


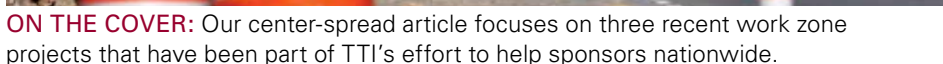
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Tightening Your Beltway in Tough Times



by Dennis Christiansen
TTI Director



Perhaps the single greatest challenge to transportation today is funding — funding to build, funding to operate, funding to maintain. Budgets are shrinking, but the driving population isn't. One way to address these competing challenges is through *innovation*.

Research and economic projections tell us that our future transportation needs far exceed our current funding levels. Conventional wisdom is that we must tighten our belts while simultaneously accommodating more system users. In short, we must “do more with less.” This

Franklin said, “Let us then up and be doing, and doing to the purpose; so by diligence shall we do more with less perplexity.” More with less, yes. But at TTI, we're also doing more with *more*. More safety . . . more efficiency . . . more innovation. These are TTI's guiding principles in conducting research in the field of transportation operations.

famous phrase — synonymous today with the idea of increasing production despite restricted resources — actually comes from *The Way to Wealth* by Benjamin Franklin. In his essay, the Founding Father proposes that if we focus our energies more directly on the task at hand rather than waste time, greater results will surely follow from increased efficiencies.

The Texas Transportation Institute (TTI) has more than 60 years of experience in improving transportation operations through research. As Franklin suggested, finding a better way usually means creating a more efficient system. This issue of the *Texas Transportation Researcher* focuses on how TTI is meeting Franklin's challenge by innovating operations research.

TTI is now home to two new transportation research centers: the Center for Strategic Transportation Solutions, created by the 81st Texas Legislature, and the Transportation Economics Center, funded by the U.S. Department of Transportation. Both centers will help map a steady course to a future transportation system that best meets our country's needs. Modeling traffic operations is key to understanding how future changes can affect tomorrow's system, and TTI researchers are integrating methods to optimize modeling results.

Protecting those who build that system is a top priority, so the Institute is working with Texas and other states to improve work zone safety for both personnel and drivers. Our Teens in the Driver Seat Program, which focuses on improving teen driver safety, has grown beyond the Lone Star State and is now saving young lives nationwide.

The Institute is also learning to leverage existing technology, like Bluetooth® devices, to improve highway operations. We're capturing lessons learned in databases to make future maintenance easier and less time consuming. And last, but certainly not least, TTI is helping the Texas Department of Transportation assess funding options to pay for our future transportation system.

Franklin said, “Let us then up and be doing, and doing to the purpose; so by diligence shall we do more with less perplexity.” More with less, yes. But at TTI, we're also doing more with *more*. More safety . . . more efficiency . . . more innovation. These are TTI's guiding principles in conducting research in the field of transportation operations. ■

Application of technology in traffic operations research goes back to earliest TTI studies

(excerpt from "A Study of Freeway Traffic Operation" by Charles J. Keese, Charles Pinnell and William R. McCasland, 38th Annual Meeting, Highway Research Board, Washington, D.C., January 5-9, 1959)



Above: Researchers used a variety of elevation towers to obtain the necessary vantage point to film above the traffic stream. This 60-foot portable tower was designed specifically for the photographic data-gathering studies.

Right: Though time-distance relationships were determined by frame count, the use of clocks on site and in the film provided researchers a check on camera speed and a record of the period of the day.

Far right: A time-motion study projector was specially constructed for the comprehensive visual analysis of motion pictures, allowing researchers to both replay and stop single frames at a fixed magnification and without warping.



In 1956, the Texas Transportation Institute initiated a research project for the Texas Highway Department to correlate freeway operational characteristics with design features. . . . The study was made principally by the motion picture method, which facilitated the simultaneous evaluation of various operational characteristics and provided the distinct advantage of being able to recreate traffic situations for more thorough study. Traffic operations were recorded on approximately 22,000 feet of 16 mm film during the course of nine separate studies made on freeways in Houston, Dallas and Fort Worth, Texas.

Research was conducted in the following areas: operation and capacity, freeway volume control, lane use and placement, entrance ramps and weaving. A study of freeway median design was also made. . . . The results of these various studies indicate that the features having the greatest effect on freeway operation are the design and operation of ramps and interchanges.

Additional research and development are needed in this area. The volume control, weaving and entrance ramp studies produced some very significant results, which are discussed in the report and will contribute to overall knowledge of freeway operation. ■



Taking It to the Streets:

Collecting travel time data, speed with Bluetooth technology



The ability to accurately estimate wait times at international border crossings is one of the goals of Bluetooth technology applications.

You might be familiar with the name Bluetooth® as a way of wirelessly talking on your cell phone. More generally, it's a personal area network that connects devices wirelessly over short distances.

Researchers at the Texas Transportation Institute (TTI) are using Bluetooth technology for a host of applications involving traveler information, traffic management and planning systems. Currently these data are collected using toll tags, GPS, license plate recognition and cellular phone networks, which can be expensive and inefficient. Data collection by Bluetooth presents a viable alternative.

How the Technology Works

Each Bluetooth device has a unique identifier called a Media Access Control (MAC) address, which the device transmits within a short range.

"A motorist with a Bluetooth-enabled device drives by a road sensor, and the sensor reads the MAC address," says Darryl Puckett, a TTI research scientist investigating uses of Bluetooth technology. "Further down the road, another sensor reads the MAC address again, and the system matches it to the first reading." Software then determines

"I see this technology as an exciting, innovative way to obtain traffic information in places where we would not otherwise be able to gather data because of the cost. Other technologies can be up to eight times more expensive than using Bluetooth technology. In some cases this is just cost-prohibitive."

*David Fink,
TxDOT TranStar Transportation
Operations Engineer*

how long it took to travel from one reader to the other and calculates the average speed.

Privacy is an important concern. MAC addresses are not directly associated with a specific user and do not contain any personal information. Users can also disable the Bluetooth function of their device to prevent it from being read.

The benefits of this anonymous wireless address matching (AWAM) system are many. A large percentage of the population has Bluetooth devices, so

the technology is easy and nonintrusive for motorists. The roadside readers are low cost and low maintenance, using standards-based, non-proprietary equipment and protocols.

Applying the Technology

Funding from the University Transportation Center for Mobility (UTCM) assisted TTI researchers in developing a full, end-to-end solution for AWAM, with the following features:

- roadside hardware and software for reading and forwarding MAC addresses,
- host software for calculating real-time and historical travel time and speed data, and
- analysis and graphics capability to view current and historical data graphically.

Border Crossings

Millions of motorists cross the U.S.-Mexico border every day, often with long delays. Current methods of determining delay — usually by visual estimates or motorist survey — are unreliable.

"Deployment of Bluetooth technology at the border is geared toward obtaining crossing times of passenger

vehicles, which can then be used to accurately estimate wait times,” says Rajat Rajbhandari, TTI associate research engineer. “This project was the first of its kind to use Bluetooth technology to gather traffic information in Texas.”

Researchers collected data at three ports of entry in the El Paso, Texas, region: the Bridge of the Americas, Ysleta and Paso Del Norte. The study confirmed that Bluetooth technology could be used to measure U.S.-Mexico border crossing times. A follow-up project will deploy Bluetooth sensors at the Ysleta port of entry in El Paso and compute the crossing time in near real time.

“We’re also working on deployment of RFID [radio frequency identification] technology at border crossings in El Paso, Laredo, Pharr and Arizona to get crossing times of commercial vehicles,” says Rajbhandari. “Crossing time information for both passenger and commercial vehicles is crucial to understand the operational and planning aspects of international border crossings.”

Urban Areas

Travel time data can help commuters choose when and what route to travel and help planners identify congested segments for operational or infrastructure improvements. TTI has worked on several projects in Texas:

- Houston commuters can check the TransStar website to see how long it will take to get to work. The partnership between Houston TranStar and TTI is investigating whether AWAM can expand this coverage to arterials.
- AWAM proof-of-concept demonstrations with the City of Houston, the Texas Department of Transportation (TxDOT) and Harris County on urban arterials showed that Bluetooth device penetration is sufficient to collect high-quality travel time data.
- In a project for TxDOT, TTI collected travel times and speeds on identical roadway segments using a toll tag reader system and the AWAM system, with comparable results.
- TTI has deployed the AWAM system at several west Houston intersections to monitor travel time for a network of urban arterials.
- TTI demonstrated the AWAM system on parallel routes to U.S. 75 North Central Expressway between Dallas and Richardson.

“We’re also working on deployment of RFID [radio frequency identification] technology at border crossings in El Paso, Laredo, Pharr and Arizona to get crossing times of commercial vehicles. Crossing time information for both passenger and commercial vehicles is crucial to understand the operational and planning aspects of international border crossings.”

*Rajat Rajbhandari,
TTI Associate Research Engineer*



A screen shot of the Houston TranStar website.

“I see this technology as an exciting, innovative way to obtain traffic information in places where we would not otherwise be able to gather data because of the cost,” says David Fink, a TxDOT transportation operations engineer with Houston TranStar. “Other technologies can be up to eight times more expensive than using Bluetooth technology. In some cases this is just cost-prohibitive.”



Puckett



Rajbhandari

MORE INFORMATION

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The anonymous wireless address matching (AWAM) concept for travel time data collection

Innovative Modeling Method Discovered in El Paso

Dress rehearsals are a common element of life. Sports teams typically have walk-throughs, weddings have rehearsal dinners, and plays have dress rehearsals. These are standard practices that don't change much but are quite valuable. Likewise, transportation agencies and professionals use modeling to simulate how changes to our transportation infrastructure will impact traffic flow.

Where modeling differs greatly from other everyday dress rehearsals is that with technology and innovation, modeling methods can, and do, evolve. During the Texas Department of Transportation's (TxDOT's) Zaragoza/Interstate Highway 10 (I-10) interchange project in El Paso, Texas, Texas Transportation Institute (TTI) Associate Research Scientist Jeff Shelton was charged with providing simulation models for evaluation purposes, but also discovered an innovative modeling method in the process.

While evaluating multiple scenarios for the Zaragoza/I-10 interchange project, Shelton determined that no single modeling method was capable of accurately simulating the scenarios this project presented. Typically, researchers use either a macroscopic, mesoscopic or microscopic model resolution depending on the situations presented by a project, but for this project Shelton found using all the model resolutions together to be advantageous over traditional methods.

"The macro, meso and micro models are not mutually exclusive," explains Shelton. "They actually complement one another and can accomplish optimal modeling capabilities. By retaining the

"The macro, meso and micro models are not mutually exclusive. They actually complement one another and can accomplish optimal modeling capabilities. By retaining the best characteristics of each model and then integrating them, a more holistic, more complete simulation is possible."

*Jeff Shelton,
TTI Associate Research Scientist*

best characteristics of each model and then integrating them, a more holistic, more complete simulation is possible."

Multi-resolution modeling (MRM) proved to be that more complete modeling system during the project

because it did just what Shelton believed it could do — it provided a more thorough and accurate simulation of the scenarios than any one single model resolution could have done. The most challenging aspect of MRM was retaining consistency between the different resolution models to ensure its accuracy.

"The project team literally spent weeks converting data for MRM during the interchange project, so I knew that MRM would need to become a more time-efficient modeling technique," says Shelton. "We worked with PTV America and the University of Arizona in developing tools that integrate VISUM, DynusT and VISSIM [various model resolution tools] and make MRM much more time efficient."

The tools they developed are the VISUM-DynusT Converter (VDC) and the DynusT-VISSIM Converter (DVC). Transportation planners can use the VDC tool to run dynamic traffic assignment (DTA) in their travel demand models and analyze the temporal and spatial distribution of traffic at any given time. Traffic engineers can use the DVC tool by converting over sub-areas from the regional mesoscopic model and converting them to a microscopic model with a high level of fidelity for detailed analyses. With the VDC and DVC tools, MRM actually presents a cost benefit because data that were taking weeks to convert can now be converted in hours.

"It comes as no surprise to me that Jeff has found a way to make a more complete and efficient modeling method because I have seen him use many different techniques on projects to ensure that the quality and accuracy of his work are at the highest level," says Gus Sanchez, project manager for TxDOT. ■



Microscopic simulation of managed lanes



MORE INFORMATION

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Teens in the Driver Seat Program Looks to Build on Milestone Year



TDS teens at Creekview High School promote National Teen Driving Safety Week by hanging a banner in the school's main hallway.

"Using the influence of peer to peer seems to be a positive way to get our traffic safety messages to our Texas teen drivers. We are always open to innovative ways that could benefit our primary focus to reduce the vehicle crashes, fatalities and injuries among this age group."

*Tracie Mendez,
TxDOT TDS Program Manager*

The phrases "peer pressure" and "spreading like wildfire" tend to carry negative connotations, yet for the Texas Transportation Institute's (TTI's) Teens in the Driver Seat (TDS) program, those phrases are signs of success.

With funding from the Texas Department of Transportation (TxDOT) Section 402 program and State Farm Insurance, the TDS program began in 2003 to help combat the number-

one killer of teenagers in Texas — car crashes. A number of impressive milestones were accomplished this past year, and for TDS that means more teen lives were saved.

"When developing the TDS program, we felt peer influence was an important aspect of keeping teen drivers safe that was being overlooked," states Russell Henk, TDS director and TTI senior research engineer. "Any success the program experiences is a credit to all of the TDS teens that not only serve as message carriers, but are also involved in the developmental stages."

Prior to 2009, many great strides had been made with TDS as the number of program schools steadily increased, and it began to reach outside of Texas to other states. High expectations were set for 2009 as TDS aimed to add 125 new program schools, which would increase the number of program schools by more than 25 percent in a single year. The goal was not only reached but surpassed



The Teens in the Driver Seat program won several awards in 2009 for its public service.

by a huge margin, with a little over 200 schools added in 2009. The program is now in more than 300 schools in Texas and a dozen others in Connecticut, California and Georgia.

Other accomplishments included being honored with one of the most distinguished national safety awards available — a Roadway Safety Award sponsored by the Federal Highway Administration and the Roadway Safety Foundation. This was the third national award TDS has received, with the other two coming in 2006 and 2007.

Six other awards were received in 2009 for the program's TV and public service announcement campaigns including two Telly awards, two Davey awards and two Videographer awards. TDS also published research findings that generated national press coverage, including in *USA Today* and CBS Evening News with Katie Couric, which highlighted the success and progress of the program.

The program also left its mark on the public policy front. During the recent session of the Texas Legislature, TDS leadership worked with staff in the state capitol on efforts that led to the strengthening of the state's graduated driver license (GDL) law in late 2009. That GDL law was recently upgraded from "fair" to "good," according to ratings by the Insurance Institute for Highway Safety.

"This past year's accomplishments are extremely encouraging because they confirm that the program is working, growing in reach and popularity, and saving lives," Henk said. "What is truly exciting is that we feel there is still much more to accomplish, and new components are always being evaluated and added to help carry the program's success forward."



The TDS website, <http://t-driver.com>, went through a major renovation this year to appeal to its primarily teen audience.

2009 also marked the establishment of the TDS Teen Advisory Board, made up of teens across Texas who help guide the ongoing development and growth of TDS. A junior high component of the TDS program was initiated last year to educate kids on how to be a safer car passenger and a safer driver before they even get behind the wheel. TDS also unveiled a new website late in 2009 that is more interactive. The new design encourages teens to contribute material to the site by providing them an open forum to discuss issues related to teen driving.

"Using the influence of peer to peer seems to be a positive way to get our traffic safety messages to our Texas teen drivers," says Tracie Mendez, TxDOT TDS program manager. "We are always open to innovative ways that could benefit our primary focus to reduce the vehicle crashes, fatalities and injuries among this age group."

"When developing the TDS program, we felt peer influence was an important aspect of keeping teen drivers safe that was being overlooked. Any success the program experiences is a credit to all of the TDS teens that not only serve as message carriers, but are also involved in the developmental stages."

*Russell Henk,
TDS Director and
TTI Senior Research
Engineer*



Henk

Fette

MORE INFORMATION

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WORK ZONE UP AHEAD

Other States Call TTI for Work Zone Research



traffic operations, such as improving the safety and efficiency of work zones, are coast-to-coast priorities. Texas Transportation Institute (TTI) researchers journey outside the Lone Star State whenever — and wherever — duty calls. Three recent work zone projects have been part of TTI's effort to help sponsors nationwide.

Intrusion Countermeasures

Orange-and-white drums do not always prevent motorists from veering into a highway work zone area. These dangerous driving situations, called intrusions, caught the attention of the California Department of Transportation (Caltrans). So when Caltrans decided to evaluate strategies and devices other than barriers to reduce intrusions, TTI's Jerry Ullman took the wheel.

"The common belief is that all intrusions are caused by the driver losing control and veering into the work zone," says Jerry Ullman, senior research engineer. "But the research shows a lot of intrusion problems are the result of deliberate driver disregard for traffic control."

Jerry Ullman's team researched the chain of events that lead to intrusions and brainstormed countermeasures that could be used to alter those chains, such as closer spacing of drums, placing barricades crosswise more frequently in closed lanes, and providing law enforcement presence upstream and within the work zone. The project, now in its final stages, will provide guidance for which countermeasures should be used under certain roadway conditions and the cost-effectiveness of each.

Improving Road Restriping Safety

One emerging technology for work zones and incident traffic control is the truck-mounted changeable message sign (TMCMS). These signs provide drivers with information on upcoming problems and actions to take. They are smaller than typical changeable message signs and have less character space and character height but are mobile.

A few states, such as Wyoming and Texas, have begun using TMCMSs, but there is limited research on how to establish effective messages for the smaller-format signs during active work operations. The Wyoming Department of Transportation (WYDOT) wanted to use TMCMSs for striping projects but needed guidance on applicable situations and appropriate

Conditions such as lighting, sight distance, traffic volume and speed all factor into the effectiveness and risk associated with temporary traffic control for utility work. Research on merging taper lengths — the practice of using cones to slowly merge two lanes of traffic into one — has been very limited.

messages. So WYDOT teamed up with TTI's Brooke Ullman, an expert on changeable message signs.

"The key is not to overload drivers. Drivers have limited time to read, comprehend and react to TMCMS messages. The message must be concise but get the point across," says Brooke Ullman, assistant research engineer. "TMCMSs are great technology when used effectively."

Brooke Ullman's team surveyed WYDOT field personnel to identify the main hazards associated with mobile operations and potential ways the TMCMS could be used to help mitigate those hazards. After assessing driver reaction to several of the more promising messages, the researchers recommended TMCMS message sets for mobile operations for WYDOT to consider.

"Mike Gostovich, state traffic engineer for WYDOT (now retired), told me he is amazed with the depth and usefulness of the information provided by TTI in the report. Mike asked me to send copies of the report to each of our transportation districts, and each district is now budgeting funds to purchase at least one, and perhaps more, truck-mounted changeable message signs," says Michael Patritch, research manager at WYDOT. "From project completion to implementation, the results of the study can be measured in mere days."

Utility Operations Merging Taper Length

Conditions such as lighting, sight distance, traffic volume and speed all factor into the effectiveness and risk associated with temporary traffic control for utility work. Research on merging taper lengths — the practice of using cones to slowly merge two lanes of traffic into one — has been very limited.



A utility crew performing maintenance on a streetlight requires a temporary work zone.



A mobile arrow panel alerts motorists to an upcoming lane merge.

Utility companies in Florida, in order to follow federal guidelines on merging taper lengths, sometimes spend 30 minutes to set up cones to spend 5 minutes changing a lightbulb. This time inefficiency led the Florida Department of Transportation (FDOT) to call TTI for research on using shorter merging taper lengths for short work duration activities, while also minimizing risk to the worker and motorist.

"As engineers, we can't lose sight of the fact that we have to balance both the workers' safety and the safety of the motoring public. We can't leave the worker exposed without visual cues for the motorist, but on the other hand, we could endanger the motorist by leaving something in the lane," says LuAnn Theiss, an associate research engineer with TTI.

Theiss's team recommends that operations that last more than 15 minutes should utilize merging taper lengths that meet federal requirements. However, for utility crew operations lasting 15 minutes or less, the large bucket truck and flashing lights appear to provide sufficient cues to drivers.

"We were very glad to have the TTI team do this research for us," says Jim Mills, a roadway design engineer with FDOT. "It was much-needed research that hasn't been addressed anywhere. More research is needed, but it certainly provided us with information that will be used to improve our work zone standards."

"The common belief is that all intrusions are caused by the driver losing control and veering into the work zone. But the research shows a lot of intrusion problems are the result of deliberate driver disregard for traffic control."

*Jerry Ullman,
TTI Senior Research Engineer*



Theiss



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MORE INFORMATION

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Preserving Lessons from the Field



The Texas Department of Transportation (TxDOT) has taken great efforts over the years to learn from pavements not performing as well as expected. But it is also possible to learn much from successes. The Texas Transportation Institute (TTI) recently conducted a research project to establish a process for TxDOT to use to learn from Texas flexible pavements that have performed notably. As a result, the research team developed a database where information about these pavements could be stored, searched and downloaded through a website interface.

“We began this project by contacting TxDOT’s 25 districts and asking them to nominate pavements that their staffs believed have performed in a superior fashion considering all factors involved,” says TTI Research Engineer Paul Krugler, who led the project team. “The final selection of pavements considered the need to represent a wide variety of flexible pavement structure

types, asphalt mixture types and the broad geographical area of the state.”

After the research team gathered preliminary information about each nominated pavement section, members visited with personnel from each nominating district to view and discuss the pavement section’s history. The information was then analyzed to gain insights into why certain pavement characteristics result in superior performance. Researchers then compared that information with current specification requirements to assess the appropriateness of specification criteria.

The key research findings include the following:

- While the success of each pavement appears to involve somewhat differing factors, in general, superior performance may be attributed to the combined result of good construction practice, high-quality materials and timely maintenance.
- Analysis of data from the 25 pavement sections reflects superior pavement performance over time. Average condition scores, distress scores and ride scores from data available from 1998 through 2006 indicate very good performance and validate the selections of these pavements by the districts.

The website allows online nomination of additional pavement sections by personnel and is made available to all potential department users to gain immediate and maximum benefit from the information now available.

“The database provides TxDOT area engineers and district pavement engineers with quick access to flexible pavement designs of various types that have been particularly successful,” says Krugler. “It also provides valuable information for materials engineers to evaluate the adequacy of specification criteria on an ongoing basis.”

The website is located at <http://tsfp.tamu.edu>. Technical report 0-5472-1, *Analysis of Successful Flexible Pavement Sections in Texas — Including Development of a website and Database*, details the development of the database and website. ■



The website displays the locations of 25 pavements, and detailed information about each pavement layer is accessed by clicking on the pavement layer of interest in the cross section.



MORE INFORMATION

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Flying Cars? Not Quite Yet...

Funding the Future of Texas Transportation



A mileage-based user fee may be one option to reliably fund maintenance and expansion of Texas roads.

In a classic line from the movie *Back to the Future*, as Doc Brown's DeLorean flies off in search of a sequel, the eccentric scientist famously says, "Where we're going, we don't need roads."

But flying cars aren't here yet, despite promises from actual scientists as far back as the 1950s. We still need roads. And someone has to pay for them.

Therein lies the challenge. Highways are largely funded by the fuel tax, which every consumer pays on every gallon of gas they pump. But as fuel prices and vehicle fuel efficiencies increase, fuel consumption (and thus tax revenues generated by it) are expected to drop by 20 percent by 2025.

"At best, the fuel tax is a proxy for road use," explains Ginger Goodin, senior research engineer and program manager for the Texas Transportation Institute's (TTI's) Austin Office. "With the expected growth in alternative-fuel vehicles, the state will ultimately need something more equitable and sustainable to fund maintenance of its transportation system."

Goodin led a project for TTI's University Transportation Center for Mobility to examine the mileage-based user fee as an alternative to the fuel tax. A mileage-based user fee is collected for every mile driven on the roadway network. Since it more accurately reflects road usage, the fee could more reliably fund maintenance and expansion of Texas roads.

"Texas' 2030 Committee estimates a \$350 billion funding gap over the next 20 years if the state relies solely on the fuel tax to fund transportation," says Goodin. "The mileage-based user fee is only one of many solutions that might help to close that gap."

Building on earlier research, the project identified available technologies to support implementing a regional mileage-based user fee system. Researchers looked at similar fee systems that have been studied domestically or implemented internationally. They also researched various interstate fee-coordination and information-sharing efforts to gather lessons learned should Texas decide to implement a similar system.

A symposium held April 14-15, 2009, in Austin brought together 80 professionals to share information regarding mileage-based user fees. Panel discussions addressed legislative and policy issues, public acceptance challenges, potential technology applications and institutional issues.

"The Lone Star State is lucky to have TTI, one of the few research agencies in the United States with the technical expertise necessary to thoroughly assess alternatives to the fuel tax," says James Whitty, manager of the Oregon Department of Transportation's Office of Innovative Partnerships and Alternative Funding. Whitty is a nationally recognized expert on funding alternatives, especially mileage-based user fees. "TTI's knowledge and experience will serve Texas well as it meets its funding challenges."



Goodin



Baker

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Primer to Help Identify Issues for Texas

Working with the Texas Department of Transportation, Senior Research Engineer Ginger Goodin and her team have developed a primer to educate transportation professionals, policy makers and advocacy groups about the various issues surrounding the mileage-based user fee. The primer serves as a starting point to identifying additional questions and information needs. It should help address many misconceptions about transportation funding, the fuel tax and how a mileage-based user fee might work for those unfamiliar with the topic.

"The primer will help frame the discussion regarding whether and how mileage-based user fees can help fund the future of transportation in Texas," says Mary Meyland, director of Strategic Policy and Performance Management for the Texas Department of Transportation.



Two New Transportation Research Centers Housed at TTI

Two new transportation research centers were approved by The Texas A&M University System Board of Regents during a meeting in January. Both centers, housed at the Texas Transportation Institute (TTI), were established to improve the transportation system in Texas and across the country.

The Center for Strategic Transportation Solutions (CSTS), created by the 81st Texas Legislature, will focus on long-term transportation solutions for the state of Texas. The center will provide credible and objective expertise to aid state and

"We are very enthusiastic about the establishment of TEC at TTI and for advancing research, development and application of sound economic analysis in reaching passenger and freight transportation solutions. Our expectation is that the work of TEC will help transportation professionals and public officials make better transportation improvement decisions that will lead to more livable communities, safer and more effective transportation system performance and improved environmental quality."

*Polly Trottenberg,
Assistant Secretary for Transportation
Policy at USDOT*

local officials in addressing transportation problems and opportunities that are statewide or global in nature. CSTS will analyze "big picture" transportation challenges and evaluate strategic solutions to address various statewide transportation issues, including transportation financing, mobility, freight

"The transportation system we build, how we develop and pay for it, and how we operate and maintain it are all changing. CSTS establishes a framework to develop future-oriented analyses to assist state leaders in making decisions that affect the long-term viability and sustainability of the Texas transportation system."

*Dennis Christiansen,
TTI Director*

movement, public transportation alternatives, border transportation planning, air quality issues and energy-related implications.

"The transportation system we build, how we develop and pay for it, and how we operate and maintain it are all changing," says TTI Director Dennis Christiansen. "CSTS

establishes a framework to develop future-oriented analyses to assist state leaders in making decisions that affect the long-term viability and sustainability of the Texas transportation system."

"Through this new center, we will assist transportation leaders in our state through research-based solutions as they confront significant transportation challenges," says Cinde Weatherby, CSTS director.

With headquarters at the TTI Austin Office, CSTS will utilize the extensive expertise and talent of TTI staff and other transportation, finance and policy experts to respond to the information and data needs of the state's transportation leadership.

The Board of Regents also established the Transportation Economics Center (TEC), which will provide economic-based analyses in formulating transportation policies and programs at the national level. TTI was selected to operate this center through a competitive procurement process by the U.S. Department of Transportation (USDOT).

"We are very enthusiastic about the establishment of TEC at TTI and for advancing research, development and application of sound economic analysis in reaching passenger and freight transportation solutions," says Polly Trottenberg, assistant secretary for transportation policy at USDOT. "Our expectation is that the work of TEC will help transportation professionals and public officials make better transportation improvement decisions that will lead to more livable communities, safer and more effective transportation system performance, and improved environmental quality."

In addition to the involvement by TTI researchers, various other experts will assist in TEC research initiatives. Faculty from the Department of Agricultural Economics and the Dwight Look College of Engineering at Texas A&M University will play key roles in various center projects. ■



The two new centers recently established at TTI will focus on transportation solutions and policies for the future.



Weatherby

Turnbull

MORE INFORMATION

For more information on the Center for Strategic Transportation Solutions, contact Cinde Weatherby at (512) 467-0946 or c-weatherby@ttimail.tamu.edu.

For more information on the Transportation Economics Center, contact Katie Turnbull at (979) 845-6005 or k-turnbull@tamu.edu.

TTI Loses a Dear Friend: Bob Gallaway, 1916-2009



Bob Gallaway helped launch TTI and participated in its first project. His groundbreaking research in asphalt pavement led him to become a world-renowned expert and beloved professor through his 60-year career at TTI and Texas A&M University.

The Texas Transportation Institute (TTI) lost one of its dearest friends on November 29, 2009, when Bob M. Gallaway passed away after an extended illness. Gallaway, a longtime supporter of TTI and professor emeritus at Texas A&M University, was 93.

Although he eventually gained prominence as a respected mentor and beloved teacher of engineers for more than 60 years, Gallaway's life could have been the topic of a Horatio Alger novel. His family moved to Texas in 1922, seeking the hunting and fishing prospects of the Rio Grande Valley. Gallaway worked hard at academics, graduating in 1938 as valedictorian, an honor with a \$25 scholarship. In those days, that was enough to pay for an entire semester of college.

Gallaway hitchhiked his way across Texas, ending up at Texas A&M University. Ever industrious, Gallaway held numerous jobs as a student at Texas A&M, including babysitting a professor's three children. Following graduation in 1942, he went to work in the petroleum industry but soon returned to Texas A&M for his master's degree, where he stayed on to teach as an assistant professor.

For 40 years, Gallaway headed up the materials and construction division of Texas A&M's Civil Engineering Department, becoming an expert

recognized worldwide in asphalt paving materials technology. Gallaway also helped launch TTI, participating in the Institute's first technical project. In fact, he was so important to the formative years of TTI that the Institute named the Gallaway Invitational Golf Tournament in his honor nearly 40 years ago.

"Gallaway led a group of innovators, teachers and researchers who, through a lifetime of dedicated service to the craft and the science of engineering, forever changed transportation and commerce," states Dennis Christiansen, TTI director. "He was one of the early pioneers at TTI and is greatly missed, not only by his former colleagues and friends, but by the many former students he taught through the years."

Mentoring countless young engineers at Texas A&M, he became a "godfather" to the Institute, shepherding many of his protégés into TTI's ranks. Always the teacher, he often challenged them to think beyond their assumptions.

"It depends" is what he'd always tell me is the answer to any engineering

question," says Tom Freeman, TTI engineering research associate. "Our lunchtime sparring sessions are my favorite memories and probably the only thing I can ever remember losing and still liking it."

Good-natured debating with colleagues was standard fare with Gallaway. Don Saylak, research engineer at TTI, recalls a debate between Gallaway and a colleague regarding the value of rigid (concrete) pavements versus flexible (asphalt) pavements. Gallaway was a proponent of the latter. When the colleague made the comment, "Gallaway, one of these days we will find that the roads in hell are paved with asphalt," Gallaway was quick to respond: "I wouldn't be surprised. It's the only thing that can stand the heat!"

In addition to his considerable body of engineering work, Gallaway has left a living legacy. He and Susan, his wife of 69 years, were blessed with three children, four grandchildren and four great-grandchildren.

Gallaway's motto was "Engage in a balanced life. Have fun, but study too. Life isn't all work." In Gallaway's case, his life's work involved generously mentoring others, having fun doing it, and striking that all-important balance between work and play. ■

TTI at TRB

When Assistant Professor and Assistant Research Engineer Dominique Lord received word that he had won a major award that would be presented at the Transportation Research Board (TRB) 89th Annual Meeting, it was a big surprise. After all, he didn't know he was in the running.



Dominique Lord was recognized during the TRB Annual Meeting in Washington, D.C. Sharing the honor are Lord's parents, Laurent and Diane Lord.

Without his knowledge, Associate Professor and Research Engineer Gene Hawkins recommended Lord for the 2009 New Faculty Award presented annually by the Council of University Transportation Centers (CUTC) and the American Road and Transportation Builders Association (ARTBA). The award recognizes "outstanding teaching and research contributions to the transportation field."

According to Hawkins, Lord "is a valuable faculty member that excels at research and teaching." Judges with CUTC/ARTBA agreed.

"The New Faculty Award is quite prestigious, and I am obviously honored," Lord said. "It was a big moment for me and my family. It was a career highlight to be recognized like this."

Director of the University Transportation Center for Mobility Melissa Tooley said the award represents

the "best of the best," and is a great recognition for TTI and Texas A&M. The award presentation took place at the CUTC annual banquet, held during the TRB Annual Meeting.

Word of Lord's recognition made its way to his boyhood home of Saint-Lambert, Canada. As a result, the town honored him with another honor: the city's Lambertois Award.

Another prestigious award, the 2009

Patricia Waller Award for outstanding paper in the field of safety and system users, was presented to Senior Research Engineer Kay Fitzpatrick and Associate Research Scientist Eun Sug Park. Their paper, "Safety Effectiveness of HAWK Pedestrian Treatment," evaluated the safety performance of the HAWK beacon device, a pedestrian safety treatment that significantly reduces pedestrian and intersection-related crashes where it's installed.

"We are pleased that TRB felt it was worthy,"

"The MOU helps to strengthen our relationship with Abu Dhabi. We have done some work with the United Arab Emirates and Abu Dhabi in the past, including a street sign project being conducted by Paul Carlson. We hope this MOU leads to more research in that region."

*Ed Seymour,
TTI Associate Agency Director*

says Fitzpatrick of the honor. The award was presented to Park and Fitzpatrick on Jan. 11.

The Patricia Waller Award was established in 2004 and is named in memory of a former researcher and clinical psychologist.

Assistant Agency Director Christopher Poe received a Committee Service Award from the TRB Freeway Operations Committee. Poe was recognized for his work with the committee in planning the Freeway and Tollway Operations Conferences over the last three years.

Also recognized was Research Engineer Tim Lomax who was made chair of the National Transportation Data Requirements and Programs Committee, and Associate Research Engineer Mark Burris was named chair of the Transportation Economics Committee.

A memorandum of understanding (MOU) between Abu Dhabi, UAE and TTI was signed Jan. 12. The director of Abu Dhabi's Main Road Division, Faisal



Photo courtesy TRB

Robert Johns, director of the Volpe National Transportation Center and chair of the TRB Technical Activities Council, presents the 2009 Patricia Waller Award to TTI Senior Research Engineer Kay Fitzpatrick and TTI Associate Research Scientist Eun Sug Park.

Edwards Honored by TTI for Transportation Efforts

In a ceremony at the TRB Annual Meeting in Washington, D.C., the Texas Transportation Institute (TTI) recognized Rep. Chet Edwards for his ongoing efforts to champion transportation research.

Edwards, the U.S. representative from Texas' 17th District, was presented with the 2010 TTI Director's Research Champion Award at the Institute's Jan. 10 reception at the Transportation Research Board Annual Meeting. The Director's Research Champion Award recognizes individuals at the national level who have been strong and effective advocates for transportation research.

"The real research champions are the people in this room who make our roadways safer, our air cleaner and our transportation system more efficient," Edwards said in receiving the award, which is sponsored by Trinity Industries. "I will treasure this award because of my deep respect for TTI and all that you do."

Rep. Edwards has made transportation a priority during his 18-year tenure representing 12 counties in his district, which includes Texas A&M University and TTI, located in College Station.

"We are honoring Rep. Edwards because he has secured vital federal investments to improve our nation's transportation



Rep. Chet Edwards (center) receives the TTI Director's Research Champion Award during a ceremony in Washington, D.C. Presenting the award is TTI Director Dennis Christiansen (left) and Director Emeritus Herb Richardson (right), who is a previous recipient of the award.

system and save lives on our public roads," TTI Director Dennis Christiansen said in announcing the award. "He is a true champion of university research and over many years has been, and continues to be, an outstanding supporter of TTI."

Edwards is the first elected official to receive the award, which TTI established five years ago. ■

Al Suwadi, and TTI Director Dennis Christiansen signed the document during the TRB Annual Meeting.

Regarding additional research possibilities, TTI and Abu Dhabi's Department of Transport signed an MOU during a private meeting between the Institute and the director of the emirate's Main Roads Division.

"The MOU helps to strengthen our relationship with Abu Dhabi," says Associate Agency Director Ed Seymour, who has been leading TTI's effort in obtaining research with other countries. "We have done some work with the United Arab Emirates and Abu Dhabi in the past, including a street sign project being conducted by Paul Carlson. We hope this MOU leads to more research in that region."

The MOU details cooperation between the parties in the field of road construction, planning and management. Any specific projects would be detailed in separate contracts. ■



A memorandum of understanding between Abu Dhabi, UAE and TTI was signed Jan. 12. Director of Abu Dhabi's Main Road Division Faisal Al Suwadi (left) and TTI Director Dennis Christiansen signed the document during the TRB Annual Meeting.

Bligh, Little Join Elite A&M System Group

TTI Research Engineer Roger Bligh and Senior Research Fellow Dallas Little were honored in December with two of the highest tributes awarded by The Texas A&M University System Board of Regents.

Bligh was named one of only 71 Regents Fellows by the A&M System Board of Regents as a result of his "outstanding record of significant research and service to the people of Texas. His work has resulted in saving many thousands of lives on our state's and nation's highways."

"I feel very privileged and humbled," Bligh said of the designation. "This is a terrific honor, especially considering

the past recipients and what they have accomplished."

Little, who holds a joint appointment with the College of Engineering, was named a Regents Professor during the board meeting. He joins 118 other professors who hold the designation. Little was named Regents Professor for his numerous accomplishments during his 33-year career at Texas A&M.

"I am extremely fortunate to receive the honor," Little said of the Regents Professor title, "but I fully recognize that many within the college and department are equally or more deserving than I."



Vice Chancellor and Dean of Engineering Kem Bennett and TTI Director Dennis Christiansen flank award winners Dallas Little and Roger Bligh.

Bligh and Little were honored with other regents title recipients during a dinner attended by the regents and Chancellor Mike McKinney. ■

Transportation Forum Seeks Ideas, Transparency

Despite a continued bleak funding forecast for infrastructure projects in Texas and across the country, there was new optimism expressed during the Fifth Annual Texas Transportation Forum in Austin Jan. 6-8.

The Texas Department of Transportation's (TxDOT's) "state of transportation" discussion — co-sponsored by Texas Transportation Institute, the Associated General Contractors of Texas and the Texas Good Roads Transportation Association — was attended by more than 1,200 people including engineers, researchers, government agency representatives and elected officials.

TxDOT Executive Director Amadeo Saenz acknowledged

the looming financial struggle (a projected \$332 billion deficit over the next 20 years) but said, "We are prepared to make the most of the money that we have." Saenz detailed TxDOT's plan to engage the public as it finds transparent solutions to funding shortfalls, including the development of the Interstate 35 Advisory Committee. He said the committee will be a blueprint for including community input in future transportation projects statewide.

Sen. John Cornyn was the forum's keynote speaker.

In the effort to improve transportation for Texans without new road construction, Saenz pointed to TxDOT's new Rail Division and the agency's push for passenger rail services. Division Director Bill Glavin, who was hired in December, was the moderator for the conference's session on passenger rail. "I don't think we can build our way out of this, even if we could afford to," Glavin said, pointing to rail as the solution to several transportation dilemmas. "The benefits are to decrease congestion, improve the quality of our air, but most importantly improve the quality of life."

The forum focused on numerous topics: Texas' population growth (Rep. John Carter told attendees, "When you live in paradise, people are eventually going to figure it out"), fuel taxes and potential new funding



TxDOT Executive Director Amadeo Saenz delivers remarks during the opening session.

methods, road construction delays due to environmental regulations, increased expenses in oil exploration, the state's share of Recovery Act funding, and new technologies in solving mobility problems.

Keynote speaker Sen. John Cornyn pointed to recent innovations that have helped ease congestion: off-peak road use, carpooling and managed lanes. But, "there are even more revolutionary ideas such as wireless connectivity initiatives and the Freight Shuttle being developed by the Texas Transportation Institute," he said. "While I believe our transportation problems are serious, I think they are solvable." ■



Sen. John Cornyn was the keynote speaker.

Garland's teen drivers show significant safety improvements

Safer driving habits for teenagers in Garland, Texas, have helped to sharply reduce fatal crashes in the community, according to a recent case study by researchers from the Texas Transportation Institute (TTI). The announcement was made at a February 17 press conference in Garland.

The researchers attribute the improvements to a combination of two factors: the state's graduated driver license (GDL)

law — which places restrictions on drivers for the first year that they hold a license — and the Teens in the Driver Seat (TDS) program, which is designed to reinforce the GDL law through peer influence. The TDS program has been active in Garland's seven high schools since 2006, whereas the program is not active in Mesquite.

"In 2006, we came together with a common purpose — to reverse the trend of teen traffic crashes in our community. And we are proud to say that we have done just that," said Jaywin Malhi, the chair of the Garland Youth Council and a member of the Garland TDS team.

The research team reviewed both driver behavior and crash statistics in Garland and Mesquite during two periods: from 2002 through 2005, and 2006 through 2009. While both cities experienced improvements during the study period, those in Garland were more dramatic: The number of teen crash fatalities in Garland dropped from 9 to 1, while the number in Mesquite fell from 4 to 2. Also, the share of crashes

involving teen drivers in Garland fell from 28 percent to 16 percent, while declining from 24 percent to 22 percent in Mesquite. In addition, Garland teens demonstrated higher seat belt use and lower cell phone use behind the wheel than their counterparts in Mesquite.

"Our research team found that a graduated driver license law can be made more effective when it is reinforced by peer-to-peer efforts like the Teens in the Driver Seat program," TTI Director Dennis Christiansen said. "Laws provide a necessary foundation, and peer influence can make those laws work better."

"Garland's involvement in the Teens in the Driver Seat program is important for the safety of our youth," Garland Mayor Ronald E. Jones said. "I am particularly pleased with the leadership demonstrated by members of the Garland Youth Council as they work with the Garland ISD high schools to spread these vital safety messages to their peers." ■



Garland School Superintendent Curtis Culwell and Garland Mayor Ronald Jones receiving plaques from TTI Director Dennis Christiansen.



TDS Program Director Russell Henk, TTI Director Dennis Christiansen, TDS Advisory Board Member Jaywin Malhi, Garland Youth Council Sponsor Dorothy White, TDS Advisory Board Member Brianda Reyes, State Rep. Joe Driver, and City of Garland Transportation and Engineering Director Robert Wunderlich.

Brydia Elected ITS Texas President



Brydia

After more than a decade as a member of the Intelligent Transportation Society (ITS) of Texas and six years serving on its board, Texas Transportation Institute (TTI) Research Scientist Bob Brydia has been elected president of the organization.

"TTI has a long history with ITS Texas, starting with helping to form the Texas chapter in 1993," Brydia says. "So, to be elected president by the members is a real honor." Brydia is the fourth TTI employee to serve as the leader of the organization,

which advocates the use of advanced technologies as a means to improve the safety, security and efficiency of our transportation system.

ITS Texas is a state chapter of ITS America. Membership includes representatives from the Texas Department of Transportation, cities, metropolitan planning organizations, transit agencies, and consultant and research firms, such as TTI.

In his one-year term, Brydia will be working to increase membership in ITS Texas and will encourage universities to establish student chapters of ITS Texas. ■

Jon Epps Appointment Approved by Board



Epps

Senior Research Fellow Jon Epps has been appointed executive associate director for the Texas Transportation Institute (TTI) effective Feb. 1. The leadership appointment was approved by The Texas A&M University System Board of Regents Jan. 21.

Epps, with more than 40 years of professional experience — including 32 years in academic leadership roles — will be a member of the Institute's management team and responsible for managing the TTI Materials and Pavement Division. ■

» TEXAS TRANSPORTATION INSTITUTE Publications

TECHNICAL REPORTS

"Assessment of a Traffic Monitoring System for a Major Traffic Generator to Improve Regional Planning: Technical Report," by Todd Carlson, **0-5531-2**, November 4, 2009.

"Considerations for Rigid vs. Flexible Pavement Design When Allowed as Alternate Bids: Technical Report," by Andrew Wimsatt, **0-6085-1**, November 5, 2009.

"Corrosion Performance Tests for Reinforcing Steel in Concrete: Technical Report," by David Trejo, **0-4825-1**, November 4, 2009.

"Development of a Video over IP Guidebook," by Bob Brydia, **0-5942-1**, November 4, 2009.

"Development of Guidelines for Cable Median Barrier Systems in Texas," by Scott Cooner, **0-5609-2**, December 18, 2009.

"Effect of Voids in Grouted Post-Tensioned Concrete Bridge Construction: Inspection and Repair Manual for External Tendons in Segmental, Post-Tensioned Bridges," by David Trejo, **0-4588-2**, November 18, 2009.

"Effect of Voids in Grouted, Post-Tensioned Concrete Bridge Construction: Volume 2 — Electrochemical Testing and Reliability Assessment," by David Trejo, **0-4588-1** Vol. 1, December 9, 2009.

"Effect of Voids in Grouted, Post-Tensioned Concrete Bridge Construction: Volume 2 — Inspection, Repair, Materials, and Risks," by David Trejo, **0-4588-1** Vol. 2, December 9, 2009.

"Improving Accuracy in Household and External Travel Surveys," by David Pearson, **0-5711-1**, January 28, 2010.

"Laboratory and Field Evaluation of Concrete Paving Curing Effectiveness," by Dan Ye, **0-5106-3**, December 17, 2009.

"Long-Term Performance of GFRP Reinforcement: Technical Report," by David Trejo, **0-6069-1**, January 22, 2010.

"Mechanistic-Empirical Asphalt Overlay Thickness Design and Analysis System," by Fujie Zhou, **0-5627-3**, November 10, 2009.

"NCHRP Report 350 Crash Testing and Evaluation of the S-Square®; Mailbox System," by Roger Bligh, **0-5210-7**, January 20, 2010.

"Potential Development of an Intercity Passenger Transit System in Texas — Report on Tasks 1-5," by Curtis Morgan, **0-5930-1**, November 16, 2009.

"Quantifying the Effects of Network Improvement Actions on the Value of New and Existing Toll Road Projects," by Ivan Damjanovic, **0-5881-1**, February 10, 2010.

"Research Report: Guidance on Mitigating Impacts of Large Distribution Centers on Texas Highways," by Brian Bochner, **0-5335-1**, January 26, 2010.

"Tests of HMA Overlays Using Geosynthetics to Reduce Reflection Cracking," by Arif Chowdhury, **0-1777-3**, February 1, 2010.

"TxDOT Administration Research: Tasks Completed in FY2009," by Tina Geiselbrecht, **0-6581-TI-1**, February 4, 2010.

PROJECT SUMMARY REPORTS AND PRODUCTS

"Characterization of In-Use Emissions from TxDOT's Non-road Equipment Fleet," by Joe Zietsman, **0-5955-S**, December 21, 2009.

"Design, Construction, and Performance Monitoring of the Very Thin Overlay Placed on BUS 59 in the Lufkin District," by Tom Scullion, **5-5598-01-2**, February 1, 2010.

"Preserving Functionality/Asset Value of the State Highway System," by Ed Hard, **0-6208-S**, February 8, 2010.

"Quantifying the Purchasing Power of Public Transportation in Texas," by Linda Cherrington, **0-6194-S**, December 21, 2009.

"Revised Text for TxDOT Manual Procedures for Establishing Speed Zones, Chapter 5, Section 2," by Jim Bonneson, **5-5439-01-P2**, November 3, 2009.

"Roadway Safety Design: An Engineer's Guide to Evaluating the Safety of Design Alternatives," by Jim Bonneson, **5-4703-01-P3**, January 28, 2010.

"Rubblization and Base Overlay of FM 912 and FM 1155," by Stephen Sebesta, **5-2110-03-4**, January 28, 2010.

"Utility Installation Review System — 2008 Follow-Up Report," by Cesar Quiroga, **5-2110-03-4**, December 9, 2009.

"Video over IP Design Guidebook," by Bob Brydia, **0-5942-P1**, December 21, 2009.

"Workshops on Using the GPS Method to Determine Curve Advisory Speeds," by Mike Pratt, **5-5439-01-1**, December 21, 2009.

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.