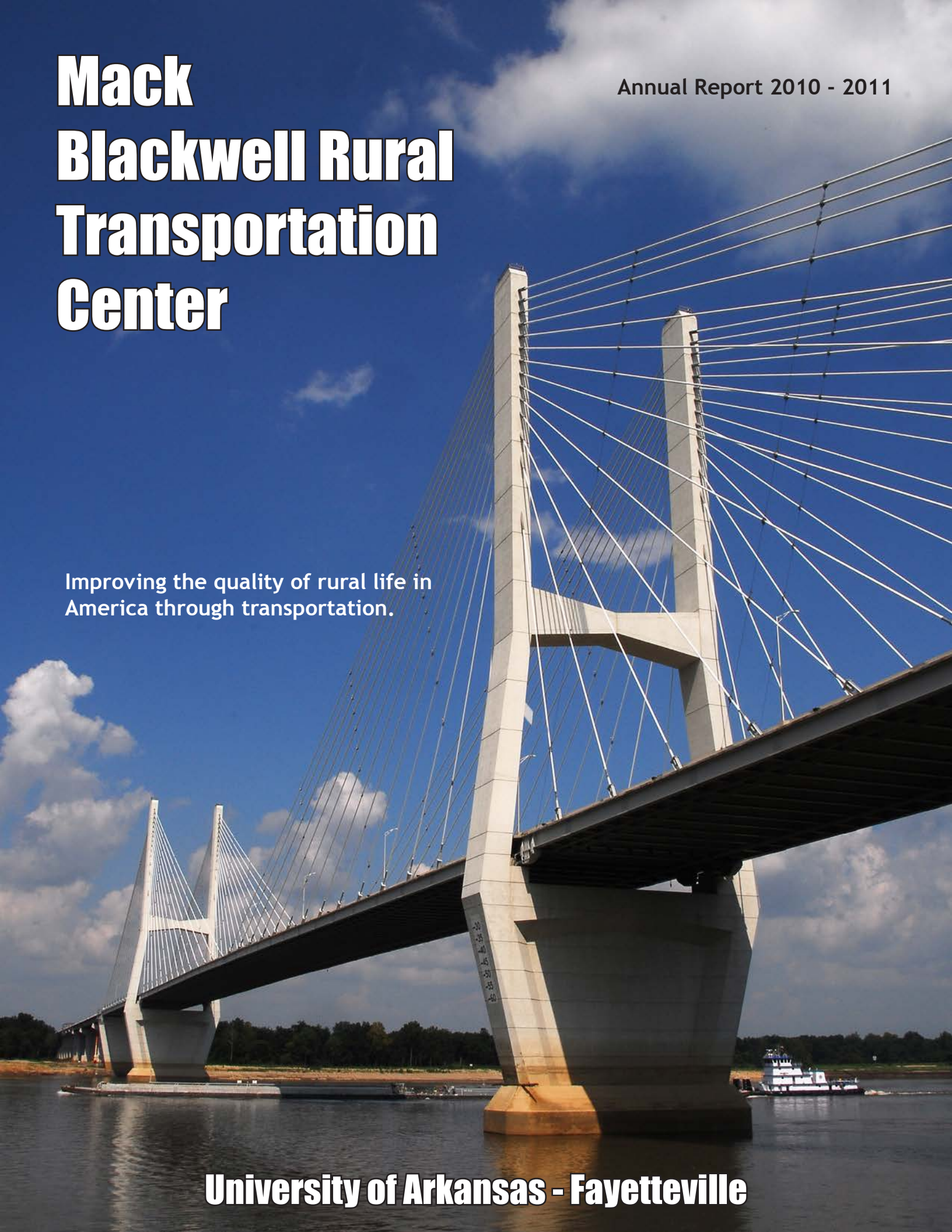
2010

Annual Report, 2009-2010

Mack-Blackwell National Rural Transportation Study Center (U.S.)

Mack Blackwell Rural Transportation Center

Annual Report 2010 - 2011



Improving the quality of rural life in America through transportation.

University of Arkansas - Fayetteville

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Front and back cover photographs are of the Greenville Bridge.

With a main span more than a quarter of a mile long, two concrete towers soaring 400 feet above the Mississippi River and four great fans of steel cable stays, the new US Highway 82 bridge in Chicot County, Arkansas, is one of the largest cable stayed bridges in the world today.

Photos courtesy of Arkansas State Highway and Transportation Department (AHTD)

Message from the Director

We have Dana, Kevin, and the Arkansas State Highway and Transportation Department (AHTD) to thank for this year's cover. The new Greenville Bridge is a breathtaking sight that embodies the "art of engineering." I spent my childhood crossing the many bridges of Pittsburgh, Pennsylvania and thought only of their beauty. I did not fully appreciate the science behind these engineering feats until I began working in the transportation field. We tend to take our nation's transportation system for granted when the system is working at its best. As transportation professionals, we should promote future investments into transportation infrastructure and research as being essential to the quality of life across America and the world.

The Mack-Blackwell Rural Transportation Center (MBTC) is proud to feature three of our many remarkable faculty researchers. In addition to their research impacts, these faculty from our industrial, civil and chemical engineering departments have made significant contributions towards educating future transportation engineers. This year MBTC student researchers completed theses and dissertations, won departmental, college and national research awards, and secured jobs throughout the transportation industry. The value of the USDOT UTC program on recruiting and technically training the next generation transportation workforce cannot be overstated.

MBTC was honored to host Mr. Chris Wilbourn, Senior Project Manager and Project Engineer of Garver Engineers; Mr. Richard Grenville, Director of Logistics and Business Development at the Tulsa Port of Catoosa; and Dr. Karen Dixon, Associate Professor at Oregon State University, as Distinguished Lecturers this year. We are always so impressed with the creative and innovative research efforts and technology solutions contributed by our peer institutions.

I would like to take this opportunity to publically thank Mr. Dan Flowers, AHTD Director, for his strong and sustained support of our Center. Mr. Flowers has announced his pending retirement effective September 21, 2011. His career at AHTD began in 1969, and he is the longest serving director of any state transportation agency in the country. Mr. Flower's support, guidance, and wisdom helped build MBTC and directly contributed to the success of our research, education and workforce development efforts.

Our team at MBTC wishes all UTC programs across the country a smooth and productive transition in the upcoming year. We greatly appreciate the ongoing support of our Advisory Board members and from Curt, Lydia, and the rest of the RITA team.

Heather Nachtmann

Director,
Mack-Blackwell Transportation Center

Featured MBTC Researchers

Principal and co-principal investigators are the backbone of the Mack-Blackwell Rural Transportation Center. MBTC has sponsored more than 200 research projects at 14 universities in 9 states over the past 20 years. Our researchers include engineers, economists, political scientists, landscape architects, and logistics specialists. These are the profiles of just a few of the faculty who make MBTC's program a success!

Justin R. Chimka, Ph.D.
University of Arkansas
Ph.D., Industrial Engineering, University of Pittsburgh
M.S., Industrial Engineering, University of Pittsburgh
B.S., Industrial Engineering, University of Pittsburgh

Dr. Justin R. Chimka is an associate professor in the Department of Industrial Engineering at the University of Arkansas. Justin teaches courses in applied statistics and production. He has received research funding from the Arkansas Biosciences Institute and the National Science Foundation in addition to funds through the Mack-Blackwell Rural Transportation Center (MBTC).

MBTC DHS 1105, "Information Enhancement Among Aviation Security Partners," began as an exploratory project focused on general aviation (GA) for the National Transportation Security Center of Excellence (NTSCOE), and was later extended to include multimodal research into border-crossing activity. Justin's work for the MBTC / NTSCOE sought to understand with statistics the usual activity associated with GA and border-crossing activity, and show how monitors of it could be used to detect unusual activity which might be attributed to a security threat. A manuscript based upon the GA work is being revised for publication by the FAA Academy in its International Journal of Applied Aviation Studies.

"I am very thankful for MBTC support to work in the important context of transportation security. My coauthor on the general aviation paper Ryan Black worked as an undergraduate assistant on the GA and border security project. Based on that work he will have an Honors College thesis that is also published in an international journal. Last year the Industrial Engineering faculty recognized Ryan with its Undergraduate Research Award, and now he is a graduate student working on another Mack-Blackwell project, Supporting Secure and Resilient Inland Waterways (MBTC DHS 1110). This goes to show how Mack-Blackwell is an invaluable part of research and education programs at the University of Arkansas."

Clarksville Bridge, Highway 109 - Photo courtesy of AHTD

Dr. W. Micah Hale is an Associate Professor in the Department of Civil Engineering and has been with the University of Arkansas since 2002. Micah's research interests include high performance concrete, self-consolidating concrete and bond behavior of prestressing strand. His MBTC research has been related to concrete durability, self-consolidating concrete bridge girders, development of a soft ground arrestor system, and ultra-high performance concrete.

Micah's current DOT project investigates the bond of prestressing strands in lightweight self-consolidating concrete (LWSCC). The use of this is growing in the precast/prestressed concrete industry but there is little guidance from industry regarding the design and analysis of LWSCC members. MBTC DOT 3021, "Performance of Prestressed Girders Cast with Lightweight Self-Consolidating Concrete," is investigating the bond of precast/prestressed LWSCC beams. His team will batch and cast beams and take cross-sections of the beams for testing.

W. Micah Hale, Ph.D., P.E.
University of Arkansas
Ph.D., Civil Engineering, University of Oklahoma
M.S., Civil Engineering, University of Oklahoma
B.S., Civil Engineering, University of Oklahoma

Micah excels in teaching, as well as research, and was selected as the 2010 recipient of the Charles and Nadine Baum Faculty Teaching Award. This is the university's most prestigious teaching award.

"I am thankful for the support that Mack-Blackwell has shown my students and me. With MBTC's support, we have been able to help the Federal Highway Administration and the bridge community better understand and estimate strand bond in a variety of concrete types. Equally important, MBTC plays a vital role in educating students at the University of Arkansas. Through MBTC research projects, both undergraduate and graduate students have had the opportunity to participate and learn through research experiences."

Dr. Jamie A. Hestekin is an Associate Professor in the Ralph E. Martin Department of Chemical Engineering and has been with the University of Arkansas since 2006. Jamie's research can be broken into two areas. The first area focuses on charged separations, mainly using wafer enhanced electrodeionization, and applications of these charged separations. The second area focuses on the extraction of oils and carbohydrates from algae and their ultimate production into both biodiesel and butanol.

One of Jamies's focus areas is highlighted in a recently completed project, MBTC DOT 3018, "The Production of Butanol Fuel from Renewable Systems Using a Membrane Assisted Fermentation System," whick investigated the use of feedstock (algae) as a new raw material for transportation fuel. Algae grown in a native algal raceway system can be used to remove pollutants from water, as well as making biofuels. The research sought to transform native algae strains, grown to clean contaminated water, into butanol, and resulted in the development and validation of a multi-step processing procedure.

Jamie A. Hestekin, Ph.D.
University of Arkansas
Ph.D., Chemical Engineering, University of Kentucky
B.S., Chemical Engineering, University of Minnesota, Duluth

Jamie was also recently voted Planet Forward's "Innovator of the Year" for his research that involved designing and building a device that can convert algae direction into butanol. Jamie's team was the online favorite and became one of the seven finalists featured in a PBS TV special before being selected as Innovators of the Year. Planet Forward will follow the development their project for a year and report on how they confront challenges and overcome obstacles.

"Mack Blackwell gave us a chance to do cutting edge biofuel research when others said it was too early," stated Jamie. "The faith they showed in us allowed us to be incredibly successful and leverage the work into other projects. We look forward to partnering again in the future."

Distinguished Lecture Series

The 2010-2011 Distinguished Lecture Series started with our annual civil engineering career orientation program, **"Evening with the Pros,"** sponsored by MBTC and the Arkansas State Highway and Transportation Department (AHTD) on September 30, 2010.

Our emcee for this year was Bob Walters, AHTD Chief Engineer (retired), who did a wonderful job introducing our speakers and keeping everyone on time. The featured speakers for the evening were Bert Parks, Garver Engineering; Scott Bennett with AHTD; Marcus Hopkins, AFCO Steel and a recent graduate; and Larry Weir, Hawkins-Weir Engineers and adjunct professor in civil engineering. All of these professionals gave a great overview of workplace issues such as working in a large organization, how to progress in your career, mentoring, why licensure is important, and other issues to anticipate when entering the workforce.

Our second lecture was held on November 18, 2010, and **Mr. Chris Wilbourn**, Senior Project Manager and Project Engineer of Garver Engineers, spoke on the rebuilding and repair of the War Eagle River Bridge. The bridge was built in 1907, prior to the creation of the AHTD, by the Illinois Steel Bridge Company located in Jacksonville, Illinois at an original cost of $4,930. It is the only Parker Truss bridge in northwest Arkansas and one of only seventeen steel truss bridges in the state. The bridge was originally built on a solid timber platform. When this was completed, in September 2010, the platform was removed. Mr. Wilbourn compared it to a giant erector set.

Photo courtesy of Chris Wilbourn


Photo courtesy of Chris Wilbourn

AHTD inspected the bridge several years ago and determined it needed to be replaced; this was a problem because the bridge is a historical landmark. The goals of the rehabilitation project were to do an independent inspection, increase the load capacity of the bridge and increase the longevity of the bridge.

It was important that the rebuilding and repair be completed by the first part of October as War Eagle Mill hosts an annual craft fair which brings hundreds of thousands of visitors to the area.

The bridge did open on October 1, 2010, and a ribbon cutting ceremony was held to celebrate the completion of the project. Cars, trucks and motorcycles were lined up on both sides, eager to try out the bridge. With all new decking, runners and new concrete support, everyone who has driven across agrees that the new bridge feels as sturdy as it looks.


Photo courtesy of Chris Wilbourn

Dr. Heather Nachtmann, Mr. Dick Grenville, and Dr. Kevin Hall

The spring semester brought two exceptional lectures. Our first lecture was delayed twice due to snow, but on March 3, 2011 **Mr. Richard Grenville**, Director of Logistics and Business Development at the Tulsa Port of Catoosa, gave a presentation on the Panama Canal Expansion and the Impact on Global Trade.

Mr. Grenville spoke on the Panama Canal's history and influence on US and world trade. He illustrated the dramatic growth in size in cargo vessels and oil tankers over the last few decades and indicated that the most modern vessels could not traverse the canal because of width and depth restrictions. A major expansion, funded by the Panama Canal Authority and due to be complete in 2014, includes a new lock configuration and a network of water reutilization basins. Mr. Grenville presented statistics on current and emerging markets, and suggested that the trends indicate a shift in trade routes and trade partners. The expansion of the Panama Canal could further alter trade routes – increasing the flow of commodities into the Gulf of Mexico and potentially increasing barge traffic on inland waterways. Mr. Grenville presented current freight rates for shipping corn and soybeans to Asia, via either the West coast or through the Gulf of Mexico. These trade routes may change substantially due to the Panama Canal expansion.

Photo courtesy of Richard Grenville

Our second lecture was held on March 31, 2011 in the Combs Auditorium on the UA campus. **Dr. Karen Dixon**, Associate Professor, Oregon State University, came well prepared to discuss the newly-published first edition of the American Association of Highway and Transportation Officials (AASHTO) Highway Safety Manual.

A significant portion of the three-volume manual provides a peer-reviewed compilation that predicts the safety performance of dozens of roadway design and operational elements. The manual offers guidance through the full range of project stages, starting with planning and programming, through the design of a roadway project, and continuing into ongoing operations and maintenance. Professionals who take advantage of the manual's contents should be positioned to offer the traveling public an improved level of safety.

Drs. Karen Dixon and Kevin Hall

Through examples, Dr. Dixon showed the audience that identifying the safer design choice is not always intuitive. Her presentation emphasized the need to better integrate safety considerations into current decision-making processes. She gave the students some insight into real-world barriers to improved safety, such as lack of resources or the cultures in some organizations that are resistant to new methods or innovations. She also provided a brief overview of the computational procedures that the manual contains.

Dr. Dixon practiced as a design engineer a number of years before receiving her Ph.D. from North Carolina State University. She was an Assistant Professor at Georgia Tech before moving to her current Associate Professor position at Oregon State University.

To learn more about the new Highway Safety Manual, go to www.highwaysafetymanual.org

Center for Training Transportation Professionals

L to R - Frances Griffith, CTTP Director Stacy Williams, Rita Parrish, Mary Fleck, Charles Steelman and Roselie Conley.

The Center for Training Transportation Professionals (CTTP) has had a productive year, focused on a full schedule of training courses and the development of web-based training modules.

Enrollment in CTTP courses has increased slightly, with most scheduled courses operating at or near capacity. It is anticipated that extra courses (in addition to those required by contract) will be scheduled later this year in order to meet the increasing need for recertification. The primary courses in greatest demand have been Portland Cement Concrete and Soils, and additional requests have been addressed for National Pollutant Discharge Elimination System and Roadway Construction Control certifications. Three courses have been conducted in Little Rock to accommodate those in the central and southern portions of the state.

Several online training courses are currently "under construction", including Basic Aggregates Refresher, Basic Math Skills, Math for Basic Aggregates, and Math for Concrete. The complete Basic Aggregates was released in early 2011, and is currently under a second tier review by industry. It is anticipated that this online refresher training will be required for all certified technicians by January 2013. In addition, these modules may also be used by participants prior to an on-site Basic Aggregates certification course as preparatory material, or by certified individuals as post-course review. Certified laboratories may also find additional benefits by using the online modules to aid in providing in-house training to new employees. Further adaptations of the modules are planned to serve local agencies and municipalities.

In addition to the online course module development, upgrades and modifications are continually being made to the CTTP website. Although many of these changes have occurred "behind the scenes," they have already begun to significantly increase the efficiency and consistency of CTTP programs. Many of these changes have benefited the laboratory certification program by streamlining a number of the processes involved in laboratory inspections and reporting.

Laboratory certification has also displayed steady enrollment, with approximately 100 participating laboratories. July 1, 2010 marked the beginning of the sixth inspection tour. Additional equipment checks are being performed during this tour as an effort to further improve the quality of laboratory testing in the state of Arkansas.

Members of the CTTP team have also devoted significant attention to national training and specification organizations, including the American Concrete Institute, the Transportation Coordination Curriculum Council, and the American Society for Testing and Materials. Successful collaborations with the Arkansas Ready Mixed Concrete Association (ARMCA) and the American Concrete Institute (ACI) have resulted in numerous opportunities for students at the University of Arkansas and John Brown University to become certified technicians in concrete field testing methods. CTTP has also assisted with the University of Arkansas' newly-formed student chapter of ACI, which was recently recognized as an outstanding student chapter at the national ACI convention in Tampa, FL.

L to R - John Pocari, USDOT Deputy Secretary, Shawn Griffiths, Steve Albert, President of CUTC and Peter Appel, Administrator of RITA at the CUTC Awards Banquet.

MBTC Outstanding Student of the Year

Shawn Griffiths was selected as the 2010 Mack-Blackwell Rural Transportation (MBTC) Outstanding Student of the Year for his research efforts that have led to the development of three new liquefaction triggering spreadsheets that are already being used by the Arkansas State Highway and Transportation Department (AHTD). Shawn traveled to Washington, D.C. for the 14th Annual Council of University Transportation Centers (CUTC) Awards Banquet to receive his award.

Shawn was nominated by Dr. Brady Cox, who said, "I have come to learn that Shawn is self-motivated, and that I can trust him to be meticulous in his research. These attributes are invaluable to a professor." Shawn has been working on MBTC project "Practical Recommendations for Evaluation and Mitigation of Liquefaction in Arkansas." The American Association of State Highway Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications indicate that "liquefaction of foundation soils [has] contributed to much of the damage" to bridges in historic earthquakes. The potential for a large earthquake in the New Madrid Seismic Zone (NMSZ) poses a real threat to transportation infrastructure in Arkansas, Missouri, Tennessee and Kentucky. Furthermore, only a few states in the nation have areas with higher earthquake-design acceleration coefficients than NE Arkansas. This fact, coupled with the unusually deep, soft soil deposits found in the NMSZ, poses a real problem for designing economic and safe bridge foundations. Shawn's research is aimed at helping the Arkansas State Highway and Transportation Department update their liquifaction evaluation procedures so that bridge foundations can be designed with confidence.

The 2011 winter meeting of the Transportation Research Board (TRB) marked the 14th Annual Outstanding Student of the Year Awards ceremony, sponsored by USDOT. Students from across the country attend this event. The student awards are held in conjunction with the Council of University Transportation Centers (CUTC) awards banquet. Each year at the annual winter meeting of TRB, USDOT honors the most outstanding student from each participating UTC for his/her achievements and promise for future contributions to the transportation field. Students of the year are selected based on their accomplishments in such areas as technical merit and research, academic performance, professionalism, and leadership.

New Projects

DOT University Transportation Center Projects

MBTC DOT 3020 - Performance of Flexible Pavement Systems Containing Geosynthetic Separators

Richard A. Coffman, Ph.D., P.E.
Civil Engineering
University of Arkansas

Base course drainage, strength, and modulus are important parameters that must be considered in the design of a roadway system. Pavement service life is maintained if the base course is permeable, strong, and rigid. In this project, a series of laboratory and field tests will be conducted to determine the efficacy of geotechnical separators in flexible pavement systems. Samples will be collected, and field in-situ permeability tests will be conducted at the Marked Tree, Arkansas test site. This site was established in 2006 and consists of a 950-foot section of pavement underlain by either six-inches or ten-inches of base course containing different geosynthetic reinforcement/separation types. Grain size analyses of the field obtained samples will be conducted in the laboratory to determine if fines (small particles of soil less than 75 micrometers in size) from the subsoil have migrated through the geotextile separators into the base course.

MBTC DOT 3021 - Performance of Prestressed Girders Case with Lightweight Self-Consolidating Concrete

W. Micah Hale, Ph.D., P.E.
Civil Engineering
University of Arkansas

Self-consolidating concrete (SCC) has been used in the precast/prestressed industry since the late 1990's. The appeal of SCC stems from its ability to fill formwork without consolidation and segregation. Likewise, lightweight concrete is also very popular due the reduced self-weight of the member which also decreases transportation costs. Lightweight self-consolidating concrete (LWSCC) is a combination of the two types of concrete. The use of LWSCC is growing in the precast/prestressed concrete industry but there is little guidance from industry regarding the design and analysis of LWSCC members.

This project will investigate the bond of prestressing strands in LWSCC. Bond in normal weight SCC has been and is currently being examined and the results vary. Some investigators have measured longer transfer and development lengths in normal weight SCC members when compared to conventional concrete of like compressive strength, and some have measured shorter lengths. Longer lengths suggest poorer strand bond and possibly unconservative prediction equations. Shorter lengths infers adequate or good bonds between the prestressing strands and the concrete and ensures the ACI 318 code equations are conservative. When compared to normal weight concrete of the same strength, the transfer and development lengths of prestressing strand in lightweight concrete are generally longer.

Helena Bridge, Highway 149 - Photo courtesy of AHTD

Greenville Bridge Construction - Photo courtesy of AHTD

MBTC DOT 3022 - Nanotechnology-Based Improvements for Portland Cement Concrete - Phase 1

R. Panneer Selvam, Ph.D., P.E.
Kevin D. Hall, Ph.D., P.E.
Civil Engineering
University of Arkansas

Concrete is the most utilized construction material and the least understood scientifically. The life of concrete is restricted due to shrinkage cracks, tensile cracks, etc. This is mainly due to complex amorphous structure of cement paste. For copper or iron, it is very easy to find the atomic structure from experiments. Since it takes many atoms combined to create cement paste or CSH (calcium, silicate, hydrate), it is very difficult to know the atomic structure from experiments. A fundamental understanding of the nano-structure of Portland Cement Concrete (PCC) is the key to realizing significant breakthroughs regarding high performance and sustainability. The MBTC DOT 2095/3004 project using Molecular Dynamics (MD) provided new understanding of CSH structure, the main component giving strength and durability to PCC. However, the study was limited, particularly regarding nano-level mechanical properties in the PCC, due to the number of atoms that could be considered in the MD approach. This research will feature a Discrete Element Method (DEM) for considering the CSH gel structure. Using this approach, the CSH structure will be manipulated to better model high and low density CSH and provide new insight on the impact of the CSH structure on PCC mechanical properties.

MBTC DOT 3023 - Automated Survey of Pavement Distress Based on 2D and 3D Laser Images

Kelvin C.P. Wang, Ph.D., P.E.
Civil Engineering
University of Arkansas

Pavement distress evaluation is a critical component in pavement evaluation for management and design. In the newly proposed Mechanistic and Empirical Pavement Design Guide (MEPDG), pavement distresses become major parameters in predicting pavement performance. At this time, the major element of pavement surface distresses is surface cracking. The detection and classification of cracks are still not fully automated in the field. Substantial amount of post-processing and manual intervention is still required. The research work conducted at the University of Arkansas in the past 10 years is world-leading in automated cracking survey. This research has the potential to pave the way to establish a new technological platform that would produce several key pavement surface distresses at highway speed and in full automation, including cracking, rutting, pothole, patching, and several other defects.

Information on pavement surface defects is critically needed for pavement rehabilitation and preservation programs. Precision and bias of the processed data are hard to establish due to lack of experience and effort in this area. In addition, using 2D laser images for surveying surface defects faces new obstacles in automatically processing a large amount of 1-mm images. Particularly, pavement surface defects all have unique 3D characteristics of various scales in both the x and y dimension, and the 3rd dimension. In recent years 3D laser imaging technology has been widely applied for inspection of manufactured products on conveyor belts. Conceptually, such 3D data gathering technique can be applied to pavement surface imaging. This research calls for the development of technology for the presentation and visualization of pavement surface in 3D at 1-mm resolution, which will potentially lead to automated processing of various pavement defects, including cracking.

Highway 65 - Photo courtesy of AHTD

MBTC DOT 3024 - Rail Transportation Models for Rural Populations

Chase E. Rainwater, Ph.D.
Ashlea R. Bennett, Ph.D.
Industrial Engineering
University of Arkansas

Growing populations in rural areas has led to interest in rail transportation as an environmentally conscious alternative to highway expansion for the alleviation of traffic congestion. Northwest Arkansas (NWA) is a prime example of this phenomenon. A study by the University of Arkansas Community Design Center points out that that two-thirds of all NWA residents live within one mile of existing rail right-of-way, making NWA a natural candidate for consideration of passenger rail transportation.

Passenger rail systems require an extensive planning process that includes strategic, tactical, and operational decisions. Radial networks are common in urban areas and throughout Europe and Asia. Linear structured path networks, in which the existing rail right of way consists of a single path, are common in rural areas.

Because of the complexity of most urban radial rail networks, researchers have historically approached the rail planning problem hierarchically for the sake of tractability. This method involves solving problems in each stage sequentially, with the solution to one problem acting as input to the next. Authorities in the field have commented that this approach fails to guarantee an optimal system, likely due to its inability to capture all interactions between various planning stages.

Simpler networks with fewer required decisions may allow for the use of an alternative integrated planning process that simultaneously considers the set of all required decisions, yielding system-optimal solutions. Rural passenger rail networks are prime candidates for this type of approach due to their linear structured path configuration. Northwest Arkansas (NWA) is one such example.

To best assess the feasibility of a NWA rail system, the researchers are developing the first integrated rail planning model for linear structured path networks. To solve this model, the researchers are designing and implementing customized solution techniques. This research will benefit NWA and other rural societies by providing a planning tool for the efficient allocation of municipal funds for a rail transit system that provides long-term congestion relief and environmental benefits. In addition, it will contribute to the literature in this area by serving as one of the few efforts to consider integrated decision planning in passenger rail transportation.

MBTC DOT 3025 - Biodiesel Waste Products as Soil Amendments - Evaluation of Microbial, Biological and Plant Toxicity

Thomas S. Soerens, Ph.D., P.E.
Civil Engineering
University of Arkansas

Biodiesel is generally considered an environmentally friendly, “green” technology. During biodiesel production, about 200 lbs of glycerol, commonly called clycerin, is produced for every 1 ton of biodiesel. As the biodiesel industry grows, so does the need to dispose of this waste product. While potential uses for glycerin exist, such as in food, industrial chemicals and pharmaceuticals, surplus glycerin is disposed of by incineration. Application of glycerin to soil for dust control or as a beneficial soil amendment is an alternative that has advantages. This approach could be more carbon neutral than burning as some of the carbon may be sequestered in the soil, and also can enhance soil quality by increasing soil organic matter. Potential issues regarding application of glycerin to soils include its effects on soil microbial activity, biological systems, and plants. Research is needed to document the impacts and understand the relationships to most effectively manage the byproducts as resources rather than waste products. The objectives of this research project are to evaluate the toxicity and growth effects of methanol-stripped glycerol from biodiesel waste on microbial, biological, and plant systems in soils.

State Highway 391 - Pulaski County - Photo courtesy of AHTD

MBTC DOT 3026 - Relative Advantages and Disadvantages of Independent Contractor Status: A Survey of Owner-Operators' Opinions and Rationale

Steven L. Johnson, Ph.D., P.E.
Industrial Engineering
University of Arkansas

The Truckload Carriers Association (TCA) is supporting this research to investigate the reasons why a driver would choose to be an independent contract driver/operator as opposed to being a company driver. The TCA has developed an extensive list of dimensions upon which the authority and responsibility of an independent contractor differs from a company driver/employee.

The objective of this research effort is to use TCA documents and develop, administer and analyze a survey instrument that will provide reliable, valid and useful information as to the reasons for choosing or not choosing to be an independent contractor. In addition to addressing the perceived advantages and disadvantages of being an independent contractor, the survey will investigate the methods that independent contractors use to capitalize on the benefits and accomplish the specific responsibilities associated with being independent.

The number of miles traveled by commercial combination trucks increased from approximately 94 billion miles in 1990 to over 143 billion miles in 2005 (Bureau of Transportation Statistics, 2007). Similarly, the number of for-hire carriers has increased from approximately 20,000 in 1980 to over 152,000 in 2007 (TRB Circular E-C146, 2010). Although the recent economic conditions reduced this rate of growth temporarily, it is anticipated that the volume of truck freight will continue to increase in the future. One concern of the industry is the ability to fill the required number of commercial driver positions. The potential for a driver shortage could as be exacerbated by a combination of factors such as driver demographics (e.g., age) and Compliance, Safety, Accountability (CSA) 2010. One potential method of addressing the shortage of drivers is for carriers to utilize independent contractors.

Commercial truck drivers range from company drivers that are employees of a carrier to independent single-truck, owner-operators who operate under their own authority. The University of Michigan Trucking Industry Program data from 1998 indicated that, at the time, approximately 74 percent of the over-the-road drivers were "employees" (company drivers), the remaining 26 percent were owner-drivers/operators who either lease or contract trucks with the carriers. According to the Motor Carrier Management Information System (MCMIS) 56 percent of all for-hire carriers have only one truck, 34 percent have between two and nine trucks and the remaining 10 percent have ten or more trucks.

I-30, Saline County, Exit 117 - Photo courtesy of AHTD

MBTC DOT 3027 - The Development of Novel and Non-Invasive Germplasm Selections Native to Arkansas for Highway Re-Vegetation Projects

Garry V. McDonald, Ph.D.
Horticulture Department
University of Arkansas

Re-vegetation strategies and programs for highway rights of way in both rural and urban areas are an important component of any highway construction project. Vegetation is used to stabilize soils to prevent sheet and gully erosion and to help in soil remediation in disturbed sites. Vegetation is also used as filter strips to protect sensitive wetlands from sedimentation caused by storm water runoff. Additionally, vegetation can be used in highway beautification projects to enhance the visibility of many highway projects and to promote seasonal tourism in rural areas such as driving tours of fall tree color. Vegetation can also act as visual and sound barriers in urban built up areas. Many plant species used for highway re-vegetation projects have shown to be invasive or unsustainable over time. Kudzu in the southeast United States and Bradford Pear in Arkansas damage native habitats and are expensive and difficult to control. Techniques and methodology using sustainable landscape system principles are currently under development for use in natural and built environments, but much is still unknown, particularly in planting and establishment guidelines and in plant propagation and production practices.

The objective of this research is to develop novel plant germplasm that is regionally native, adapted, and non-invasive and useful for rural and urban highway re-vegetation projects. This particular component will be accomplished by traditional plant selection methods via the collection of native and regional plant material (seeds, cuttings, etc.) and evaluation under simulated roadside conditions. Another major objective of this proposed research is to develop science-based best management practices guidelines for using native plants in Arkansas for re-vegetation projects by investigating best methods for transplanting and establishment along simulated roadsides. Interactions with fertility applications and herbicide use will be studied. Expected outcomes include the development and release of novel germplasm useful for re-vegetation projects along rural and urban highways in the State of Arkansas, new knowledge on the production of these species using sustainable propagation methods, and finally the generation of best management practices and guidelines for the use of native plants, to be made accessible to vegetation managers and highway project planners.

DHS National Transportation Security Center of Excellence Projects

MBTC DHS 1109 - Mitigating Dynamic Risk in Multi-Modal Perishable Commodity Supply Chain Networks

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This research focuses on the development of decision support models that mitigate dynamic risk caused by an adversary with an unknown, adaptive objective when allocating scarce fortification resources for transportation infrastructure components in perishable commodity supply chain networks. The assessment of supply chain risk will be from an all-hazards perspective, wherein potential disruptions include both unplanned (i.e., natural disasters) and planned, albeit dynamically changing, adversarial actions. While the methods the researchers develop in this effort will be applicable to a wide variety of supply chain networks, including the transport of a variety of commodities via multi-modal transportation, the implementation efforts will focus on bulk transportation of perishable commodities (e.g., corn, coal, chemicals) on inland waterways in the United States.

The primary research questions to be addressed are as follows: how should fortification resources be allocated over time to inland waterway infrastructure components such that the resiliency of perishable commodity supply chain networks is maximized when disruptions are caused by (1) natural disasters, (2) an adversary whose objective is to cause the greatest economic loss, and (3) an adversary whose objective is adaptive and not known with certainty. The latter case is motivated by the conjecture that an adversary's target is likely to change in response to the decision maker's fortification investments made at each planning epoch. Therefore, decisions should be made that mitigate both present and future risk.

This research will culminate in a decision framework that can guide the allocation of DHS funding to various agencies that have the capability to fortify inland waterway infrastructure components, and identify long-term fortification strategies that are robust to a variety of disruption scenarios.

Arkansas River, Little Rock Skyline - Photo courtesy of AHTD

MBTC DHS 1110 - Supporting Secure and Resilient Inland Waterways

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Inland waterways in the United States transport millions of tons of cargo every day. The most commercially important waterways include the Mississippi/Ohio River System, the Gulf Intracoastal Waterway, the Intracoastal Waterway along the Atlantic Coast, and the Columbia-Snake River System in the Pacific Northwest. Barges carry approximately 20% of the nation's coal, 22% of U.S. petroleum and 60% of the nation's farm exports. Major disruptions to the inland waterway transportation system due to either natural or manmade causes can result in significant economic loss.

Supporting Secure and Resilient Inland Waterways (SSRIW) is a collaborative project between MBTC and researchers at Rutgers University. The SSRIW project will develop a prototype decision support system that integrates geographic information system (GIS) technology and computer-based freight movement models to provide timely knowledge and awareness of what cargoes should be prioritized for offloading during emergency response and what infrastructure exhibits low resiliency in terms of modal capacity to potential attacks or natural disasters against inland waterway transportation systems. If a catastrophic disaster causes a shutdown on an inland waterway transportation system, the prototype system will address (i) how should waterborne cargoes be prioritized for offloading based on primary and secondary economic impacts and societal requirements and (ii) how should prioritized freight be offloaded and transported via rail and truck based on freight capacities.

Ongoing Projects

DOT University Transportation Center Projects

MBTC DOT 2006 -Investigation of the Long Term Stability of Highway Slopes, Phase III
Norman D. Dennis, Jr., Ph.D., P.E.
University of Arkansas

MBTC DOT 2007 - Estimating Subgrade Resilient Modulus for Pavement Design
Norman D. Dennis, Jr., Ph.D., P.E.
University of Arkansas

MBTC DOT 2026 - Using Multi-Spectral Satellite Imagery to Enhance Slope Failure Prediction
Norman D. Dennis, Jr., Ph.D., P.E.
University of Arkansas

MBTC DOT 2037 - Route and Site Characterization Using Multi-Spectral Satellite Imagery
Norman D. Dennis, Jr., Ph.D., P.E.
University of Arkansas

MBTC DOT 2070 - Development of Methods for Estimating Remaining Life of Hot-Mix Asphalt Field Mixes
Kevin D. Hall, Ph.D., P.E.
Norman D. Dennis, Jr., Ph.D., P.E.
University of Arkansas

MBTC DOT 2074 - Evaluation of Pavement Thickness and Modulus Using Spectral Analysis of Surface Waters
Norman D. Dennis, Jr., Ph.D., P.E.
University of Arkansas

MBTC DOT 3014 - A Prototype Remote Structural Health and Security Monitoring System for Bridges
Kirk A. Grimmelsman, Ph.D.
University of Arkansas

MBTC DOT 3015 - Rapid Condition Screening of Bridges by Falling Weight Deflectometer
Kirk A. Grimmelsman, Ph.D.
University of Arkansas

MBTC DOT 9312 - Development of a Large-Scale Transportation Course
Sarah E. Root, Ph.D.
University of Arkansas

DHS National Transportation Security Center of Excellence Projects

MBTC DHS 1101 - Designing Resilient and Sustainable Supply Chain Networks
Edward A. Pohl., Ph.D.
Chase E. Rainwater, Ph.D.
University of Arkansas
Scott J. Mason, Ph.D.
Clemson University

MBTC DHS 1104 - Structural Health Monitoring and Assessment of Critical Intermodal Transportation Infrastructure Elements
Kirk A. Grimmelsman, Ph.D.
Brady R. Cox, Ph.D.
Ernest P. Heymsfield, Ph.D. P.E.
University of Arkansas

MBTC DHS 1106 - Emergency Response via Inland Waterways
Heather L. Nachtmann, Ph.D.
Edward A. Pohl, Ph.D.
University of Arkansas

MBTC DHS 1108 - Sustaining Resilient Inland Waterways via Renewable Energy
Heather L. Nachtmann, Ph.D.
Letitia M. Pohl, Ph.D.
University of Arkansas

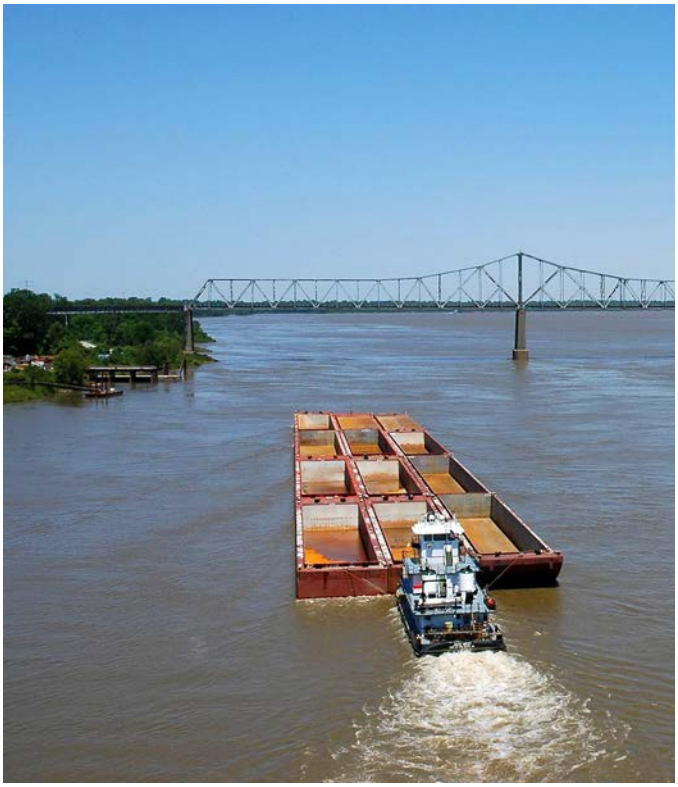

Photo courtesy of AHTD

Completed Projects

DOT University Transportation Center Projects

MBTC DOT 3012 - Examining the Effects of Mixer Type and Temperature on the Properties of Ultra-High Performance Concrete

W. Micah Hale, Ph.D., P.E.
Kirk A. Grimmelsman, Ph.D.
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University of Arkansas

Ultra-High Performance Concrete (UHPC) is a highly advanced material that has been created as a result of many years of concrete research and development. UHPC addresses a number of concerns that plague most concrete types by taking advantage of today's latest technology in order to produce this innovative product.

Although UHPC is known for producing many beneficial qualities for concrete users, because of the unique makeup of the material, there are some areas that remain unexplored. For instance, the mixer typically specified to batch UHPC is a high shear/energy mixer (e.g. pan). Currently, little information is known as to whether a beneficial or negative impact may be experienced in concrete properties (e.g. flow, strength, modulus of elasticity [MOE]) when a lower shear/energy mixer (e.g. drum/ready-mix truck) is used. Another point of interest that has not been explored is the effect on fresh concrete temperature produced when the dry constituent mixing materials (also referred to as premix), such as Portland cement, aggregate, silica fume, and ground quartz, are placed at some specific temperature and batched with ice as a replacement for mixing water.

Because of these two uncertainties, the goal of this project is to rectify such unknowns. Two studies were fashioned addressing the issues listed in the previous paragraph. Both studies documented UHPC fresh (flow and temperature) and hardened properties (modulus of elasticity and compressive strength) to gather information for analysis purposes.

The influence of ice on resultant batch temperature could not be determined for the small pan made batches. The drum mixed batches, with their larger volume of materials, proved more beneficial for analysis. Flows for both mixers were erratic over time, but were generally within the acceptable specifications; this fact was dependent upon the type of mixer used.

Two different curing procedures were used during the research period. The type of curing regimen used largely influenced UHPC hardened properties. Depending upon the type of curing method used, a stark difference in ultimate strength and MOE values could be observed.

MBTC DOT 3016 - Arkansas Highway and Transportation Department (AHTD) Cracking Protocol Application with Automated Distress Survey for Design and Management

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Kevin D. Hall, Ph.D., P.E.
Civil Engineering
University of Arkansas

Manual surveys of pavement cracking have problems associated with variability, repeatability, processing speed, and cost. If conducted in the field, safety and related liability of manual surveys present challenges to highway agencies. Therefore automated processes for cracking analysis have been sought in the past decades. Processed cracking results need to be compiled based on a standard or a protocol so pavement engineers can apply the results in design and management. Pavement cracking protocols vary in details. Cracking definitions in the Highway Performance Monitoring System (HPMS) and the Mechanistic-Empirical Design Guide (MEPDG) represent two efforts in defining cracking applications for pavement condition monitoring and prediction modeling of pavement condition in design respectively. This research presents findings of using a fully automated process with the Automated Distress Analyzer (ADA) to establish a viable method for analyzing cracks based on 2D laser images for HPMS and MEPDG. It is determined that automated survey is possible for both protocols as long as careful design and implementation are made and errors are controlled in the process as much as possible. In addition, an analysis of wheel-path wandering and its effect on cracking analysis is conducted by varying positions of wheel-paths and their sizes.

I-540, Bobby Hopper Tunnel - Photo courtesy of AHTD

MBTC DOT 3017 - Practical Recommendations for Evaluation and Mitigation of Soil Liquefaction in Arkansas

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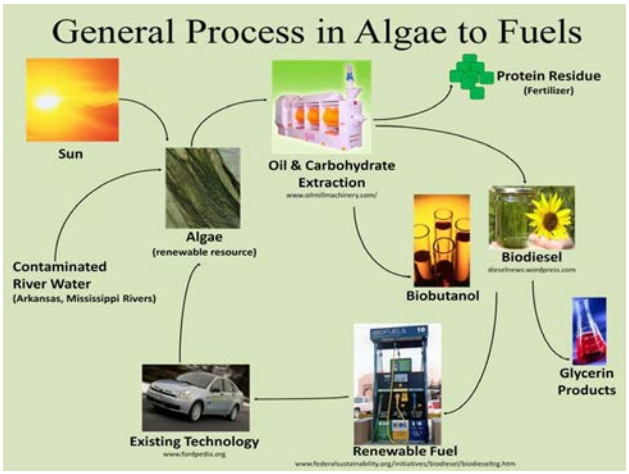
Civil Engineering
University of Arkansas

Northeastern Arkansas has some of the largest design earthquake ground motions in the continental U.S. due to its location within the New Madrid Seismic Zone (NMSZ). These large earthquake ground motions are particularly problematic when coupled with the unknown seismic response of the deep, soft soils of the Mississippi Embayment. Based on empirical standard penetration test (SPT) liquefaction triggering analyses, many soils in this area exhibit apparent liquefaction susceptibility at depths up to 30-plus m (100-plus feet). However, there is very little guidance in the literature on what to do in these situations, because soils soft enough to liquefy at great depths (i.e. greater than approximately 20 m [65 feet]) have not been documented in the case history databases from previous earthquakes.

The primary task of this research project was to help AHTD, and other interested entities involved with design and construction of deep foundations in the NMSZ, update procedures used to evaluate earthquake-induced soil liquefaction triggering, particularly with respect to liquefaction of soils at great depths. Specific subtasks of this research project included providing recommendations and insights concerning: (1) appropriate use of SPT-based liquefaction triggering procedures, (2) residual shear strength of liquefied soils, and (3) potential liquefaction mitigation measures (i.e. possible ground improvement techniques).



MBTC DOT 3018 - The Production of Butanol Fuel from Renewable Systems Using a Membrane Assisted Fermentation System

Jamie A. Hestekin, Ph.D.
Robert E. Babcock, Ph.D.
Robert B. Beitle, Ph.D.
Chemical Engineering
University of Arkansas

The U.S. presently imports over 60% of the crude oil that is used to generate most of the 180 billion gallons of gasoline and diesel fuel that are annually consumed in this country. It is estimated that in the U.S., there are at least 500 million dry tons of biomass available annually. This biomass is in the form of forest residues, mill residues, dedicated energy crops, urban wood waste, and agricultural residues. This research investigates the use of another feedstock, algae, as a new raw material for transportation fuel. Algae grown in a native algal raceway system removes pollutants from the water as well as making biofuels. Our specific research aim was to transform native algae strains, grown to clean contaminated water, into butanol (1-butyl alcohol).

Interest in the potential use of algae as a feedstock in biofuel production is gaining momentum in the United States and Europe. The reasons for the interest in algae is because of their ability to grow on marginal land, the high concentrations of carbohydrates and lipids in their cell mass, and the ability to clean nitrogen and phosphorus contaminants from water. In fact, ongoing research at the University of Arkansas has found that the nitrogen and phosphorous in the Mississippi River could provide a source for as much as 250 million gallons of biofuel per year, while also providing a cleaner water source. However, although biodiesel from algae has been studied, there have been far fewer studies on the conversion of algae to fuel oxygenates and no studies on the conversion of algae to butanol. Since the DOE has identified biobutanol as a 2nd generation biofuel, research of converting algae into biobutanol is important and could lead to a sustainable fuel alternative. Thus, the overall objective of this project was to show that algae could be used as a feedstock for butanol production. This included drying, extraction of carbohydrates, conversion of carbohydrates into butanol, isolation and purification of the butanol, and leveraging this work into other algae related projects.

MBTC DOT 3019 - Network Design Analysis for Special Needs Student Services

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Clemson University

Edward A. Pohl, Ph.D.
Industrial Engineering
University of Arkansas

Population growth can lead to public school capacity issues, as well as increased school bus utilization. This increased utilization, in turn, can result in longer school bus transport times for both regular and special needs/medically fragile students. Special needs or medically fragile students are children with special health care needs who are at increased risk for a chronic physical, developmental, behavioral, or emotional condition. These students require health and related services of a type or amount beyond that required by typical children. It is common practice to provide special needs students with specially equipped buses and/or special classroom environments with specific facilities or services. However, the assignment of student services to schools is regularly made without regard to bus transportation considerations for special needs students. Considering the potentially negative impact of long school bus rides on these students, the researchers present the first systematic, integrated analyses of special needs student busing and classroom assignments. Models and algorithms for maintaining administration-based transportation financial performance measures are provided while simultaneously designing smarter transportation networks. The smarter networks produced by our models assign special needs services to schools in concert with considering both student geographical location and service needs. In the future, the researchers hope to pilot the model results in local school districts to assess the efficacy of their proposed methods in practice.

DHS National Transportation Security Center of Excellence Projects

MBTC DHS 1105 - Information Enhancement Among Aviation Security Partners

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University of Arkansas

Since September 11, many steps have been taken to improve security against attacks on commercial aviation, but relatively little has been done to secure general aviation (GA). One reason for the security gap is that GA operates differently than the commercial aviation industry making it difficult to borrow improvements. Another reason for lower GA security standards is that many people did not perceive GA as a serious threat, since planes carry much less fuel and are much smaller in size than their commercial counterparts. However in February 2010 a suicide attacker crashed a single-engine plane onto an Austin IRS building killing one employee and injuring thirteen others.

To accommodate the need for improved GA security, one goal should be to integrate a variety of relevant data formats, "and transform raw data into useful and understandable information that enables productive and efficient analysis (IDS University Affiliate Center for Multimodal Information Access and Synthesis)." The objective of this research is to understand the variation associated with usual GA activity and operations, so unusual activity can be detected, analyzed and resolved. General techniques include estimation and design of relevant statistical model-based quality control charts. This opportunity to specialize in model-based control for an applied context should eventually result not only in contributions to GA security but also to quality engineering. The research described here improves upon previously existing models of GA operations data and would make possible improved monitoring and detection for GA security.

The research conducted in this project has produced a more accurate and efficient model for estimating the annual number of operations at a GA airport. This information can of course be used to create better terminal area forecast summaries for GA airports. But more importantly it could possibly be used to detect unusual behavior based on the annual number of operations at an airport. One future objective of this project is to create quality control charts that could be used to monitor general aviation activity.

Another future objective of this project is to provide recommendations for multiple data stream integration applied to transportation security. Methods must be developed to improve monitoring across collaborative data sources and modes. Further improved information technology for GA could lead to even better recommendations for early detection decision aids for GA security. All of these activities would exist with a common philosophy that if good models of usual activity fail to predict, then unusual activity may indicate a security threat. The model-based control of GA security described in the final report may also be extended to other contexts such as highway, maritime transportation systems, mass transit, pipeline systems, and rail.

Publications Available @ www.mackblackwell.org

DOT University Transportation Center Projects

Research and Innovative Technology Administration (RITA) Communities of Interest

Transportation Planning and Policy Research

2010

MBTC DOT 3010 - A Cost-Driven Policy Approach for Development of On-Street and Off-Street Bicycle, Multi-Use and Single-Use Paths and Related Facilties
Crone, John V.

2008

MBTC DOT 2034 - Community Impact of Regional Transportation Infrastructure: Revisited After Completion of Airport and Major Highway
Miller, Will

MBTC DOT 2078 - Evaluation of Economic Impacts of NAFTA on the Transportation System/Sector of Selected Southern States
Hamilton, Gregory L.

2007

MBTC DOT 2081 - A Study of Rural Transit Operations in the Arkansas Delta
Tooley, Melissa S.

MBTC DOT 2082 - Ancillary Benefits of the Ouachita River Navigation System
Nachtmann, Heather L.

2005

MBTC DOT 2038 - Physical, Economic, and Political Feasibility for Trade of U.S. Grain for Russian Oil
Asfahl, C. Ray

MBTC DOT 2068 - Northwest Arkansas Regional ITS Architecture
Tooley, Melissa S.

2004

MBTC DOT 2018 - Environmental Technology Verification Report of the Low-Cost Stormwater BMP Study
Edwards, Findlay G.

MBTC DOT 9206 - Update and Modification of the Kansas Low-Volume Roads Handbook and the Handbook of Traffic Engineering Practices for Small Cities
Russell, Eugene R.

2003

MBTC DOT 2002 - Ingredients in Planning Successful Rural Transportation Services for Welfare Reform
Wedel, Kenneth R. and Richard S. Marshment

MBTC DOT 2009 - Regional Mobility Plan: Development of Technical Scope of Services
Tooley, Melissa S.

MBTC DOT 2012 - Modeling and Analysis of Transportation Flows Created by E-Commerce Transactions
Kutanoglu, Erhan, Michael H. Cole and Michael Bartolacci

MBTC DOT 2022 - Development of a Strategic Plan for Statewide Deployment of Intelligent Transportation Systems in Arkansas
Tooley, Melissa S.

2002

MBTC DOT 9208 - Economic Evaluation of the Impact of Waterways on the State of Arkansas – Phase II
Nachtmann, Heather L.

2001

MBTC DOT 2001 - Quick Response Community Planning
Russell, Eugene R., E. Dean Landman and Avijit Mukherjee

State Highway 341, Norfolk, AR - Photo courtesy of AHTD

Systems Performance Research

2004

MBTC DOT 9210 - Training and Course Materials of Stormwater Pollution Prevention
Edwards, Findlay G. and Steven J. Burian

2003

MBTC DOT 2015 - Online Benchmarking Database for Transportation Providers
Rossetti, Manuel D. and Terry Collins

Human Factors Research and Applications

2009

MBTC DOT 2083 - Human Factors Study of Driver Assistance Systems to Reduce Lane Departures and Side Collision Accidents
Johnson, Steven L.

2008

MBTC DOT 2100 - Evaluation of the Role of Driver's Knowledge of Who Has the Right-Of-Way Contributes to Interstate On-Ramp Crashes
Eustace, Deogratias

2007

MBTC DOT 2040 - Supplemental Signing for Stop Signs - Phase 2
Gattis, James L.

MBTC DOT 9202 - Supplemental Materials for Use with Educational Videotapes
Griffith, Frances

MBTC DOT 9204 - Development of a Construction Surveying Certification Course
Williams, Rodney D. and Kevin D. Hall

2004

MBTC DOT 2043 - A Model for Predicting Tractor-Trailer Truck Drivers' Job Performance Related to Highway Safety
Nafukho, Fredrick M. and Barbara E. Hinton

Transport, Logistics and Infrastructure Research

2011

MBTC DOT 3017 -Practical Recommendations for Evaluation and Mitigation of Soil Liquefaction in Arkansas
Cox, Brady R.

MBTC DOT 3019 -Network Design Analysis for Special Needs Student Services
Mason, Scott J. and Edward A. Pohl

2010

MBTC DOT 3011 -Analysis of Transportation Network Design Strategies for Forced Transfer Busing
Mason, Scott J. and Edward A. Pohl

2009

MBTC DOT 2056 - Applicability of Microelectronic and Mechanical Systems (MEMS) for Transportation Infrastructure Management
Wang, Kelvin, C.P.

MBTC DOT 2086 - Routing Models for Rural Networks with Time-Varying Constraints
Mason, Scott. J., Russell D. Meller and Edward A. Pohl

Photo courtesy of AHTD

MBTC DOT 2087/3001 - A Model to Design a National High-Speed Network for Freight Distribution
Meller, Russell D. and Kevin R. Gue

MBTC DOT 2094/3003 - Acceleration Lane Design for Higher Truck Volumes
Gattis, James L.

2008

MBTC DOT 2072 - Roundabout Feasibility Study for West Memphis
Crone, John V., Otto Loewer and Carolyne Garcia

MBTC DOT 2073 - Effects of Frontage Road Conversion
Gattis, James L.

MBTC DOT 7015 - Assessment of Multimodal Transport of Baled Poultry Litter and Dewatered Biosolids from Northwest Arkansas
Goodwin, Harold and Kenneth B. Young

2005

MBTC DOT 2035 - WebShipCost – Quantifying Risk in Intermodal Transportation
Nachtmann, Heather L. and Manuel D. Rossetti

2004

MBTC DOT 2024 - WebShipCost – Intermodal Transportation Linkage Cost Assessment Via the WWW
Rossetti, Manuel D. and Heather L. Nachtmann

MBTC DOT 2041 - Integrated Analysis of Transportation and Inventory In Intermodal Distribution Networks
Mason, Scott J. and Erhan Kutanoglu

2003

MBTC DOT 2003 - Empty Container Management for Container-on-Barge (COB) Transportation: Planning Horizon Effects on Empty Container Management in a Multi-Modal Transportation Network
Cole, Michael H. and Erhan Kutanoglu

MBTC DOT 2016 - Further Study of Roundabouts
Russell, Eugene R. and Margaret J. Rys

MBTC DOT 2019 - Designing Horizontal Curves for Low-Speed Environments
Gattis, James L.

2002

MBTC DOT 2013 - Efficient Timing of Pickup and Delivery Assignment Decisions Through Simulation and Optimization
Kutanoglu, Erhan and G. Don Taylor

2001

MBTC DOT 2004 - Efficient Dispatching in a Terminal City Network
Kutanoglu, Erhan and G. Don Taylor

Materials Research

2011

MBTC DOT 3012 - Examining the Effects of Mixer Type and Temperature on the Properties of Ultra-High Performance Concrete
Hale, W. Micah and Kirk A.Grimmelsman

MBTC DOT 3016 - Arkansas Highway and Transportation Department (AHTD) Cracking Protocol Application with Automated Distress Survey for Design and Management
Wang, Kelvin C.P. and Kevin D. Hall

MBTC DOT 3018 -The Production of Butanol Fuel from Renewable Systems Using a Membrane Assisted Fermentation System
Hestekin, Jamie A., Robert E. Babcock and Robert B. Beitle

2010

MBTC DOT 2090/3002 - Performance Prediction of the Strong Company's Soft Ground Arrestor System Using a Numerical Analysis
Heymsfield, Ernest P.

MBTC DOT 2095/3004 - Potential Application of Nanotechnology on Cement Based Materials
Selvam, R. Panneer and Kevin D. Hall

MBTC DOT 3009 - Economic Issues Related to Continuous Supercritical Biodiesel Production
Babcock, Robert E., Edgar C. Clausen and Michael P. Popp

MBTC DOT 3013 - Accelerated Characterization of Full-Scale Flexible Pavements Using a Vibrosesis
Cox, Brady R. and John S. McCartney

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MBTC DOT 2071 - Prestress Losses in Prestressed Bridge Girders Cast with Self-Consolidating Concrete
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MBTC DOT 2089 - Development of a Soft Ground Arrestor System
Hale, W. Micah and Ernest P. Heymsfield

2008

MBTC DOT 2066 - Surface Friction Measurements of Fine-Graded Asphalt Mixtures
Williams, Stacy G.

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Williams, Stacy G.

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MBTC DOT 2027 - Investigation of the affect of Fines on Base Course Performance
Dennis, Norman D., Richard M. Welcher and John H. Lawrence

MBTC DOT 2030 - Development of 4.75 MM Superpave Mixes
Williams, Stacy G. and Kevin D. Hall

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MBTC DOT 2058 - Biodiesel Production from Varying Grades of Beef Tallow and Chicken Fat
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MBTC DOT 2076 - Physical and Chemical Characteristics of Superpave Binders Containing Air Blown Asphalt from Two Different Feedstocks
Hardee, John

2006

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Dennis, Norman D.

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MBTC DOT 2039 - Life Cycle Economic Comparison of Common Sign Post Materials and Types
Rys, Margaret J. and Eugene R. Russell

MBTC DOT 2049 - A Study of Physical and Chemical Characteristics of Superpave Binders Containing Air Blown Asphalt
Hardee, John R.

2004

MBTC DOT 2033 - Repair of Damaged Concrete Structures Using Prepreg Composites
Li, Guoqiang

MBTC DOT 2052 - Comparative Esterification of Agricultural Oils for Biodiesel Blending
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Hall, Kevin D.

2003

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Vehicles Systems Research

2007

MBTC DOT 2008 - Automation of Pavement Surface Distress Survey Through Parallel Processing
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Nutter, Darin W. and C. Richard Cassady

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Nutter, Darin W., C. Richard Cassady, John R. English, Don Taylor and Chet Tuck Wong

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CNS/Traffic Management/Command and Control

2009

MBTC DOT 2088 - Applications of GIS and Operations Research Logistics Planning Methods for Arkansas Rural Transportation Emergency Planning
Rossetti, Manuel D., Edward A. Pohl and Fred Limp

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McCann, Roy A.

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MBTC DOT 2044 - Cost Efficient Management Tools for Assessing Cultural Resources
Sabo, George and Lela Donat

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Rossetti, Manuel D.

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MBTC DOT 2055 - Roadway Median Treatments - Phase 1
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MBTC DOT 2067 - Roadway Median Treatments - Phase 2
Gattis, James L.

MBTC DOT 2091 - Rural Transportation Emergency Preparedness Plans
Nachtmann, Heather L. and Edward A. Pohl

County Road 22 - Photo courtesy of Sandra Hancock

MBTC DOT 3008 - Emergency Response via Inland Waterways
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2009

MBTC DOT 2098/3005 - A Model-Based Risk Map for Roadway Traffic Crashes
Nam, Chang S. and Joon J. Song

MBTC DOT 2099/3006 - Identification and Analysis of High Crash Segments on Interstate, US, and State Highway Systems of Arkansas
Bham, Ghulam H.

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Patangia, Hirak C.

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Pohl, Edward A.

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McCann, Roy L. and Steven L. Johnson

MBTC DOT 2064 - Assisted Night Vision for Motorists in Highway Construction Zones: Phase II
Patangia, Hirak C. and John M. Faucett

MBTC DOT 2079 - Study Drivers' Behavior at Passive Railroad-Highway Grade Crossings
Russell, Eugene R. and Margaret J. Rys

MBTC DOT 2080 - Effectiveness of Seat Belts in Reducing Injuries
Dissanayake, Sunanda

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Click, Steven M.

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MBTC DOT 2062 - Development of a Human Performance Simulation Model to Evaluate In-Vehicle Information and Control Systems in Commercial Trucking Operations
Johnson, Steven L. and Chang S. Nam

MBTC DOT 2085 - Homeland Security for Rural Transportation Networks
Nachtmann, Heather L., Edward A. Pohl and C. Richard Cassady

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MBTC DOT 9211 - Video Tapes/DVD's: "Driving in Orange"
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2001

MBTC DOT 9203-A - Video Tapes/DVD's: "Lane Closures"
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MBTC DOT 9203-B - Video Tapes/DVD's: "Pavement Markings"
Gattis, James L.

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DHS National Transportation Security Center of Excellence Projects

2011

MBTC DHS 1105 - Information Enhancement Among Aviation Security Partners
Chimka, Justin R.

2010

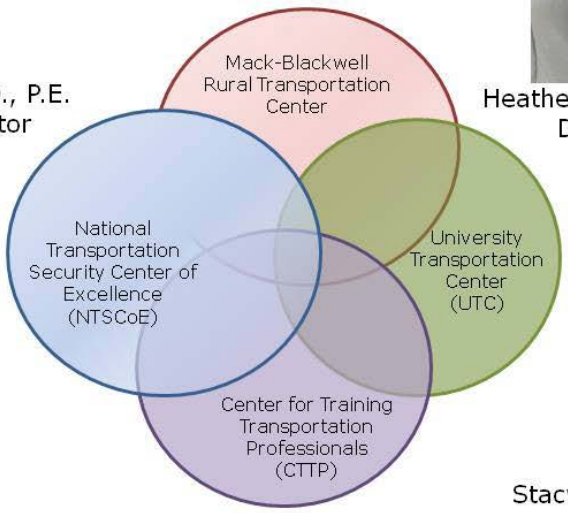
MBTC DHS 1102 - Simulating Large-Scale Evacuation Scenarios in Commercial Shopping Districts - Methodologies and Case Study
Rossetti, Manuel D.

MBTC DHS 1103 - Applicability of Microelectronic and Mechanical Systems (MEMS) for Transportation Infrastructure Management
Wang, Kelvin C.P.

MBTC Administrative Personnel

Kevin D. Hall, Ph.D., P.E.
Executive Director

Heather Nachtmann, Ph.D.
Director, MBTC



Letitia Pohl, Ph.D.
Assistant Director

Stacy Williams, Ph.D., P.E.
Director, CTTP

MBTC Administrative Staff

Dana Williams, M.S.
Communications Director

Sandra Hancock, CPS, M.S.
Fiscal Support Analyst

CTTP Administrative Staff

Frances Griffith, M.S.
Administrator for Technician Training

Roselie Conley
Research Technologist

Mary Fleck
Instructor

Charles Steelman
Online Product Specialist

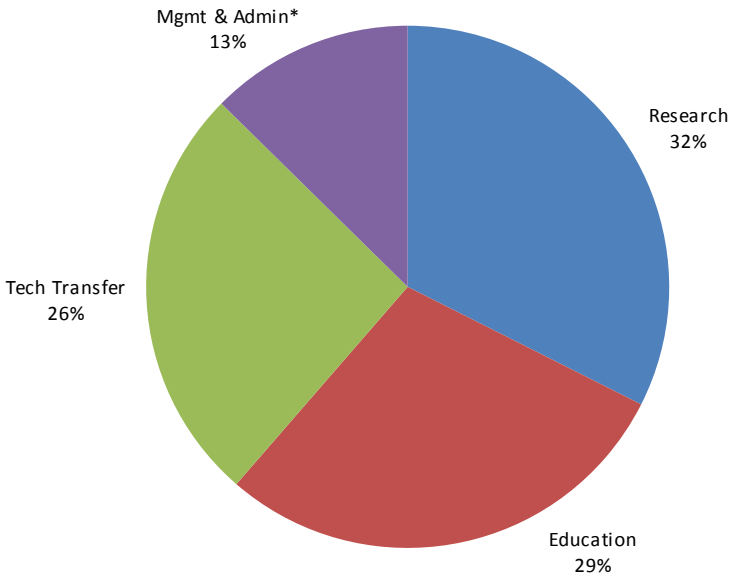
Rita Parrish
Administrative Assistant II

Financial Report

Grant Year: July 1, 2010 - June 30, 2011

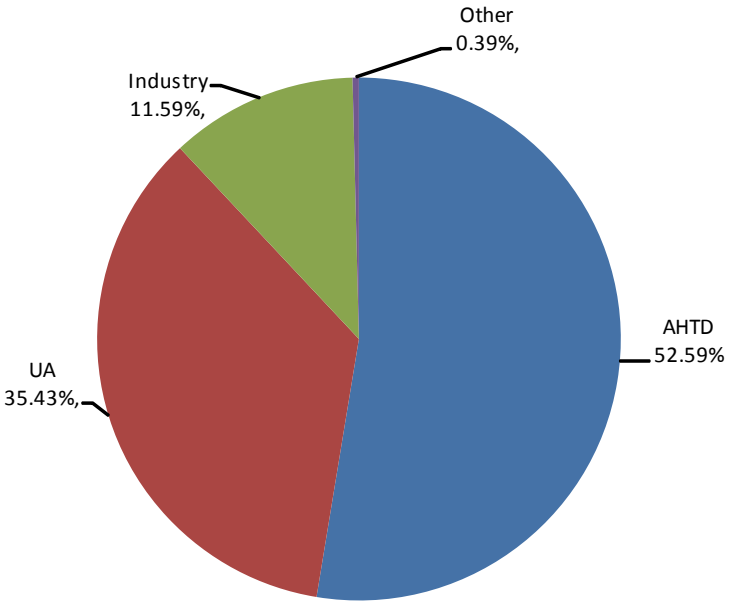
DOT Federal Share - $337,894
DOT Matching Share - $919,138
Total - $1,257,032

MBTC Total DOT Expenditure Distribution
July 2010 - June 2011



*31.1% of Management and Administrative Expenditures come from Match Sources

MBTC DOT Match Sources
July 2010 - June 2011



MBTC Upcoming Activities for 2011-2012

National Transportation Security Center of Excellence *Communicator* Newsletter

MBTC is leading the effort for the August 2011 issue of the NTSCOE *Communicator* - a quarterly newsletter. On-going research projects, funded by the DHS Science & Technology Directorate - Office of University Programs, at the Mack-Blackwell Rural Transportation Center at the University of Arkansas and the Center of Transportation Safety, Security, and Risk at Rutgers University investigate the resilience of the inland waterway system and the role inland waterways can play in emergency response. Featured in the newsletter is Drs. Heather Nachtmann and Edward A. Pohl's research.

Summer Transportation Institute

July 8, 2011

MBTC will be hosting students from the Summer Transportation Institute in Little Rock, AR. Activities for their visits include tours of the University of Arkansas campus, Bell Engineering Center and Engineering Research Center. STI is an innovative summer program for high school students guaranteed to spark their interest in transportation through creative problem-solving and hands-on activities.

Advisory Board Meeting

October 13-14, 2011

MBTC will hold its annual Advisory Board dinner and meeting.

AHTD Director Retires

Dan Flowers, Director of the AHTD, announced his pending retirement effective September 21, 2011. Mr. Flowers has served as Director of the AHTD since 1994, and is the longest serving CEO of any state transportation agency in the country. He worked four summers at the AHTD while in college, and began full-time employment after graduating from the University of Arkansas with a Bachelor of Science in Civil Engineering in 1969. He started as Planning Engineer in the Department's Planning & Research Division, and worked in eight other engineering and management positions within the Department prior to becoming Director in 1994. Mr. Flowers is a registered professional engineer and is a member of the University of Arkansas' Academy of Civil Enginerring. The "Dan Flowers Education and Training Facility" at Engineering Research Center is named in his honor.

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UNIVERSITY OF ARKANSAS
COLLEGE OF ENGINEERING