

TEXAS TRANSPORTATION Researcher

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The Best & Brightest

*Learning in TTI's
Living Laboratory*



ON THE COVER: Students walk the halls of academe at Texas A&M University on their way to class. Texas A&M provides the best of both worlds: first-rate classroom instruction combined with hands-on experiential learning at Texas A&M University System agencies like the Texas Transportation Institute.



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TEXAS TRANSPORTATION Researcher

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The Future Requires Original Thinking



by Dennis Christiansen
Agency Director

When I became director of the Texas Transportation Institute (TTI) in 2006, I inherited a number of initiatives from our Director Emeritus Herb Richardson.

Herb built on the accomplishments of previous directors and left TTI in excellent shape, especially in terms of our relationships with the academic sector.

Before becoming agency director, Herb served as both dean and vice chancellor of engineering at Texas A&M University and chancellor of The Texas A&M University System. Part of his job involved strengthening the relationship between Texas A&M's academic institutions and the A&M System agencies. He emphasized that students have the unique opportunity of receiving both first-class instruction and invaluable, hands-on training experiences at the agencies in pursuit of their degrees at Texas A&M. As educators and mentors, we do whatever we can to help students get the most from those experiences.

Creating Well-Rounded Transportation Professionals

Transportation, while an important discipline all its own, cuts across all facets of our daily lives. Transportation planning today recognizes this. While it used to be the philosophy to "build a road and someone will use it," the modern planning model looks at that road in a smarter way. Questions modern planners ask include:

- Is the road truly needed?
- How does the road's placement affect mobility?

- Does it connect neighborhoods to schools/shopping/recreational activities?
- What is the economic impact of this particular road and those it connects to?
- Is the road friendly to bicyclists and pedestrians?
- Can the road carry buses and large trucks as easily as sedans and motorcycles?
- Is technology appropriately included in the project?

Clearly, training transportation engineers today requires a different training model than when I went to school.

Solving transportation problems is more challenging than it used to be because the problems themselves are more complex. As a result, employers tell me they look for more than technical knowledge when it comes to hiring freshly minted transportation professionals; they look for the ability to *think critically*, to innovate — not only to think outside the box, but to question if the box is even constructed correctly in the first place.

This issue of *Researcher* addresses how TTI continues to cultivate partnerships with Texas A&M and other academic institutions to do just that. Texas A&M hands students the raw materials of knowledge; TTI helps them temper that knowledge

in a living laboratory of learning. It's this symbiotic approach to education that helps enable Texas A&M to shape the brightest young minds into the original thinkers of tomorrow.

Looking to the Future

Because transportation impacts every aspect of modern life, it stands to reason that decisions made by transportation professionals do the same. With that in mind, TTI researchers work closely with our academic partners to create a broader spectrum of knowledge for Texas A&M students to call on.

In TTI's case, that means giving students the opportunity to participate in research projects and create implementable products and solutions alongside their more experienced mentors. TTI offers Texas A&M students the chance to put theory into practice by *doing*.

Yet, the value of research is not simply the end product — the new technical specification, the improved process or the innovative technology discovered. It's also found in the learning experience itself, when those tumblers click into place in the young minds of our students, and they learn to think over, under, around and outside that box of *what is already known*. It's that ability to *innovate* — to redesign the box to be better — that results from TTI's academic partnerships.

The investment is measurable in dollars and resources; the return is priceless. ■

Agricultural Economics and TTI

Deeply Rooted Together in Education



Sorghum is a crop traditionally used in many different products: animal feed, ethanol, molasses, syrup and beer. Through selective breeding, parts of sorghum — namely the grain, stalk, juice and leaves — could become a future cornerstone of the bioenergy industry.

“The association we have with TTI is deep and rich. These projects have helped us think outside the box and given us access to TTI sources that we would not have otherwise. As a result, our students and faculty members are using their talents in a lot of different ways. And that helps us grow as a department.”

Dr. John Nichols, head of AgEco

One of the most robust relationships the Texas Transportation Institute (TTI) enjoys with Texas A&M University is through its partnership with the Department of Agricultural Economics (AgEco). There is, of course, an obvious transportation connection of getting food to market and all that entails. But the organizations’ respective roots are more closely tied than that.

In 1950 — the year TTI was established — the late Charley Wootan, who went on to be a director for TTI, graduated with an agricultural economics degree from Texas A&M. He joined TTI in 1956 as an associate research economist and became the Institute’s director in 1976. Under his leadership, TTI grew into the largest university-based transportation research agency in the nation.

Fast-forward to 2011.

Graduate student Alicia Israel was looking for a challenging project as part of her work on a master’s degree through AgEco. Her undergraduate degree in applied mathematics had little to do with transportation, so the project — which examined the transportation issues faced by rural elderly people — provided the opportunity to learn a new aspect of her chosen field.

"I grew up in Pleasanton, south of San Antonio, so I do have rural roots," Israel says. "My mother has a courier business there and is often asked by elderly neighbors for rides to San Antonio. Although I had no background in transportation research, I knew this project was worthwhile and could help with quality-of-life issues that many people without access to public transit face."

The Value of Non-medical Transportation for Improving the Quality of Life for the Rural Elderly is one of numerous TTI/AgEco joint projects funded by TTI's University Transportation Center for Mobility™ (UTCM).

"The association we have with TTI is deep and rich," Dr. John Nichols, head of AgEco, says. "These projects have helped us think outside the box and given us access to TTI sources that we would not have otherwise."

Nichols likes the idea of bringing new people with different perspectives into projects. "As a result, our students and faculty members are using their talents in a lot of different ways. And that helps us grow as a department."

Creating the opportunity for that growth did not happen by accident. In 2007, TTI Director Dennis Christiansen and Director Emeritus Herb Richardson formed an executive committee for the newly formed UTCM.

"Their vision was to have input from various people from across the



As our population ages, access to goods and services becomes an issue, especially for those living in rural areas. The issue of public transportation for the rural elderly hit home for Alicia Israel, a Texas A&M graduate student.



Getting goods to market cost effectively is a perennial challenge, and historically inland waterways have provided one of the most reliable shipping methods. Research into inland waterway transportation became the basis for two recent research projects between TTI and AgEco.

university," Nichols says. And he would know. Nichols has been a member of the committee since its formation.

"Dr. Nichols has been an invaluable member of UTCM's executive committee," UTCM Director Melissa Tooley says. "His participation is integral to our success. We appreciate his input and his enthusiasm for finding new ways to work together — it's clear why Texas A&M has one of the most respected agricultural economics departments in the country."

Among the other joint projects between UTCM and AgEco are:

- Improving Intermodal Connectivity in Rural Areas to Enhance Transportation Efficiency: A Case Study,
- Valuation of Buyout Options in Comprehensive Development Agreements,
- Bio-fuels Energy Policy and Grain Transportation Flows: Implications for Inland Waterways and Short-Sea Shipping,
- Statistical Analysis of Waterway Network Congestion: Causes and Costs, and
- Effect of Climate Change on Transportation Flows and Inland Waterways due to Climate-Induced Shifts in Crop Production Patterns.

"Before this project I did a lot of statistical analysis. Now, I realize the human impact of the work we do. It was challenging, but it was an extremely rewarding experience."

Alicia Israel, graduate student

With a strong history of working together on meaningful projects, the TTI/AgEco affiliation bodes well for the future of this partnership in education.

"The connection has certainly allowed us the chance to bring in graduate students and give them opportunities they would not have otherwise," Nichols says.

As for student Alicia Israel, the South Texas native wrote her master's thesis on the work she did on the joint TTI/AgEco rural transportation project. She is the first person in her family to go to college and, in May, graduated with her master's degree.

"Before this project I did a lot of statistical analysis," she says. "Now, I realize the human impact of the work we do. It was challenging, but it was an extremely rewarding experience." ■



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TTI and the George Bush School of Government and Public Service

A Presidential Partnership

We might not think about it this way, but every time we buy a gallon of gas — and pay the state and federal taxes associated with it — we illustrate how transportation is inextricably tied to public policy and politics. It's only natural then that the George Bush School of Government and Public Service and the Texas Transportation Institute (TTI) would become partners soon after the school's opening, bringing together some of the nation's top talent in public policy and transportation research.

The partnership covers many dimensions, says Dr. Arnold Vedlitz, Bush School professor and director of the Institute for Science, Technology and Public Policy (ISTPP). They include teaching, student involvement, advisory board service, research and publishing. Joint efforts have spanned numerous topic areas, including infrastructure, air quality, climate change and transportation finance.

Urban Decision Making

TTI Senior Research Engineer Tim Lomax worked with Bush School researchers and the City of Houston to produce a decision support system to assist local governments in making infrastructure decisions in a way that balances the competing influences of environmental issues, engineering and planning, and politics. The work was funded through one of the first National Science Foundation grants ever led by TTI.

Local governments devote a generous share of their annual budgets to streets, water and wastewater systems, and other infrastructure needs that require ongoing maintenance, repair and expansion.

Professionals in planning, engineering and public works — along with elected officials — all bring forth different perspectives and concerns in the process of providing services that taxpayers typically don't understand and frequently take for granted. In such an environment, the need for informed and effective decision making can hardly be overstated.

"Our Texas A&M team developed a framework that explicitly incorporates the different perspectives and data from technical, policy and political professionals; this linkage offers a richer and more open decision process," says Lomax. "Working with professionals and politicians in Houston, we were able to understand how things really happen, as well as envision a more transparent process that is based on everyone's needs and concerns."

Climate Change and Transportation Planning

In a transportation sense, climate change goes well beyond the narrow environmental definition. Rather than focusing on the causes that typically spark passionate debate, a study by Bush School

"Our Texas A&M team developed a framework that explicitly incorporates the different perspectives and data from technical, policy and political professionals; this linkage offers a richer and more open decision process. Working with professionals and politicians in Houston, we were able to understand how things really happen, as well as envision a more transparent process that is based on everyone's needs and concerns."

Tim Lomax, TTI senior research engineer

Associate Research Scientist Eric Lindquist instead sought to examine its effects and potential impacts on the nation's mobility.

Lindquist's study offers insight into how transportation planners and decision makers can more readily adapt to the challenges outlined by climate scientists. Such changes include:

- increased frequency of very hot days and heat waves,
- increases in arctic temperatures,
- rising sea levels, and
- increases in hurricane intensity.

The project's final report provides a framework for professionals involved in transportation planning and policy, particularly those in coastal areas. The work, funded in part through TTI's University Transportation Center for Mobility™, added significantly to the so-far very limited body of research on the link between climate change and transportation policy.

Mileage-Based User Fees

The population in Texas is growing, and transportation revenue sources are shrinking, creating a gap between mobility needs and solutions that grows wider with each passing day. As a result, policy makers are exploring new ways to pay for roadways, including the application of mileage-based user fees. Lindquist and Trey Baker, an associate transportation researcher at TTI (and Bush School graduate), assisted TTI Senior Research Engineer Ginger Goodin with her work



Population growth is prompting research into alternative sources for transportation funding.

"Both partners know they can depend on one another to deliver high-quality work, on time and with clearly delineated attribution and credit. For us, this means we can count on TTI to support our graduate teaching program and our research and publication efforts. And for TTI, they know that the Bush School and ISTPP will do whatever they can to help TTI achieve its goals and meet its legislative mandates."

Dr. Arnold Vedlitz, Bush School professor and director of the Institute for Science, Technology and Public Policy

examining the feasibility of those fees as an alternative to the motor fuel tax in rural and small urban areas.

The researchers collected an extensive amount of public perception data and identified the issues that represented public acceptance barriers to a shift in transportation-funding methods. They also developed a broad framework for the mileage-based alternative based on that public feedback, taking a first step toward pilot testing for such a program in northeast Texas.



The Bush School and TTI supported a campaign designed to reduce auto emissions statewide.

Drive Clean Across Texas

For nearly 10 years, the Lone Star State has sponsored the Drive Clean Across Texas (DCAT) campaign, designed to encourage decisions by drivers that will reduce the volume of auto emissions and help the state comply with federal clean air requirements. From the beginning, the Bush School conducted periodic surveys to gauge the campaign's success.

In a 2003 survey, 23.7 percent of those surveyed had heard of an air quality campaign. By 2007, 40.6 percent of those surveyed were aware of the DCAT campaign specifically. Similarly, in 2003 only 25 percent of survey respondents reported that they had made one or more changes in their behavior (carpooling, using public transportation, properly maintaining their vehicle, checking tire pressure or reducing idling, for example), but by 2008 that number had grown to 62.8 percent.

Graduate Student Internships

Numerous Bush School students have worked as interns while pursuing their graduate degrees, most nota-

bly in the Master of Public Service and Administration program. The students produced white papers on important policy topics — including traffic safety culture, passenger rail transportation and the use of ignition interlocks for DWI offenders — and analyzed more than 200 bills related to transportation that were filed during the 2011 legislative session.

In nearly 10 years of collaboration, the Bush School and TTI have developed a working relationship based on mutual respect and trust, says Dr. Vedlitz, who also serves as a member of the advisory board for TTI's Center for Transportation Safety.

"Both partners know they can depend on one another to deliver high-quality work, on time and with clearly delineated attribution and credit," he says. "For us, this means we can count on TTI to support our graduate teaching program and our research and publication efforts. And for TTI, they know that the Bush School and ISTPP will do whatever they can to help TTI achieve its goals and meet its legislative mandates." ■



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On Deck

TTI's Young Professionals Step Up

The first string heavy hitters are not the only key ingredient to a strong baseball team. For a team to be just as good next year, you have to groom the up-and-coming green players on the bench or in the bull pen for greatness. The Texas Transportation Institute (TTI) has made a tradition out of seeking promising young professionals to join the research ranks, ensuring a strong future for the Institute.

Earned Certificate in Transportation Planning (CTP) at TTI

Nick Norboge

Grad school: Texas A&M Bush School
Assistant Transportation Researcher
Mobility Analysis

Kristi Miller

Grad school: Texas A&M Urban Planning
Associate Transportation Researcher
Research and Implementation

Matt Sandidge

Grad school: Texas A&M Urban Planning
Assistant Transportation Researcher
Transit Mobility Program

Suzie Edrington

Grad school: Texas A&M Urban Planning
Assistant Research Scientist
Transit Mobility Program

Jon Brooks

Grad school: Texas A&M Urban Planning
Assistant Transportation Researcher
Transit Mobility Program

Phil Lasley

Grad school: Texas A&M Urban Planning
Assistant Transportation Researcher
Mobility Analysis

Graduate to Full-Time Employees

Tara Ramani

Grad school: Texas A&M Civil Engineering
Assistant Research Scientist
Air Quality Studies

Trey Baker

Grad school: Texas A&M Bush School
Associate Transportation Researcher
Mobility Management

Michael Yager

Grad school: Texas A&M Industrial
and Systems Engineering
Associate Transportation Researcher
Multimodal Freight Transportation



"In my tenure at TTI, we've always been able to attract the best and the brightest of graduate students, and the recent group is at the top of the class. They are all excellent researchers," says TTI Executive Associate Agency Director Katie Turnbull.

Many of these new faces came to TTI as graduate students and stayed as full-time employees. Veteran researchers cite fresh perspectives — especially on emerging technology — as the biggest benefit to having young professionals on a research team.

"Fresh ideas are always welcome. Graduate students often bring new methods or familiarity with another approach to an issue that adds to the quality of our research products," says Curtis Morgan, manager of TTI's Multimodal Freight Transportation Programs.

While bringing the latest state-of-the-practice to a team, graduate students benefit by gaining real-world experience, which makes their transition into the professional world easier.

"The key thing that TTI does is integrate students into all facets of research to give them a broad experience of the research process: meetings with sponsors, literature reviews, data collection. These students gain a comprehensive picture of research instead of just a slice," says Turnbull. "The academic programs can market to prospective students to come to Texas A&M for an excellent education and get

valuable research experience with TTI at the same time."

Another major draw to Texas A&M University is the Graduate Certificate in Transportation Planning (CTP), a multidisciplinary program developed between Texas A&M's Department of Landscape Architecture and Urban Planning, the Department of Civil Engineering, and the Bush School of Government and Public Service. The CTP aims at providing students the knowledge to be broadly successful in the transportation profession, and offers specialized instruction tailored to building their skills and capabilities in three critical areas: multimodal systems planning, transportation and urban design, and transportation policy. Soon, the CTP will add a transit management track as well. (See the sidebar on page 11 for more about the CTP.)

"Once we produce remarkable young graduates, it is especially nice to integrate them into our programs," says Cinde Weatherby, director of the Center for Strategic Transportation Solutions at TTI. "Our graduate students and young professionals bring to projects their energy and real thirst for learning; they want to be challenged and empowered to make a difference. I believe that they really are making a difference in our programs." ■



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and Systems Engineering
Associate Transportation Researcher
Human Factors

Jason Wagner

Grad school: Texas A&M Bush School
Associate Transportation Researcher
Planning and Evaluation Group

Michael Brackin

Grad school: Texas A&M Civil Engineering
Associate Transportation Researcher
Crashworthy Structures

Nick Wood

Grad school: Georgia Tech
Assistant Transportation Researcher
Mobility Management

Ipek Sener

Grad school: The University of
Texas-Austin
Associate Transportation Researcher
Travel Forecasting

Currently Seeking CTP

Lisa Larsen

Grad school: Texas A&M Civil Engineering
Graduate Research Assistant
Transportation Planning

Brittney Weathers

Grad school: Texas A&M Urban Planning
Graduate Research Assistant
Mobility Analysis

Shailesh Chandra

Grad school: Texas A&M Civil Engineering
Graduate Research Assistant
Mobility Analysis

Ben Sperry

Grad school: Texas A&M Civil Engineering
Associate Transportation Researcher
Multimodal Freight Transportation

Teaming, Teaching, Transforming Minds

TTI and the Department of Landscape Architecture and Urban Planning

From the building of the first Roman roads, a symbiotic relationship between transportation and planning has existed. “It’s the nature of the relationship that’s changed over time,” says Dr. Forster Ndubisi, department head of Texas A&M University’s Department of Landscape Architecture and Urban Planning (LAUP). “For most of the 20th century, engineers decided what needed to go where. In the 21st century, that’s changing a bit.”

Take the Interstate Highway System, for example. Most would agree that its construction enabled unparalleled economic growth for the United States. There was a downside, however.

“It encouraged suburban sprawl,” notes Dr. Shannon Van Zandt, coordinator of LAUP’s Master of Urban Planning program. “Our communities spread out, and that created new problems.”

That’s where urban planning comes in. Planners look ahead to see how community planning and design can maximize efficiencies and minimize human costs. To see how growth occurs, look at a large city from the top down and note the concentric highways, or loops, ringing its interior. “Like rings in a tree, traffic loops tell you something about the growth patterns of cities,” says Van Zandt.

But planning is complex and takes multiple perspectives to piece together the big picture. One thing that every LAUP graduate learns is that the value of a community — its people, buildings, access, design and economic prosperity — is greater than the sum of its parts.

A Natural Partnership

TOD, or transit-oriented development, for instance, is one of the modern approaches to planning communities. TOD is founded on the notion of sustainability — or building a long-lasting, environmentally friendly, energy-efficient and multimodal transportation system. That’s where LAUP’s partnership with the Texas Transportation Institute (TTI) comes in.

“Like rings in a tree, traffic loops tell you something about the growth patterns of cities.”

Dr. Shannon Van Zandt, coordinator of LAUP’s Master of Urban Planning Program



Traffic loops, like Loop 1 in Austin, Texas, can indicate growth patterns of major cities. Modern transportation planning places the concepts of livability and sustainability co-equal with mobility, in part to undo some of the problems created by the suburbanization phenomenon of the late 20th century.

“Marrying the concerns of modern transportation planning with TTI’s expertise helps leverage the strengths of both organizations to everyone’s advantage,” says Dr. Kenneth Joh, assistant research scientist with TTI, assistant professor and LAUP’s program coordinator for the Graduate Certificate in Transportation Planning (see sidebar).

Modern planning strives to undo suburban sprawl by creating cozier, closer-knit communities that rely more on foot traffic and cycling and less on the automobile. This live-work-play approach, as it’s called, seeks to create communities where citizens, and particularly those who may not drive, can do all three in virtually the same space.



Mixed-use developments, like this one in Austin, Texas, provide easy access for residents to shops, restaurants and park areas, creating the live-work-play ideal of modern planners. Often these developments have shops and businesses on the first floor with residential areas above. Bazaars, where local businesses come out to residents and literally set up shop, bring communities together in a common area.

Enter TTI, whose mission to solve transportation problems and train tomorrow's transportation professionals is a natural fit with LAUP's. Partnering enables a multidisciplinary approach to solving multifaceted problems with multimodal solutions.

"It's not enough anymore to simply build our way out of transportation problems," says TTI Executive Associate Director Katie Turnbull, "and that's what we team with LAUP to teach students. Transportation is part of the solution but not an end unto itself."

Sharing Resources, Building Alliances for Education

Like Turnbull, numerous other TTI researchers share their real-world knowledge with students by teaching in the department. And LAUP faculty members, like Joh, lend their expertise on TTI research projects.

For TTI, LAUP provides access to innovative ideas from students just beginning to think critically about the transportation world. And TTI lends LAUP the agency's reputation as a world-class institute.

"People all over the world know TTI," acknowledges Van Zandt. "It's a big magnet for bringing students in to the department and recruiting faculty to teach here as well."

"Our partnership is robust, healthy and still growing," says Ndubisi. "TTI has sought to strengthen our relationship at every turn. But I have to especially acknowledge our alumna, Katie Turnbull, for how much she's personally given back."

Turnbull sponsors the annual \$1,000 Katherine F. Turnbull Transportation Planning Scholarship for Masters of Urban Planning. Turnbull says that she very much enjoyed the experience of getting her Ph.D. and wants to give back in a small way.

"Although I'm not involved with selecting the student," Turnbull says, "it's especially gratifying when it goes to someone who ends up employed at TTI."

In those cases, it's easy to see the TTI-LAUP connection completing a circle — like the traffic loops around a growing city — promising years to come of healthy growth through partnership. ■

The Graduate Certificate in Transportation Planning

Developed collaboratively by LAUP, TTI, Texas A&M's Department of Civil Engineering and the Bush School of Government and Public Service, the Graduate Certificate in Transportation Planning seeks to create well-rounded transportation professionals.

The certificate captures the strengths of both engineering and planning, supplementing the needs of each discipline with the knowledge of the other. Multimodal and interdisciplinary, it's the first university-wide program offered by LAUP. Any graduate student at Texas A&M can seek the certificate.

"Because it's produced at the university level, it appears on student transcripts," Ndubisi says. "And that can be very helpful when seeking employment after graduation."

TTI Research Engineer and LAUP Visiting Associate Professor Bill Eisele teaches the capstone course for the certificate. "The course provides a hands-on opportunity for students to apply what they learned from coursework," says Eisele. "They work with an actual developer to create a site plan for an 80+ acre property."

LAUP is looking to expand the reach of the certificate by offering it online to non-degree-seeking students. The department is also currently working with the American Planning Association and American Institute of Certified Planners as the two organizations develop their own certification course. ■



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A New Era

The SWUTC Adds Two New Schools to Consortium

For nearly 25 years, the Southwest Region University Transportation Center (SWUTC) has worked to develop transportation solutions and attract some of the best and brightest students into becoming the next generation of transportation leaders. Now the SWUTC is poised to continue its legacy by renewing its grant and adding two schools to its consortium.

Officials with the U.S. Department of Transportation's (USDOT's) Research and Innovative Technology Administration met with the Texas Transportation Institute (TTI) and other the SWUTC consortium members on March 21 in College Station, Texas, to officially kick off the grant. TTI leads the consortium that includes Texas A&M University, The University of Texas at Austin, Texas Southern University (TSU), Louisiana State University (LSU) and the University of New Orleans (UNO).

"One of the things we find particularly energizing is that our consortium has added two schools from Louisiana — LSU and the University of New Orleans," says SWUTC Director Dock Burke. "These schools offer some very high-quality resources in terms of their faculty, students and some of their ongoing programs, particularly in terms of hurricane evacuation modeling

techniques and rebuilding. We believe the entire Gulf Coast will benefit from this new alliance."

The original alliance has its origins in 1987, when the Surface Transportation and Uniform Relocation Assistance Act authorized the creation of the USDOT University Transportation Centers (UTC) program. Soon after, transportation centers across the nation began operation at universities in each of the 10 federal regions through a federal grant, with dollar-for-dollar matching funds from nonfederal sources required. The SWUTC was established at The Texas A&M University System in October 1988 and has been continuously headquartered at TTI in College Station on the main Texas A&M University campus.

"When we competed for this grant, we were asked to look at the overall priorities of the national transportation program, and see if we could find within

"One of the things we find particularly energizing is that our consortium has added two schools from Louisiana — LSU and the University of New Orleans. These schools offer some very high-quality resources in terms of their faculty, students and some of their ongoing programs, particularly in terms of hurricane evacuation modeling techniques and rebuilding. We believe the entire Gulf Coast will benefit from this new alliance."

Dock Burke, SWUTC director

those priorities a place to do our work," says Burke. "When you consider our consortium members, we have a critical mass of expertise that can address almost any topic you could conceivably think of in transportation. What we are focused on for this upcoming year is funding research proposals in each of the five USDOT-outlined goals to improve safety, competitiveness, sustainability, state of good repair and livability. We are getting good response and have research

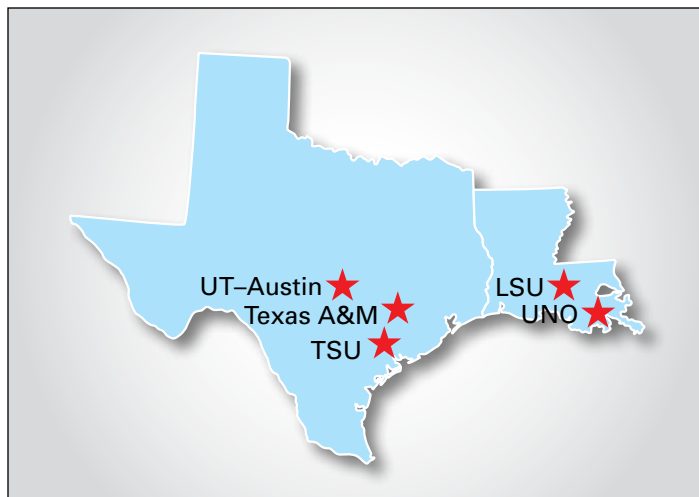
projects selected and under way, especially at TTI. We hope to have the full research program in place with the remaining members of the consortium by the beginning of the summer.”

In addition to transportation research and technology transfer, the third mission thrust of the SWUTC is to prepare young leaders for future transportation challenges. “When we were originally founded 25 years ago, the transportation industry was losing top-quality engineering graduate students to computer and electrical engineering, which were more attractive and higher-paid professions,” explains Burke. “So we started a scholarship program that’s been very successful nationwide at populating the leadership of the transportation sector with very bright graduates who are alumni of this UTC program.”

Currently, the transportation industry is experiencing a normal attrition of the top leadership in government, education and the private sector. “So now there’s an opportunity to graduate more and better students to take on those responsibilities,” says Burke. “We’re encouraged that what may have been a long-term decline in the transportation workforce sectors is now an opportunity to put our graduates to work in highly responsible positions in the industry.”

One of the enhancements to the SWUTC under the new grant is the establishment of a dissertation research program within Texas A&M’s Zachry Department of Civil Engineering (CE) that competitively select Ph.D. candidates.

“These are going to be research projects that will serve as our Ph.D. students’ dissertations,” explains SWUTC Associate Director Gene Hawkins, also an associate professor in CE. “We have set up a process by which we will evaluate research



The Southwest Region University Transportation Center consortium includes Texas A&M University, The University of Texas at Austin, Texas Southern University, Louisiana State University and the University of New Orleans.

proposals for these Ph.D. students and competitively select several of them for funding.” ■



FOR MORE INFORMATION

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Undergraduate Transportation Scholars Program

The SWUTC — through the Transportation Scholars Program, TTI and the Zachry Department of Civil Engineering at Texas A&M — established the Undergraduate Transportation Engineering Fellows Program (now called the Undergraduate Transportation Scholars Program) in 1990.

“This has been a very valuable program and has been successful in attracting some high-quality students not only from Texas A&M, but from around the country,” says Gene Hawkins, SWUTC associate director. “Typically the program has anywhere from six to nine students. It’s good for the researchers who support those students and serve as mentors, and it’s a great experience for the students.”

The 10-week program design allows students to interact directly with a Texas A&M faculty member or TTI researcher in developing a research

proposal, conducting research, and documenting the research results through oral presentations and research papers. The goal is to introduce transportation engineering to students who have demonstrated outstanding academic performance, thus developing capable and qualified future transportation leaders. Some of the student research conducted in the 2011 program was presented at the 2012 Transportation Research Board Annual Meeting in Washington, D.C.

“Transportation engineering is a dynamic field and unique in many aspects because it involves so many different disciplines and areas of expertise,” says Hawkins. “The transportation engineers of the future will not only need to be capable engineers; they will also need to be part psychologist to understand driver mentality, part banker to understand funding aspects

of transportation improvements, part politician because they work so closely with elected officials in establishing priorities and policies, and part marketer because they have to work with the general public to implement new ideas and find innovative solutions to the challenges out there. This program helps to develop these well-rounded transportation professionals.”

Burke adds, “We are pleased to have successfully competed for the \$3.5 million federal grant to pursue excellence in transportation research, education and technology transfer. Each of the SWUTC partner universities (LSU, TSU, UNO and UT-Austin) adds value to the programs here at TTI and Texas A&M to create one of the leading UTCs in the nation. This year will be one of our most exciting and challenging in our history. We are ready!”



TTI and the Zachry Department of Civil Engineering

A Natural Combination

The partnership between the Texas Transportation Institute (TTI) and the Texas A&M University Zachry Department of Civil Engineering (CE) is a natural — researchers, faculty and students working together to solve real-world problems important to the state and nation.

“Working with TTI is a big part of what we do,” says John Niedzwecki, CE head and Regents professor. “It’s not just transportation — TTI’s projects impact structural engineering, materials engineering, geotechnical engineering, construction and pavements, which are all important areas of study to CE students.”

Teaching

CE, ranked in the top 10 CE programs at public institutions in the nation, prepares students by giving them the fundamentals of civil engineering and a wealth of classroom knowledge. There’s no substitute for hands-on experience, and TTI serves as that bridge between academia and an engineering career, allowing students to work in the field while being mentored by leaders in the transportation industry.

“The undergraduate experience should prepare our students for the workplace upon graduation,” Jon Epps, TTI executive associate director and head of TTI’s Materials, Pavements

and Constructed Facilities. “When our students enter careers in transportation, they already have practical knowledge they can put to work immediately.”

TTI relies on graduate students as both employees and innovators who bring different perspectives to their research. TTI employs approximately 100 undergraduate and nearly 100 graduate students who work on research projects sponsored by state and national sponsors.

Working with students in the field, the professors gain valuable knowledge through research and bring it back into the classroom. Students benefit from direct involvement with these projects by learning how things really work.

Research

In the 1950s, early leaders like Gibb Gilchrist and DeWitt C. Greer saw the opportunity to put Texas A&M research to work for the Texas Highway Department. In 1955, Fred Benson became the first director of TTI after serving as a faculty member in CE and dean of the College of Engineering. From that perspective, you could say TTI is a product of CE, and there have always been strong linkages between the two organizations.

“Land-grant universities like Texas A&M have the mission of teaching, research and service,” says Epps. “No other partnership serves this mission better than that between TTI and CE.”

In addition to sharing researchers, TTI and CE also share research facilities. TTI maintains state-of-the-art laboratories, buildings and outdoor test beds. The CE/TTI Building on the main campus of Texas A&M University houses a portion of TTI staff, many of whom are also faculty in the CE department.

“TTI helps Civil Engineering invest in new equipment every year, asking us what we need in order to pursue new research initiatives,” says Niedzwecki. “For example, we needed higher-

“Land-grant universities like Texas A&M have the mission of teaching, research and service. No other partnership serves this mission better than that between TTI and CE.”

Jon Epps, TTI executive associate director and head of TTI’s Materials, Pavements and Constructed Facilities

CE Professor's Legacy is Educating the Young

Nearly 80 fifth graders from Johnson Elementary in Bryan, Texas, participated in a unique, hands-on educational experience at Coulter Field Airport in Bryan, April 11.

The Dr. James Noel Foundation sponsored the day's events along with support from the Bryan school district, Coulter Field, academic departments from Texas A&M University and the Texas Transportation Institute (TTI). The air fair promotes a practical application of math and science through aircraft- and aviation-related meteorological projects.

The late Dr. James Noel was an educator, teacher and friend to hundreds of students and pilots in Central Texas and around the country. As a professor in civil engineering at Texas A&M University, he influenced the lives of his students not only by his ability to explain subject matter, but by his concern for them as individuals.

"The goal of the air fair is to not only expose kids to aviation, but to apply STEM [science, technology, engineering and mathematics] concepts in an aviation environment."

Brian Heckman, vice chairman of the Dr. James Noel Foundation Board of Directors and event organizer



Students learn about water droplet distribution during the Coulter Field air fair.

"The goal of the air fair is to not only expose kids to aviation, but to apply STEM [science, technology, engineering and mathematics] concepts in an aviation environment," says Brian Heckman, vice chairman of the Dr. James Noel Foundation Board of Directors and event organizer.

"Before the air fair, we visited Johnson Elementary and, with the help of Texas A&M students, conducted several teaching exercises to prepare them for their airport visit."

A few days after the air fair, the volunteers returned to Johnson Elementary to analyze the data

students collected from their fair projects, which included an Air Tractor, glider flights and weather balloons.

"This event provides students an opportunity to interact with pilots, engineers and college students outside the classroom," says TTI Research Scientist Jeff Borowiec. "It was a great day for aviation education." ■



FOR MORE INFORMATION

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speed current capabilities in the Haynes Coastal Engineering Laboratory as it was being constructed to be able to take on some new projects, and TTI stepped up to help us purchase the needed equipment."

"Research is an important part of the undergraduate experience and a necessary part of graduate education," says Epps. "Students are valuable TTI employees who give as much as they get back."

Service

The culmination of TTI and CE's work together is service to Texas, the United States and the world. The partnership puts research into the hands of those who need it — through outreach, workshops, training, and participation in professional and technical associations.

"Service activities are a means of connecting with industry professionals," says Epps. "One of the greatest rewards of research is the implementation and use of developed research.

Service activities provide an opportunity to move research from state of the art to state of the practice."

Working with the transportation industry ensures that both TTI and CE are delivering the best research and developing the brightest transportation professionals possible.

"Looking into the future," says Niedzwecki, "I can only see this partnership strengthening as we move toward developing and applying new technologies and shared practices, and exploring educational opportunities in the broad field of transportation engineering." ■



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Updated Geometric Design Research Report Released



The Transportation Research Board recently published *NCHRP Synthesis 432: Recent Roadway Geometric Design Research for Improved Safety and Operations* for

the National Cooperative Highway Research Program. The report, written by TTI Associate Research Engineer Marcus Brewer, reviews and summarizes roadway geometric design literature completed and published from 2001 through early 2011. It emphasizes impacts on safety and operations, such as intersection control and roundabouts.

NCHRP Synthesis 432's structure corresponds to chapters in the American Association of State Highway and Transportation Officials' *A Policy on Geometric Design of Highways and Streets*, more commonly referred to as the Green Book.

"Being able to see it through from start to finish was very rewarding," says Brewer. "There are more than 100 references coming from a variety of sources, including many reports that other TTI people have done. We want this to be a one-stop shop for people to come to and find the latest research related to design issues for the past 10 years."

Additional information on *NCHRP Synthesis Report 432*, and how to obtain a copy, can be found at <http://www.trb.org/Main/Blurbs/166996.aspx>. ■

TTI Recognized by Women's Transportation Seminar International

A TTI project designed to improve community bicycle facilities received the Women's Transportation Seminar (WTS) International 2011 Innovative Solutions Award at the organization's annual conference in Denver in May.

The project, Using Smartphones to Collect Bicycle Travel Data in Texas, was first honored March 30 with the WTS Heart of Texas (HOT) chapter's Innovative Transportation Solutions Award. International winners are selected from the many local chapter awards winners.

"This was an unexpected honor locally, but to win on the international level as well was especially exciting," says TTI Associate Research Engineer Joan Hudson, who led the project.

The project tested a smartphone application's effectiveness in tracking bicyclists' travel routes, logging a total of 3,000 bicycle trips. A final report will determine if the data collection method will be useful for communities wanting to improve bicycle facilities.

WTS's HOT chapter also honored TTI Planning Division Head Ginger Goodin with its 2011 Woman of the

Year award. The award "honors a woman who is an outstanding role model and has contributed to the advancement of women and minorities in transportation."

"I'm very humbled to have been selected for this award," Goodin says. "The women recognized in the past are community leaders, women I

look up to. To be included in the company of such an elite group is a huge honor for me." Goodin is nationally known for her research on mileage-based user fees and as an expert on managed lanes.

The WTS HOT chapter awards also included nominations for TTI itself as Employer of the Year and TTI Director of the

Center for Strategic Transportation Solutions Cinde Weatherby as Member of the Year. The Texas 2030 Committee — which examined the state's transportation needs for the next 20 years and was staffed by TTI, The University of Texas (UT) at Austin and UT–San Antonio — was nominated for the Innovative Transportation Solutions Award. ■



TTI's Ginger Goodin (right) with Melinda Clary, president of the WTS International Heart of Texas Chapter, at the recent Awards and Scholarship Gala.

Study Argues for Wider Edge-Line Markings on Rural Two-Lane Highways



Sponsored by the American Glass Bead Manufacturers' Association (AGBMA), a recent TTI study provides the most compelling evidence yet that wider paint lines on roadway shoulders (commonly called edge lines) are a cost-effective, statistically sound approach to reducing crashes and fatalities on rural two-lane highways.

"This is the first formal evidence of a correlation between wider edge lines and improved crash safety," said TTI Research Engineer Paul Carlson, one of the authors of the study. "Previous studies over the last 10 years were small and lacked data to provide statistically significant results."

The study demonstrates that wider edge lines can reduce total crashes by 15-30 percent and fatal plus injury crashes 15-38 percent. In addition, the benefit-cost ratio for wider

edge lines is \$33 to \$55 for each \$1 spent, similar to shoulder rumble strips. If an agency is considering installing rumble strips as a safety countermeasure but is concerned about potential noise or pushback from the bicycle community, wider edge lines appear to offer similar results but without the concerns, according to the report.

The study also suggests that the *Manual on Uniform Traffic Control Devices* (MUTCD) amend its minimum edge-line width on rural two-lane highways to six inches.

"With the ultimate goal being highway safety, transportation agencies across the U.S. now have strong data to support the undertaking of a relatively low-cost measure to improve highway safety and reduce fatalities," said Kevin Goforth, president of AGBMA. ■

Turnbull Cited for Excellence in Applied Research



TTI Executive Associate Agency Director Katie Turnbull received recognition from the Transportation Research Board (TRB) Managed Lanes Committee on May 23 for her

contribution to high-occupancy vehicle (HOV) and high-occupancy toll (HOT) research, an effort spanning more than 20 years.

The citation states that “[Turnbull’s research findings] and her hands-on involvement in specific projects have provided practitioners with the tools and information needed to plan, develop and operate HOV and HOT lanes in the U.S. and abroad for the past two decades, providing the foundation for new applications of managed lanes today.”

The Managed Lanes Committee’s Excellence in Applied Research Award recognizes an individual’s contribution to advancing the practice of applied research through his or her groundbreaking and innovative ideas. Qualification for the award includes one’s research resulting in “changes and improvements in activities by implementing agencies and a heightened understanding and acceptance between operating agencies and researchers.”

“It is an honor to be acknowledged for helping advance applied research in HOV and HOT lanes,” notes Turnbull. “TTI has a history of research in this area, and it is especially gratifying to be recognized by one’s peers on a TRB committee.” ■

Carlson Profiled in *TR News*



Paul Carlson, head of TTI’s Operations and Roadway Safety Division, was recently profiled in *TR News*, published by the Transportation Research Board (TRB) of the National Academies. Carlson currently serves as the chair of the TRB Operations and Preservation Group.

Carlson’s work continues to receive national attention. Most recently, after a five-year process, his test measurement for wet pavement markings was approved by ASTM International. Officially, it’s *ASTM E2832-12 Standard Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Continuous Wetting*.

In the *TR News* article, Carlson said, “When you find your niche, your days on the job will be fun, time will fly, and your overall quality of life will be top-notch.” ■

Amy Epps Martin Wins AAPT Award, Elected to Board of Directors

TTI Research Engineer Amy Epps Martin was recently awarded the Association of Asphalt Paving Technologists (AAPT) Board of Directors Award of Recognition during their annual meeting in Austin, Texas. Epps Martin also began her term as one of two AAPT directors at large.

“I’ve been involved with this organization for several years, so it was a big honor to receive this award,” says Epps Martin, who is also a professor of materials engineering at Texas A&M University.

AAPT is a leader in the advancement of asphalt paving technology with over 800 members from every continent in the world. Members depend on the association as an authoritative source for the latest developments in the field and as a hub for communicating with fellow professionals. The organization meets annually, and their activities include asphalt-related technical sessions, symposia, poster sessions and workshops presented by experts in all aspects of asphalt paving technology from around the world. ■

TTI to Study High-Speed Rail in Texas

TTI has signed a three-year interagency contract with the Texas Department of Transportation (TxDOT) to study high-speed rail and help determine its viability in the Lone Star State. Two Texas high-speed rail corridors are currently being considered: one connects Dallas to Houston; the other would stretch from Oklahoma City to South Texas.

“High-speed rail needs to be thoroughly investigated and researched,” TTI Manager of Rail Passenger Research John Sedlak says. He’s the principal investigator on the contract and was recently hired by TTI to lead the project. Sedlak spent his career planning and designing major transit projects, including Atlanta’s rapid rail system and Houston’s first light-rail project. He was Houston Metro’s executive vice president before retiring last year.

“Our job is to compile all the facts about high-speed rail — the existing and planned operations around the world and the corridors that are proposed for Texas. It’s a big undertaking,” Sedlak says. “TTI will assist TxDOT in educating decision makers, stakeholders, and interested groups and individuals on proposed high-speed rail. The research effort will also identify the roles that the state and TxDOT might play in advancing high-speed rail.” ■



TTI Executive Associate Director Jon Epps, TTI Research Engineer Amy Epps Martin and Jonna Epps.

TTI Has Major Role in State Congestion Relief Proposals

After months of working with local agencies about proposed transportation projects in the most congested corridors in the state, TTI presented a detailed report to the Texas Transportation Commission Feb. 23.

The document, titled *Mobility Investment Priorities — Early Recommendations Report*, includes recommendations that will advance major projects to improve mobility for the areas of the state with the most congestion — Austin, Dallas-Fort Worth, Houston and San Antonio.

"We are working with the Texas Department of Transportation (TxDOT) on an interagency agreement to coordinate studies, identifying projects that will have the greatest impact on congestion," says Tim Lomax, TTI senior research engineer and TTI's project leader. "And just as important, TTI's work will examine how the state can pay for the improvements."

The Mobility Investment Priorities Project was developed in coordination with agencies in each of the four metropolitan areas to identify studies, identify design efforts, or purchase

rights-of-way that meet the goals of the Rider 42 legislation, which allocated \$300 million in Proposition 12 bond proceeds. TTI will help implement the studies that examine congestion relief and the resulting economic benefits.

"This is a two-year project and is really a team effort," Lomax points out. TTI is working closely with metropolitan planning organizations, regional mobility authorities, city and county governments, transit agencies, and others on the TxDOT interagency contract. "The goal of all this is to make sure the improvement plans reflect the needs of local entities and local commuters."

After the Institute's first recommendation report is examined, TTI Research Scientist Dave Ellis will begin the economic analysis process. "We have the TRENDS model and other tools to examine a menu of potential funding options for policy makers and to assess the potential economic impact of the projects," he says.

TTI's final report to the commission is expected in August 2013. ■

TTI's Weatherby Elected to WTS International Board



Weatherby

Cinde Weatherby, director of the Center for Strategic Transportation Solutions at TTI, began a two-year term on the Women's Transportation Seminar (WTS) International Board of Directors in May. She has been an active member in both the Greater Dallas-Fort Worth and Heart of Texas (HOT) chapters of the organization.

WTS International boasts nearly 5,000 members — both men and women — in 49 local chapters across the United States, Canada and the United Kingdom. The HOT chapter has also sponsored one of the few student chapters in the country at The University of Texas. The international association was established in 1977 to help women "find opportunity and recognition in the transportation industry."

Weatherby was also recently spotlighted in the March edition of the Transportation Research Board's Strategic Management Committee newsletter as the committee's featured member. When asked her biggest transportation fear in the article, she responded: "Funding is the thing that gives me the most worry. We are not the little boy calling wolf. Our infrastructure, if not already, will soon be in a crisis." ■

Texas Transportation Institute
The Texas A&M University System

For more information about these news items or other media inquiries regarding TTI research, please contact Rick Davenport at (979) 862-3763 or r-davenport@tamu.edu.

TTI Employees Honored for Patents

TTI researchers have been honored by The Texas A&M University System Office of Technology Commercialization for a highway safety product patent issued in 2011. Patent number US 7,883,075 B2 is for a new guardrail end terminal they designed and tested. The product will soon be manufactured by Trinity Highway Products.

Akram Abu-Odeh, Gene Buth, Lance Bullard, Dean Alberson and Roger Bligh, all from TTI's Roadside Safety and Physical Security Division, were honored for their invention, which will be marketed under the name Soft Stop.

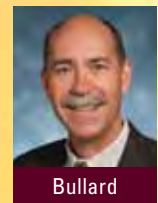
"I believe this new guardrail system is the next generation of end terminals," Dean Alberson, TTI assistant agency director, explains. When the end terminal is struck by a vehicle, the tension on the guardrail is not released like the other guardrail terminals. "Upon impact, the Soft Stop terminal squeezes the guardrail vertically into a series of folded plates that are diverted under the vehicle once they exit the head of the device," Alberson explains. ■



Abu-Odeh



Buth



Bullard



Alberson



Bligh

Vice Chancellor Spends the Day at TTI

Dr. M. Katherine Banks, vice chancellor for engineering at The Texas A&M University System, director of the Texas Engineering Experiment Station (TEES), and dean of the Dwight Look College of Engineering, made her first official visit to TTI on March 22. She was accompanied by Dr. Dennis O'Neal, associate dean for research and deputy director of TEES. They were treated to a day filled with tours, briefings and a roundtable discussion with some of TTI's key academic partners.

In her opening comments, Banks noted that she was already familiar with TTI through Purdue University's transportation research program. She previously served as the Bowen engineering head for the School of Civil Engineering at Purdue University.

After hearing an overview of the Institute from TTI Agency Director Dennis Christiansen, Banks and O'Neal visited TTI's Environmental and Emissions Research Facility and the Institute's Roadside Safety and Physical Security crash-testing facility.

"These and other TTI facilities provide unique opportunities for students to temper classroom knowledge with practical know-how," Banks says. "Employers tell me they hire our graduates because they know they're getting more than technical knowledge; they're getting the ability to think critically. I attribute that ability to the dual approach of classroom instruction and real-world training that our students receive in 'living laboratories' like these."

During her visit, Banks joined in an academic roundtable discussion attended by Forster Ndubisi, head of the Department of Landscape Architecture and Urban Planning; John Nichols, head of the Department of Agricultural Economics; and Arnold Vedlitz, director of the Institute for Science, Technology

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Dr. M. Katherine Banks, vice chancellor for engineering at The Texas A&M University System, director of the Texas Engineering Experiment Station, and dean of the Dwight Look College of Engineering



Dr. M. Katherine Banks (center), the new vice chancellor for engineering, visits TTI for the first time. Posing with Banks are (from left to right) TTI Assistant Agency Director Gene Buth, TTI Executive Associate Agency Director Katie Turnbull, TEES Deputy Director Dennis O'Neal, TTI Agency Director Dennis Christiansen and TTI Executive Associate Agency Director Don Bugh.

and Public Policy at the George Bush School of Government and Public Service, all at Texas A&M. (See related stories in this issue on how TTI works with these academic partners to educate future transportation professionals.)

"Today, 25 million Texans are counting on our universities to create new knowledge, discover new technologies and pass along our tradition of research excellence to the next generation," says Banks. "TTI's role in training tomorrow's transportation professionals is vital to our nation's future, particularly in light of growing economic competition around the globe."



Doh-Won Lee (far right) of the Air Quality Studies Program describes equipment for Banks (center) during her tour of the Environmental and Emissions Research Facility. Looking on are Dr. Dennis O'Neal, TEES deputy director (second from right) and TTI staff.

TTI researchers and staff also gave the vice chancellor a crash course in crash testing, policy research, legislative studies, sustainability research and projects under way in TTI's urban offices around the state.

"We were honored that Dr. Banks took the time to spend almost an entire day at TTI learning more about our research initiatives, meeting our leadership and interacting with our academic partners," Christiansen says. "She has been a great supporter of TTI during her short time at Texas A&M, and we look forward to inviting her back to TTI many more times in the future." ■



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TEXAS TRANSPORTATION INSTITUTE

Publications

VIDEO SUMMARY REPORTS

Video summary reports are available on the Texas Department of Transportation's Research and Technology Implementation Office's YouTube channel at [YouTube/bestpracticesvrsr/](https://www.youtube.com/channel/UCbestpracticesvrsr/).

Development of Very Thin Overlay Systems, **0-5598**.

Evaluation of Modern Traffic Control Devices to Improve Safety at Rural Intersections, **0-6462**.

FDR (Full-Depth-Reclamation) Performance Based Design, Construction, and Quality Control, **0-6271**.

Performance Evaluation and Mix Design for High RAP Mixtures, **0-6092**.

Preparing for EPA Effluent Limitation Guidelines, **0-6638**.

TECHNICAL REPORTS

Analysis of Roadway Departure Crashes on Two-Lane Rural Roads in Texas, by Dominique Lord, **0-6031-1**, February 7, 2012.

Best Practice for Using RAS in HMA, by Fujie Zhou, **0-6614-1**, April 30, 2012.

Characterization of Exhaust Emissions from Heavy-Duty Diesel Vehicles in the HGB Area — Final Report, by Jeremy Johnson, **0-6237-1**, February 1, 2012.

Comprehensive Evaluation of Compaction of Asphalt Pavements and Development of Compaction Monitoring, by Emad Kassem, **0-6992-2**, April 19, 2012.

Development Guidance for Sign Design Standards, by Chiara Silvestri, **0-6363-1**, March 2, 2012.

Energy Developments and the Transportation Infrastructure in Texas: Impacts and Strategies, by Cesar Quiroga, **0-6498-1**, April 2, 2012.

Identification of Priority Rail Projects for Texas — Initial Methodology/User Manual and Guidebook, by Curtis Morgan, **0-6467-1**, May 15, 2012.

Implementation of the Soil Compactor Analyzer into Test Method TEX-113-E: Technical Report, by Stephen Sebesta, **5-5135-01-1**, April 26, 2012.

The Overlay Tester: A Sensitivity Study to Improve Repeatability and Minimize Variability in the Test Results, by Lubinda Walubita, **0-6607-1**, April 2, 2012.

Performance Monitoring Pavements with Thermal Segregation in Texas, by Stephen Sebesta, **0-6080-1**, April 19, 2012.

Research and Recommendations for a Statewide Sign Retroreflectivity Maintenance Program, by Paul Carlson, **0-6408-1**, April 12, 2012.

Statewide Implementation of PAVE-IR in the Texas Department of Transportation, by Stephen Sebesta, **5-4577-05-1**, February 27, 2012.

Texas M-E Flexible Pavement Design System: Literature Review and Proposed Framework, by Sheng Hu, **0-6622-1**, April 11, 2012.

Unknown Foundation Determination for Scour, by Jean-Louis Briaud, **0-6604-1**, May 3, 2012.

PROJECT SUMMARY REPORTS AND PRODUCTS

Accommodating Oversize and Overweight Loads, by Dan Middleton, **0-6404-S**, March 26, 2012.

Dealing with Texas-Sized Problems around Schools: Workshop Materials, by Scott Cooner, **5-5470-01-P1**, March 14, 2012.

Develop Practical Field Guidelines for the Compaction of HMA or WMA, by Tom Scullion, **0-6992-S**, March 1, 2012.

Evaluation and Development of Pavement Scores, Performance Models and Needs Estimates, by Andrew Wimsatt, **0-6386-S**, March 1, 2012.

Flexible Base Acceptance Testing, by Tom Scullion, **0-6587-S**, March 8, 2012.

Full Depth Reclamation: Workshop Materials, by Tom Scullion, **0-6271-P2**, April 6, 2012.

Geodatabase of Energy Developments in Texas, by Cesar Quiroga, **0-6498-P1**, March 14, 2012.

Identification of Priority Rail Projects, by Curtis Morgan, **0-6467-S**, March 26, 2012.

Performance Histories of Thermally Segregated HMA, by Tom Scullion, **0-6080-S**, March 8, 2012.

Test Procedure for Surface Treatment Bond Test, by Tom Scullion, **0-6271-P3**, April 6, 2012.

TTI PUBLICATIONS

A full catalog of TTI publications and other products is online at <http://tti.tamu.edu/> publications. You can find the publications by searching for either the title or publication number listed here. Most of these publications are available as free downloads in portable document format (PDF).

Printed, bound versions of these reports are also available through the URL above.