TOTAL STUDY COST TO DATE: \$13,799

DATE STARTED: 10/01/08

COMPLETION DATE: 03/31/13

STUDY TITLE:

Laboratory Testing and Evaluation of Near Surface Properties of Flexible Pavements Due to Bituminous Surface Treatments

RESEARCH AGENCY:

Mississippi State University

PRINCIPAL INVESTIGATOR:

Isaac Howard

**Objective:**

The project will test all emulsions that at present can be delivered into Mississippi for sealing activities. The end product will be a draft performance/material acceptance specification for chip and scrub seal activities. The project will also investigate the benefits of fog seals via wheel tracking of pavement slabs treated with fog seals.

**Progress:**

**FY 2009:**

Work accomplished was primarily related to obtain slabs from pavements and subsequently to saw them into cores and other appropriate samples for testing. Vialit testing, viscosity testing, and frosted marble testing made up the majority of the testing performed. The Vialit testing made significant progress and should be completed in the relatively near future. Likewise, the majority of the viscosity testing should be complete in the relatively near future. Preliminary work related to sawing specimens for bending beam rheometer and dynamic shear rheometer testing also occurred alongside preliminary efforts to develop a long term performance test for seal treatments.

**Plans for FY 2010:**

Continue laboratory testing with the goal to have the majority of testing complete by the end of FY 2010. Some analysis related to the test data will commence during FY 2010. Near the end of FY 2010, preliminary efforts related to development of the performance specification should commence.

**Cost Estimate for FY 2010 \$125,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 30 STATE STUDY NO: 212  
TOTAL STUDY BUDGET: \$115,000 TOTAL STUDY COST TO DATE: \$24,489  
DATE STARTED: 10/01/08 COMPLETION DATE: 09/30/10  
STUDY TITLE: Utilization of RAP in Construction (Phase II –  
High RAP Surface Course)  
RESEARCH AGENCY: Mississippi State University  
PRINCIPAL INVESTIGATOR: Isaac Howard

**Objective:**

The project will focus on laboratory investigation of high RAP content warm mixed asphalt for use as an overlay material. Material characterization will be the focus of the research, and will include determination of a variety of properties needed for mix design (e.g. stiffness), as well as attempt to modify properties expected to be problematic (e.g. durability and cracking). The project will also attempt to leverage the information obtained from MDOT SS 200.

**Progress:**

**FY 2009:**

Work accomplished was primarily related to compaction and testing of 100% RAP specimens incorporating warm mixed additives. Significant amounts of bending beam rheometer specimens were also sawn from compacted gyratory samples. Slabs were produced for friction measurements and were subsequently tested with a dynamic friction tester and a circular texture meter. Data analysis related to evaluation of properties of varying RAP bituminous materials was also performed.

**Plans for FY 2010:**

Continue laboratory testing with the goal to have the majority of testing complete by the end of FY 2010. Wheel tracking samples will be fabricated and tested containing varying amounts of RAP. Analysis of data related to multiple facets of performance should be near complete by the end of FY 2010. The final report generation should begin near the end of FY 2010.

**Cost Estimate for FY 2010 \$70,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 31 STATE STUDY NO: 213  
TOTAL STUDY BUDGET: \$70,920 TOTAL STUDY COST TO DATE: \$0  
DATE STARTED: 10/01/08 COMPLETION DATE: 12/31/10  
STUDY TITLE: Performance Evaluation of Roundabouts for  
Traffic Delay and Crash Reduction in Oxford,  
MS  
RESEARCH AGENCY: University of Mississippi  
PRINCIPAL INVESTIGATOR: Waheed Uddin

**Objective:**

This study will evaluate the effectiveness of the roundabout traffic control method for improved traffic flow, reductions of traffic delays and crashes, and enhanced air quality. The project research team will collect post- roundabout traffic volume, delay, and crash data for comparison with the pre- roundabout data. Volume data will be collected during peak flow events such as home football games in the fall of 2009. The pre- and post-construction data will be analyzed using plots, trends, and statistical tests of significance. A public opinion survey on roundabouts will also be performed and included in the project. Benefit and cost analysis will be conducted and results will be presented in GIS visualization and thematic maps.

**Progress:**

**FY 2009:**

The study oversight committee members agreed to revise and expand the scope of the work after the first kick-off meeting. The revised work plan includes an opinion survey of the road users and additional traffic data collection. Review of Lamar Blvd project consultant report was initiated. A few meetings were held in the office of the City of Oxford Assistant City Engineer who provided a GIS road map file and crash data from their database files. The data is being processed by the student staff. The graduate student is implementing the newly acquired S-Paramics traffic microsimulation software that will be used in this study.

**Plans for FY 2010:**

Work on traffic data history, crash data history, and simulation software will be continued. The PI will continue review of related literature and project info. Site traffic data will be planned and collected from both roundabout sites in fall 2009 and spring 2010. An opinion survey will be planned and conducted with MDOT's review and advice to evaluate public perception of the effectiveness of these roundabouts.

**Cost Estimate for FY 2010 \$46,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 32

STATE STUDY NO: 214

TOTAL STUDY BUDGET: \$172,988

TOTAL STUDY COST TO DATE: \$0

DATE STARTED: 10/01/08

COMPLETION DATE: 03/31/11

STUDY TITLE:

MDOT Implementation Plan for GPS  
Technology in Planning, Design, and  
Construction Delivery

RESEARCH AGENCY:

The University of Southern Mississippi

PRINCIPAL INVESTIGATOR:

John Hannon

**Objective:**

Global Positioning System (GPS) technology offers advantages to transportation agencies in the planning, design and construction stages of project delivery. This research study will develop a guide for MDOT implementation of GPS technology, both internally and externally, assisting the agency in the areas of construction specifications, quality control, business policies and procedures, and cost budgeting. This study will result in the delivery of a report that includes recommendations for specification language regarding contractor use of GPS for automated machine grading and the sharing of MDOT electronic data. This report will include a suggested plan for implementation of GPS technology in the MDOT corresponding functional areas. Workshops will be delivered with the participation of MDOT personnel and construction company representatives centered on the GPS Guidance Specification and Implementation Plan to facilitate their adoption.

**Progress:**

**FY 2009:**

Work accomplished and deliverables included a topical review and collection of both published and unpublished literature regarding state of the art technological advances and similar experiences of other transportation agencies and construction contractors. Some of this literature was obtained from attendance at conferences and seminars such as the Transportation Research Board and the Earthworks Engineering Research Center. Interviews were conducted with primary role personnel of MDOT functional areas in order to map business processes for analysis. Data has also been gathered from field pilot projects. Planning for stakeholder input workshops has been initiated.

**Plans for FY 2010:**

Work planned for the next fiscal year includes conducting/implementing contractor Workshops for input, analysis of MDOT workflow processes, and input from the MDOT Technical Advisory Committee for creation of guidance specification. It is our intention to complete the project this fiscal year and invoice the agency for full amount of the project.

**Cost Estimate for FY 2010 \$172,988**

MISSISSIPPI SPR-1(56)

LINE ITEM 33 STATE STUDY NO: 215  
TOTAL STUDY BUDGET: \$50,215 TOTAL STUDY COST TO DATE: \$2,224  
DATE STARTED: 10/01/08 COMPLETION DATE: 03/30/12  
STUDY TITLE: Integrated Kudzu Control on Mississippi  
Roadsides  
RESEARCH AGENCY: United States Department of Agriculture  
PRINCIPAL INVESTIGATOR: Mark Weaver

**Objective:**

Management of invasive weed species is an ongoing challenge for land managers. Kudzu is among the 10 most common, aggressive and poorly controlled weeds in Mississippi and presently infests over 500,000 acres of private forestland within the state, resulting in annual loss of \$54 million dollars in timber sales. While various control options have been documented over the years, there are new, effective, affordable approaches that need to be integrated into a rapid and efficient land management strategy. This study will evaluate an intense, rapid, integrated kudzu eradication program at four locations in Mississippi. Use of herbicides with high selectivity and a biological control agent will allow for simultaneous re-establishment of desirable vegetation, thus providing more long-lasting kudzu exclusion.

**Progress:**

**FY 2009:**

The replicated field trials have been established near Coffeenville, MS, in the Holly Springs National Forest to control experimental evaluation of kudzu management tactics. Under evaluation at this test site are two selective, non-restricted-used herbicides; an experimental herbicide; mechanical control (mowing); biological control; and three different integrated control regimens.

Additionally, three other field locations around Mississippi are under ongoing evaluation, which include chemical, biological, mechanical and integrated control techniques. Work towards more efficient production of the biological control agent is underway, and results on improved safety of the bioherbicide were published.

**Plans for FY 2010:**

Continue experimental development of kudzu eradication strategies. An additional field site will be tested, if landowner –cooperators can be identified. The work will expand to include the concomitant establishment of desirable and suppressive vegetation on kudzu-infested sites.

**Cost Estimate for FY 2010 \$16,900**

MISSISSIPPI SPR-1(56)

LINE ITEM 34

STATE STUDY NO: 216

TOTAL STUDY BUDGET: \$72,000

TOTAL STUDY COST TO DATE: \$64,902

DATE STARTED: 10/01/08

COMPLETION DATE: 09/30/10

STUDY TITLE:

Shrinkage and Durability Study of Bridge Deck  
Concrete

RESEARCH AGENCY:

Burns, Cooley & Dennis, Inc.

PRINCIPAL INVESTIGATOR:

Robert Varner

**Objective:**

MDOT's water to cement ratio requirement for concrete bridge decks is contributing to excessive shrinkage and cracking. Burns Cooley & Dennis, Inc. (BCD) will work with the MDOT District Materials Engineer in each district to identify the most common sources of aggregates and cementitious materials used in bridge deck concrete in their respective district. BCD will conduct testing on five laboratory mixtures for each district using local materials, including a typical MDOT Class AA mixture and a mixture based on the University of Kansas study. (Note that The University of Kansas study is a pooled fund study of which MDOT is a participant, but does not consider the influence of local Mississippi materials.) BCD will use the other three mixtures to evaluate a 0.50 water to cement ratio with supplemental cementitious material. This study will provide MDOT engineers with data to write specifications that will reduce shrinkage cracking while maintaining durability for concrete in bridge decks.

**Progress:**

**FY 2009:**

All materials were sampled and laboratory mixing was completed. Fresh properties and strength data was collected for all mixtures. Shrinkage and permeability data was also periodically collected.

**Plans for FY 2010:**

Continue shrinkage measurements as required by ASTM C 157 and permeability measurements according to ASTM C 1202 until the last measurement scheduled on September 16, 2010. The data will be summarized and provided in a final report.

**Cost Estimate for FY 2010 \$7,098**

MISSISSIPPI SPR-1(56)

LINE ITEM 35 STATE STUDY NO: 217  
TOTAL STUDY BUDGET: \$225,000 TOTAL STUDY COST TO DATE: \$0  
DATE STARTED: 10/01/08 COMPLETION DATE: 03/30/12  
STUDY TITLE: Strain Resistant, Extended Performance Pavements, an Alternate to Subdrainage  
RESEARCH AGENCY: Mississippi State University  
PRINCIPAL INVESTIGATOR: Tom White

**Objective:**

Deterioration or failure of pavement layers below the surface means pavement maintenance or rehabilitation costs will increase significantly. Moisture is one medium contributing to pavement deterioration. The effect can be countered by use of subdrainage systems. However, they increase pavement costs and are exhibiting their own maintenance needs. An alternate pavement type is the perpetual or strain resistant, extended performance pavement. This type of pavement uses a high binder, moisture and strain resistant HMA at the bottom of the pavement structure. Overlying layers are rut and fatigue resistant HMA mixtures.

This study proposes construction of a strain resistant, extended performance pavement test section. Tests, including distress, FWD, smoothness and skid resistance, will be conducted on this test section on a periodic basis. Groups of in service pavements, both with and without subdrainage layers, will also be identified and evaluated for condition, structural capacity, smoothness and skid resistance. Performance of the strain resistant, extended performance pavement will be arrayed against that of the conventional pavements with and without subdrainage systems.

**Progress:**

**FY 2009:**

A Technical Advisory Committee (TAC) meeting was held and the scope of work agreed to. The proposal for scope of work and budget was submitted for review and approval. Software to be utilized in the project was obtained and installed.

**Plans for FY 2010:**

The study literature review will be initiated. Concurrently, two groups of in service candidate sites for study will be identified. One group will be pavements with conventional layers and thicknesses but without a subdrainage system. A second group of pavements with subdrainage systems will be selected. The groups of pavements will include sections of various ages. The two groups of pavements will be evaluated for structural capacity, smoothness, and condition. Performance of these two sets of pavements will be compared with that of the strain resistant, extended performance pavement test section. A candidate test section site will be selected and material samples obtained. Laboratory material tests of subgrade and pavement layer materials will be conducted.

**Cost Estimate for FY 2010 \$78,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 36	STATE STUDY NO: 218
TOTAL STUDY BUDGET: \$40,000	TOTAL STUDY COST TO DATE: \$549
DATE STARTED: 10/01/08	COMPLETION DATE: 03/30/12
STUDY TITLE:	In-House Support to State Study No. 217
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division

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PRINCIPAL INVESTIGATOR: Jordan Whittington

**Objective:**

This study will provide requisite distress, FWD, smoothness and skid resistance data of the strain resistant, extended performance pavement test section constructed for evaluation in SS No. 217. Collection of similar data will be conducted on in service pavements identified in the referenced study. This support study will also provide assistance for any forensic studies conducted on the test section.

**Progress:**

**FY 2009:**

Advisory meetings were conducted for State Study 217.

**Plans for FY 2010:**

Research Division will assist in identifying in service sites for research as well as a candidate section for the strain resistant pavement construction. Testing will be performed on the in service sections and will consist of smoothness, FWD, and pavement condition evaluation.

**Cost Estimate for FY 2010 \$17,380**

MISSISSIPPI SPR-1(56)

LINE ITEM 37	STATE STUDY NO: 219
TOTAL STUDY BUDGET: \$290,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/08	COMPLETION DATE: 03/30/12
STUDY TITLE:	Development of a Method for Estimating Lateral Earth Pressures for Retaining Structures Sited in Expansive Clay Deposits
RESEARCH AGENCY:	Mississippi State University
PRINCIPAL INVESTIGATOR:	Chris Saucier Miriam Smith

**Objective:**

A high degree of uncertainty exists for the prediction of lateral earth pressures applied to earth retention structures sited in the swelling clay deposits which exist throughout Mississippi. Current procedures for estimating these pressures are known to include some conservatism, by necessity. In consideration of the high degree of uncertainty in earth pressure estimates and the high costs of design inefficiencies, this research seeks to reduce these inefficiencies via the development of a rational procedure for evaluating stress states which may exist throughout the life of the retaining structure. This will be achieved through the introduction of soil suction measurements to conventional geotechnical analyses. The results of this research program would be subjected to prediction and validation in a field monitoring program involving a constructed retaining wall in an expansive clay deposit.

**Progress:**

**FY 2009:**

No work performed because study postponed until FY 10.

**Plans for FY 2010:**

No work planned as study again postponed to FY 11.

**Cost Estimate for FY 2010 \$0**

MISSISSIPPI SPR-1(56)

LINE ITEM 38 STATE STUDY NO: 220  
TOTAL STUDY BUDGET: \$25,862 TOTAL STUDY COST TO DATE: \$9,544  
DATE STARTED: 10/01/08 COMPLETION DATE: 03/30/10  
STUDY TITLE: Framework of Calculating the Measures of Resilience (MOR) for Intermodal Transportation Systems

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RESEARCH AGENCY: Mississippi State University  
PRINCIPAL INVESTIGATOR: Li Zhang

**Objective:**

The main objective of this research is to develop a framework of calculating the Measures of Resilience (MORs) for intermodal transportation systems. This is to be accomplished by defining the MORs of intermodal transportation systems, propose a framework to calculate the proposed MORs, case study of MORs in the recovery of Mississippi Gulf Coast after Hurricane Katrina, and demonstrating the enhancement strategies of the MORs.

**Progress:**

**FY 2009:**

The award was officially approved by MDOT on March 23, 2009. Actual work started last year since this is a co-founded project: the funding from NCIT/US DOT was received since the last summer. An undergraduate student was hired for the summer from MDOT funding. A survey of major ports along the Mississippi Gulf Coast for freight statistics according to Task 4 was completed; Survey to the major transportation modes will be conducted to collect data of operation level change before/after Hurricane Katrina. Many communications with CSX railroad have been conducted, and the information from CSX is still pending. Field measurements were taken along Hwy 49 in Gulfport to obtain a truck flow estimate and highway status after Katrina. The base year (2002) population and employment data for each Traffic Analysis Zone located in the three counties of Gulf Coast was collected. The target years (2005 and 2006) population and employment data has been generated according to the base year data and inputted into the TransCAD model. The intermodal OD flow among TAZs is estimated by running the TransCAD forecast model. Detailed methods of calculating the travel time and Level of Service for the study area have been developed. Task 1, Task 2, Task 3, and Task 6 of the project report has been finished.

**Plans for FY 2010:**

The project team plans to finish the project within this year, ahead of the schedule and the final report will be delivered at that time. Also, the diversion strategies dealing with the infrastructure damage by the companies within Gulf Coast will be studied and measures of resilience calculation and results analysis conducted.

**Cost Estimate for FY 2010 \$16,318**

MISSISSIPPI SPR-1(56)

LINE ITEM 39	STATE STUDY NO: 221
TOTAL STUDY BUDGET: \$120,422	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/09	COMPLETION DATE: 12/31/11
STUDY TITLE:	Evaluation of MDOT's Distress Thresholds for Maintained Pavement Projects
RESEARCH AGENCY:	Jackson State University
PRINCIPAL INVESTIGATOR:	Feng Wang

**Objective:**

Establishing warranty criteria and associated distress thresholds to monitor the performance of warranted pavements (maintained projects) is a very important issue that must be resolved. Currently MDOT uses converted deduct points for pavement distresses and the distress thresholds are accumulated deduct points, while many other states use distress indicators and thresholds directly from measurements of pavement distresses or density of distresses. This research will evaluate the effectiveness of using the current MDOT's distress thresholds and investigate new ways of quantifying distress thresholds to monitor the performance of the maintained projects in Mississippi. Through a literature search and a survey study of other states, specifications on performance indicators and associated thresholds used in other states or recommended by expert opinions are reviewed and compared with the practice in MDOT. The validity of using the current MDOT's distress thresholds and any possible adjustment or replacement option will be checked with the performance data saved in MDOT's pavement management system (PMS). Analytical capabilities based on statistical analysis and regression modeling over the PMS performance data will be developed to establish warranty specifications on distress thresholds. Based on the investigation, the research will make suggestions for MDOT to adopt possible new features of the warranty specifications on distress thresholds and how the MDOT PMS database can be used to monitor the performance of maintained projects in the state of Mississippi.

**Cost Estimate for FY 2010 \$60,211**

MISSISSIPPI SPR-1(56)

LINE ITEM 40	STATE STUDY NO: 222
TOTAL STUDY BUDGET: \$131,217	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/09	COMPLETION DATE: 06/30/11
STUDY TITLE:	Best Practices of MDOT's Survey Operation, Organization & Technology Implementation
RESEARCH AGENCY:	The University of Southern Mississippi
PRINCIPAL INVESTIGATORS:	Tulio Sulbaran Andrew Strelzoff

**Objective:**

The objective of this project is to increase the cost efficiency, timeliness and safety of MDOT surveying activities through the identification of MDOT best practices grounded on: (1) Best operational approach to use a range of surveying technologies, (2) Most effective organizational model/process to best utilize the newest surveying technologies; and (3) Best roll-out strategy which will help MDOT districts move to the most efficient surveying technology.

The result of this project will form a body of knowledge which will be used by policy makers to increase the use of cost and time effective technologies for surveying throughout MDOT.

**Cost Estimate for FY 2010 \$91,197**

MISSISSIPPI SPR-1(56)

LINE ITEM 41	STATE STUDY NO: 223
TOTAL STUDY BUDGET: \$152,810	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/09	COMPLETION DATE: 12/31/11
STUDY TITLE:	I55 Integrated Diversion Traffic Management Benefit Study
RESEARCH AGENCY:	Mississippi State University
PRINCIPAL INVESTIGATOR:	Li Zhang

**Objective:**

Integrating diversion traffic from a congested freeway with traffic signal timing on parallel arterials could take advantage the capacities of freeway and arterials and that therefore forms an Integrated Corridor Management strategy. The objective of the project is to evaluate the benefits of freeway congestion relief by utilizing corridor-wide capacity in I-55 corridor. Possible strategies of a state of the practice approach and a state of the art approach are proposed and implemented first. Those strategies are evaluated in a calibrated simulation environment. The state of the practice approach would provide MDOT policy makers the information about the benefits that might be achieved under existing infrastructure while the state of the art approach would provide MDOT policy makers the information about the best possible benefits that can be achieved under ICM approach.

**Cost Estimate for FY 2010 \$74,699**

MISSISSIPPI SPR-1(56)

LINE ITEM 42	STATE STUDY NO: 224
TOTAL STUDY BUDGET: \$30,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/09	COMPLETION DATE: 06/30/10
STUDY TITLE:	Summary of Lessons Learned From the MDOT MEPDG Materials Library Study
RESEARCH AGENCY:	Burns, Cooley & Dennis, Inc.
PRINCIPAL INVESTIGATOR:	Randy Ahlrich

**Objective:**

Burns Cooley Dennis, Inc. (BCD) has recently completed the testing of 34 subgrade soils, 13 granular base/subbase materials and 16 stabilized soils for the pavement materials library that will be used in the implementation of the Mechanistic Empirical Pavement Design Guide (MEPDG) in Mississippi. This information was submitted to Applied Research Associates for use in MDOT State Study 170, "Implement the 2002 Design Guide for MDOT." Valuable practical experience was gained and observations were made during the testing and brief review of the data. Currently there is no mechanism to document these observations. This work program will capture the experience gained as well as record any recommendations that BCD can make regarding the completed testing.

**Cost Estimate for FY 2010 \$30,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 43 STATE STUDY NO: 225  
TOTAL STUDY BUDGET: \$99,999 TOTAL STUDY COST TO DATE: \$0  
DATE STARTED: 10/01/09 COMPLETION DATE: 12/31/10  
STUDY TITLE: Turbidity Monitoring at Select Construction Sites  
RESEARCH AGENCY: Thompson Engineering  
PRINCIPAL INVESTIGATOR: Bobby Moseley

**Objective:**

MDOT has no real-world data on effects of construction on turbidity levels in run-off from construction projects, and the EPA may soon be promulgating a Final Rule establishing numeric turbidity limitations. The goal of this research project is to establish baseline turbidity conditions at select construction sites by establishing a water quality monitoring program and documenting existing and MDOT approved BMPs. The water quality monitoring program will be primarily focused on gathering turbidity data, but because turbidity is related to other factors, may include parameters such as total suspended solids, pH, and temperature. Data, following initial site selection and site visits with MDOT, will be collected using MDEQ and EPA protocols as guidance. Because of the complex factors which affect turbidity, this may be the first phase of a multiphase project.

**Cost Estimate for FY 2010 \$99,999**

MISSISSIPPI SPR-1(56)

LINE ITEM 44	STATE STUDY NO: 226
TOTAL STUDY BUDGET: \$99,999	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/09	COMPLETION DATE: 12/31/10
STUDY TITLE:	Environmental Management Plan Development for MDOT Laboratories
RESEARCH AGENCY:	Thompson Engineering
PRINCIPAL INVESTIGATOR:	Bobby Moseley

**Objective:**

Maintaining compliance with environmental regulations, environmental permits and handling and disposal of waste materials is growing increasingly complicated. The establishment of a fully functioning Environmental Management Plan will serve as the framework for setting, reviewing and maintaining environmental objectives and targets throughout MDOT Laboratories. An Environmental Management Plan will ultimately maintain environmental policy and develop the procedures to achieve the goals and targets of various Plans within MDOT Laboratories.

The development of the Environmental Management Plan will be achieved through audits, inspections, and document development. The Environmental Management Plan will be maintained by routine inspections, review of procedures and documents, and implementation of corrective or preventative actions.

**Cost Estimate for FY 2010 \$80,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 45	STATE STUDY NO: 227
TOTAL STUDY BUDGET: \$80,000	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/09	COMPLETION DATE: 12/31/10
STUDY TITLE:	Variability of Cement Treated Layers in MDOT Road Projects
RESEARCH AGENCY:	Burns, Cooley & Dennis, Inc.
PRINCIPAL INVESTIGATOR:	Robert Varner

**Objective:**

MDOT does not currently require QC/QA testing for subgrade and subbase stabilization. MDOT specifications have recently been revised to reduce the cement content in cement treated layers. However, little or no field investigations have been performed to determine the impact of this change on the in-place layer. Burns Cooley Dennis, Inc. will work with MDOT to identify two projects that have utilized cement treated subbase layers and will perform tests to determine variability. Cores of cement treated subbase will be extracted and evaluated for cement content (ASTM D 806), thickness, and compressive strength (ASTM D1633).

**Cost Estimate for FY 2010 \$80,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 46 STATE STUDY NO: 228  
TOTAL STUDY BUDGET: \$135,045 TOTAL STUDY COST TO DATE: \$0  
DATE STARTED: 10/01/09 COMPLETION DATE: 12/31/12  
STUDY TITLE: Evaluating Alternative Mowing Regimen and  
the use of Native Grasses and Wildflowers on  
Roadside Right of Ways

RESEARCH AGENCY: Mississippi State University

PRINCIPAL INVESTIGATOR: John Guyton  
Jeanne Jones

**Objective:**

This three year project will determine if a limited mowing regimen is sufficient to make ROW maintenance more cost effective while increasing the beauty of Mississippi's ROWs. It will also identify additional propagules that may be useful in expediting the transition to natural ROWs and ascertaining motorist patience with the transition and perception of a more natural ROW.

This project will begin to showcase some of the following benefits:

- Reduce vegetation expenditures by an average of over \$10-\$20 on the acres not mowed,
- Slow the rate of spread of invasive plants which require bare soil and disturbance for spreading along road ROW,
- Obscure visibility of roadside litter and trash,
- Increase roadside beauty due to occurrence of wildflowers, native bunch grasses and native pollinators (butterflies and hummingbirds),
- Increase food plants for wildlife species of old fields, prairies and meadows and
- Provide nesting habitat for wild turkey, rabbits and other ground-nesting birds and small mammals while discouraging deer.

**Cost Estimate for FY 2010 \$49,359**

MISSISSIPPI SPR-1(56)

LINE ITEM 47 STATE STUDY NO: 229  
TOTAL STUDY BUDGET: \$150,000 TOTAL STUDY COST TO DATE: \$0  
DATE STARTED: 10/01/09 COMPLETION DATE: 12/31/11  
STUDY TITLE: Instrumentation & Computational Modeling for  
Evaluation of Bridge Substructures across  
Waterways

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RESEARCH AGENCY: Jackson State University

PRINCIPAL INVESTIGATOR: Wei Zheng

**Objective:**

The bridge substructures across waterway in Mississippi are frequently subject to scour due to flood currency and collision from barge or ship. Scour is major cause of bridge failure from floods in Mississippi. This research project seeks to investigate the instrumentation and computational modeling that can monitor scour and pier damage and correlate substructure deteriorations with the remainder of bridge's capacity. It will supplement current underwater inspection of bridge substructures with more reliable measurement-and-analysis-based approaches. It also provides wireless instrumentation platform for future MDOT research to monitor other critical components of transportation systems. It will lay down foundation for professional preparation and multidisciplinary collaboration to implement field instrumentation for bridge substructure system.

**Cost Estimate for FY 2010 \$69,750**

MISSISSIPPI SPR-1(56)

LINE ITEM 48

STATE STUDY NO: 230

TOTAL STUDY BUDGET: \$93,000

TOTAL STUDY COST TO DATE: \$0

DATE STARTED: 10/01/09

COMPLETION DATE: 06/31/11

STUDY TITLE:

Identification of Botanical Reference Sites on Mississippi Highways to Serve as Models for Future Management of Green Corridors

RESEARCH AGENCY:

Engineer Research and Development Center

PRINCIPAL INVESTIGATOR:

Pamela Bailey

**Objective:**

Highway corridors are routes for invasive species movement. Once established, invasive species are very costly to remove. Managing native plant communities not only aids in minimizing invasive plant species, but can also reduce maintenance costs such as mowing, reduce the use of chemical sprays, control erosion, provide soil retention capability, provide a beautiful landscape along roadways, and provide habitat for pollinators. This proposal seeks identify existing plant communities found in the highway corridors to be established as reference sites to guide MDOT in future maintenance efforts.

**Cost Estimate for FY 2010 \$69,750**

MISSISSIPPI SPR-1(56)

LINE ITEM 49	STATE STUDY NO: 231
TOTAL STUDY BUDGET: \$97,500	TOTAL STUDY COST TO DATE: \$0
DATE STARTED: 10/01/09	COMPLETION DATE: 06/30/11
STUDY TITLE:	Optimizing Mississippi Aggregates for Concrete Bridge Decks
RESEARCH AGENCY:	Burns, Cooley & Dennis, Inc.
PRINCIPAL INVESTIGATOR:	Robert Varner

**Objective:**

A class BD concrete has been recently added to MDOT's classes of concrete in an effort to reduce the amount of shrinkage cracks in bridge decks. A primary focus of the BD class concrete is to optimize aggregate gradations to reduce voids in the concrete mixture matrix and reduce cement paste that is required to fill the voids. Limits have been included in the BD class concrete based on combined gradations. These limits will require possible blending of aggregates, crushing, and modifications to ready mix concrete plants. Little or no data has been generated using Mississippi aggregates that confirm that gradation limits included in the BD class concrete specifications provide concrete mixtures that exhibit less shrinkage and cracking.

Burns Cooley Dennis, Inc., will work with the department to identify one sand and gravel source of local aggregates for this research project. The aggregates will be processed and stockpiles will be create for the 1", 3/4", 1/2", 3/8", No. 4, No. 8, No. 16, No. 30, No. 50, and No. 100 sizes. These stockpiles will then be used to meet combined gradation requirements listed in the BD class concrete specification. Concrete mixtures will be developed to follow the contour of the middle and upper and lower limits of the combined aggregate gradation. An additional forty-two concrete mixtures will be developed to evaluate extending the limits of the BD gradation and to determine the impact on shrinkage and strength. Unit weight and voids will also be determined for each combination of aggregates used in the mixtures. Data collected from these forty-five mixtures will be used to develop combined gradation limits for Mississippi aggregates. Each mixture will be tested for slump, temperature, air, unit weight, strength, and shrinkage (ASTM C 157).

**Cost Estimate for FY 2010 \$80,000**

MISSISSIPPI SPR-1(56)

LINE ITEM 50	STATE STUDY NO: N/A
TOTAL STUDY BUDGET: \$25,000	TOTAL STUDY COST TO DATE: N/A
DATE STARTED: 10/01/09	COMPLETION DATE: 09/30/10
STUDY TITLE:	Minor Research Studies
RESEARCH AGENCY:	Mississippi Department of Transportation Research Division

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PRINCIPAL INVESTIGATOR: James C. Watkins

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.

Additionally, support for national efforts coordinated by organizations such as AASHTO, will be funded by this line item.

**Cost Estimate for FY 2010**     \$25,000

MISSISSIPPI SPR-1(56)

**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).

**Cost Estimate for FY 2010 SPR Part II Funds: \$109,056**

MISSISSIPPI SPR-1(56)

**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 2010 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 2010 SPR Part II Funds: \$27,534**

## POOLED FUND STUDIES

### Pooled Fund Study: ***Auburn University Accelerated Pavement Test Facility - Round 4***

Host Agency - Alabama Department of Transportation

The objective of this pooled-fund study is to construct, operate, and analyze the data from Mississippi's sections on the NCAT test track. One of MDOT's existing sections from previous rounds at the track will continue to be trafficked, and a new section will be constructed to replace MDOT's other previous section. The mix design for the new section will explore the possibility of incorporating the maximum amount of recycled asphalt pavement (RAP). Round 4 at the test track 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 is 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 fourth round of test section construction, trafficking and analysis. This commitment will be for fiscal years 2009 through 2011 in the following amounts:

FY 2009 - \$175,000      FY 2010 - \$175,000      FY 2011 - \$175,000

### 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. Sponsoring agent extended the study and MDOT will contribute an additional \$10,000 for FY 2010.

FY 2006 - \$30,000    FY 2007 - \$30,000    FY 2008 - \$30,000    FY 2010 - \$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: *Subsurface Drainage for Landslide and Slope Stabilization***

Host Agency – Washington State Department of Transportation

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

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

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

Host Agency – Minnesota Department of Transportation

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

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

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](http://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 - \$20,000 FY 2010 - \$20,000

Pooled Fund Study: **AASHTO 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. Since MDOT began participating in this project late, Our FY 2009 contribution will go toward the newly formed “Support to SafetyAnalyst” pooled fund TPF-5(182).

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 approximately \$1,000,000.

MDOT originally funded participation in this project in the FY 2008 Research Work Program with a onetime payment of \$15,000. Subsequent to this initial payment, the project study performed some additional work directly for MDOT in its efforts to improve and enhance library services; therefore, MDOT provided an additional \$15,000 during FY 2009. This additional work continues into FY 2010.

FY 2008 - \$15,000 FY 2009 - \$15,000 FY 2010 - \$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. Not enough partner states have been obtained to date; therefore, MDOT has been unable to commit funding to this project. Previously approved funds will be shifted from FY08-10 to FY09-11 in the event requisite partners are obtained.

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

Pooled Fund Study: ***Southeast Transportation Research Consortium***

Host Agency – Louisiana Department of Transportation & Development

The RAC Region II is developing a collaborative research program through the Transportation Pooled Fund (TPF) Program. The research program is called the Southeast Transportation Consortium and is intended to encourage coordination among member states and provide resources and management of collaborative studies. The consortium intends to address high priority transportation research topics of common interest to the RAC II Region states and for which expertise exists within the region.

FY 2009 - \$5,000 FY 2010 - \$5,000 FY 2011 - \$5,000

Pooled Fund Study: ***Analytical Review of Child Mobility Assessments for School Site Programs***

Host Agency – Washington State Department of Transportation

Thirty years ago, nearly 90% of children who lived within a mile of school used active transportation (i.e., walking or bicycling) as their primary mode of travel. In recent years, the rate of active transport to schools has declined dramatically. Increasing numbers of children being driven to schools by their caretakers has contributed to worsening traffic congestion and increases in obesity and respiratory diseases related to poor air quality.

Consensus is developing across the nation to reverse these trends by allowing children to walk and bike to and from school. This project will serve the development of programs to help prioritize and select safety enhancement projects around schools.

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

Pooled Fund Study: **Concrete Pavement Road Map Operational Support**

Host Agency – FHWA

In March 2005, Iowa State University completed work under a cooperative agreement with FHWA to develop a Long-Term Plan for Concrete Pavement Research and Technology. A comprehensive, strategic plan, called the CP Road Map, was created with the full backing and participation of the concrete pavement industry, State DOTs, FHWA, and academia. In that sense, it is the concrete pavement community's research plan.

The CP Road Map is strategic in that it guides the investment of concrete pavement research dollars toward the development of specific technologies and systems identified by stakeholders as critical for accomplishing customer-driven goals. It is comprehensive in that it helps the concrete pavement community meet today's paving needs and tomorrow's pavement challenges.

Composed of integrated research tracks, with more than 250 research problem statements, the CP Road Map is not a funded program. Instead, it provides a collaborative management structure for existing local, State, and national concrete pavement research programs to focus their investments (about \$300 million over 10 years) on stakeholder-identified priorities.

FY 2009 - \$25,000

Pooled Fund Study: **Extension of TPF-5(039) FWD Calibration Center & Operational Improvements**

Host Agency – FHWA

The objectives of this study are to minimize the variability in pavement deflection data obtained with FWD and to develop and implement long-term plans for FWD calibrations. This study will be conducted in two phases. The first phase would include numerous tasks that would provide an assessment of State highway agency and other FWD owner needs, including a long-term strategy, improved QC/QA techniques for FWD operation, and appropriate training. The second phase would be to implement recommendations from the first phase. Phase I estimated cost is \$175,000 and Phase II estimated cost is \$850,000. MDOT will contribute a total of \$60,000 during the fiscal years 2003 through 2005.

During FY 09 the FHWA called for one final contribution to this pooled fund study to support the work items under the final year (FY2009 Task Order). This work is needed to achieve the primary Phase II objective of the study, which is to assure long term calibration center support through a smooth transition of responsibility from the pooled fund study to the AASHTO Materials Reference Laboratory. Study is being extended into FY 2010 and MDOT will contribute an additional \$10,000 for FY 2010.

FY 2003 - \$20,000    FY 2004 - \$20,000    FY 2005 - \$20,000    FY 2010 – \$10,000

Pooled Fund Study: ***Accommodating Oversize/Overweight Vehicles at Roundabouts***

Host Agency – Kansas Department of Transportation

The objectives of this study are to: 1. Compile current practice and research by various states and countries related to the effects that oversize/overweight vehicles (also called super loads) have on roundabout location, design and accommodation, and 2. Fill in information gaps with respect to roundabout design and operations for these classes of vehicles. Total funding required is \$200,000. MDOT will contribute a total of \$30,000.

FY 2010 - \$15,000 FY 2011 - \$15,000

Pooled Fund Study: ***DARWin-ME Cooperative Software Development***

Host Agency – AASHTO

AASHTO is soliciting its member agencies to participate in a project to develop the next generation of pavement design software based on mechanistic-empirical methods as part of the AASHTOWare Cooperative Software Development Program. The NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide (MEPDG) study produced research grade software to design pavements. The proposed project will transform this research grade software into a production grade pavement design software tool, DARWin-ME, for use by practicing pavement design engineers.

For production use the existing research grade software requires enhancements such as improvement in software execution speed, optimization of HMA layer thickness and a redesigned graphic user interface (GUI). While consideration of future program functionality, such as SI units and agency design libraries, were included in the original GUI design, they were not completely implemented or tested due to other project expediencies and uncertainty of the final form and function of the numerical engines. Additional features such as a database storage system and agency parameter validation were not considered or planned for in the original software GUI design. Therefore, the GUI will be redesigned to enhance existing functionality and add new functionality, including agency defined data libraries, input for hot mix asphalt (HMA) dynamic modulus calculation, the ability to import FWD backcalculation results, provide input validation checks and improve batch mode functionality. The total cost for this study is \$1,800,000.

FY 2009 - \$50,000 FY 2010 - \$50,000

100% State Funded Research for FY 10

LINE ITEM N/A STATE STUDY NO. 146  
TOTAL STUDY BUDGET: \$220,000 TOTAL COST TO DATE: \$80,000 SP&R  
\$140,000 Non-SP&R  
\$220,000 Total

DATE STARTED: 10/01/00 COMPLETION DATE: 09/30/10

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 10-year project will begin October 1, 2000, and will end September 30, 2010. The total estimated cost of the project is \$440,000 distributed over ten Federal Fiscal years (October 1 to September 30) as follows:

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>Total</u>
MDOT	\$20,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$20,000	\$220,000
USGS	<u>\$20,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$20,000</u>	<u>\$220,000</u>
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.**

Due to delays of completing the 10-meter DEMs for the State and the dependence of the basin characterization and regional analyses on these DEMs, the study was not completed by September 30, 2008. The principal investigator requests a no-cost time extension with completion of the study anticipated in the spring to early summer of 2009. During FY 09 the principal investigator requested an additional no-cost time extension with completion of the study anticipated in the spring to early summer of 2010.

**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 2010**     \$0 (Non-SP&R funds)