transportation today

At the same time, environmental regulations to safeguard the quality of our sensitive wetlands and coastal waters require that expansion and maintenance of “marine highways” be done safely and responsibly.

In addition to its 127-mile Atlantic coastline, New Jersey has more than 4,000 miles of waterways used for commerce, recreation, and drinking water. It also is home to the third-largest port complex in the United States: the Port of New York and New Jersey, which generates more than $37 billion in regional commercial income, almost $12 billion in personal income, and supports approximately 280,000 jobs. With so much at stake, the engineers, policy makers, and operators who are responsible for managing these marine assets require highly sophisticated and reliable tools and information in order to develop integrated methods that will protect the public while simultaneously promoting maritime business growth.

The Richard N. Weeks Soil and Sediment Management Laboratory (SSML) at CAIT is pursuing this knowledge with the most advanced

Science beneath the surface

Lab is uniquely equipped to study erosion in waterways, thanks to a captain of industry

Nearly 80 percent of goods in the United States move via maritime shipping—about $115 billion worth annually. Maintaining waterways and ports is crucial to growing the economy; to do that, they must accommodate ever-larger ships and meet the ongoing demand for increased port capacity.

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Rutgers is among the first in New Jersey to advance EV infrastructure with free charging stations at CAIT
New year, renewed commitment

A new year is a natural opportunity to look both back and forward. When we take stock of our 2011 accomplishments, there’s a lot to be proud of.

Steady advances in several programs are notable: AASHTO reaccreditation of our Pavement Resource Program’s (PRP) asphalt lab, a new phase of the FHWA Long-Term Bridge Performance (LTBP) program, progress on the NIST-sponsored Automated Nondestructive Evaluation and Rehabilitation System (ANDERS) project, and continued growth for long-standing programs like our New Jersey Local Technical Assistance Program (NJ LTAP) and Transportation Safety Resource Center (TSRC). All of these initiatives—as well as our eight other programs—have made great strides.

The LTBP pilot program is complete. We are now gathering long-term data on a number of bridges around the country and plan to add many more in 2012. ANDERS’ development of a new robot that will do NDE diagnoses on bridge decks and administer “on the spot” rehabilitative treatments is progressing nicely. (We hope to share more on this exciting technology later this year.)

Our Soil and Sediment Management Laboratory (SSML) is firmly established in its new home (see cover story). The Pipeline Safety and Security Program (PSSP) is deep in development of a smartphone app that will help prevent damage to underground utilities (see story on page 15). Even though the economy has seen little or no improvement, NJ LTAP trained more transportation professionals this year than it has for two years prior. TSRC expanded its activities in road safety audits (see page 10), traffic safety education, and crash data analysis. And, as reported in the July issue of Transportation Today, our NDE and bridge research teams collaborated with researchers around the globe in a ground-breaking international study on a bridge right here in New Jersey.

Looking to the future, we are still pursuing the dream of building an innovative accelerated infrastructure testing facility that will revolutionize research on bridge deterioration. We have some new faces at the center. Two civil engineering faculty (see page 18) hired last fall semester by the School of Engineering have joined CAIT as resident faculty researchers—Eric Gonzales and Hao Wang—and we can’t wait to see the valuable contributions we know they will make.

New technologies, enhanced bridge data, more powerful asset management tools, better predictive models—plus stronger partnerships and more services for our stakeholders—all exemplify our work to keep U.S. infrastructure in a state of good repair as well as CAIT’s mission of research, teaching, and technology transfer. We know 2012 is going to be a great year!

Ali Maher
The Ex-Situ Erosion Testing Machine (ESETM) is one of only two sediment flumes of its kind. It simulates flow conditions in aquatic environments and allows researchers to create computer models of erosion and sediment dispersion. The purchase of this equipment was made possible by a gift from the chairman of Weeks Marine, Inc.

Cover photo: The Ex-Situ Erosion Testing Machine (ESETM) is one of only two sediment flumes of its kind. It simulates flow conditions in aquatic environments and allows researchers to create computer models of erosion and sediment dispersion. The purchase of this equipment was made possible by a gift from the chairman of Weeks Marine, Inc.

Right: Research engineer Ryan Miller gave guests at the dedication a demonstration of the ESETM and explained how it works and what makes it unique.

Resources, expressed their gratitude to the Weeks family and shared their remarks on the significance of research that contributes to keeping waterways healthy and navigable.

President McCormick noted how SSML supports Rutgers’ mission and its commitment to transportation research. “This lab embodies our key values: service to New Jersey and the nation, student involvement in research, and the dedication to discovery. We are so grateful to Richard Weeks for his generosity and this extraordinary device that will help faculty, staff, and students who use this lab to advance knowledge, sustainability, and our economy,” McCormick said.

Scott Douglas from NJDOT added, “Our agency is counting on this lab to provide scientific data to support planning decisions. More than $80 million a year is spent maintaining New York Harbor alone—that’s not entirely the state’s costs but it’s a significant burden. Having reliable information on how various actions and construction projects are going to affect how sediment moves around the harbor can help us better plan and budget maintenance. What we learn here can help us with not just dredging projects, but also remedial actions. There’s a lot of historical contamination in the region, so understanding how our projects might influence the migration of those contaminants is really important to us.”

Among other projects, CAIT has been assisting NJDOT with a plan for evaluation and utilization of dredge material, the preparation of a manual for managing processed dredge material at upland sites, and a dredge operations planning decision-support tool.

The nitty-gritty of simulating sediment erosion in the lab

“In view of the huge economic importance of our ports and rivers, we have to answer a very important question: How many cubic yards of dredge do we need to move each year to keep our maritime channels operable?,” said CAIT Director Maher. “The ultimate application for the research we’re doing in this lab is to create predictive models, tools, and technologies that will help agencies and port operators anticipate and plan dredging requirements.”

Ryan Miller, the research engineer who oversees technical operations of the lab, gave guests at the dedication a demonstration of the ESETM and explained how it works and what makes it special.

“CAIT Director Ali Maher, Ph.D., (right) discusses future plans for the lab with Richard N. Weeks, chairman of Weeks Marine, Inc., one of the largest marine construction and dredging contractors in North America. In the foreground is the special sediment flume that is making it possible for CAIT to expand its erosion research capabilities, thanks to a donation from Weeks.”

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in ways that have never been simulated in a laboratory setting.”

“To a greater degree than previous technology, the ESETM is capable of generating flow profiles that look far more like what we find in nature. Inducing these fluid conditions in the lab allows us to measure, with great accuracy, shear and vertical forces in real time. We can control the velocity and “shape” of the flow over the sample in a repeatable way. Then, we directly measure the forces acting on the material. Given a known flow rate and duration, we can calculate the erosion rate from the sample’s beginning and ending weight. By combining this with measurements of the moment-by-moment forces acting on the sediment, we use fluid dynamics software to develop a very complete picture of the physics at hand.

“What makes the ESETM different than traditional sediment flumes is the amount of control we have during the experiment,” Miller explained. “The combination of sensors allows for extremely fine measurements. In addition, we have incorporated a pen camera that lets us visually verify the velocity associated with the ‘start of sediment motion’ that is referred to as the critical shear stress, and the elevation of the sample relative to the flow, which is essential to replicating natural conditions.

“We’ve even customized a special coring rig that minimizes disruption of the material when we collect samples in the field, and that improves efficacy of ex-situ testing,” Miller said.

More than erosion: SSML research has more issues “on deck”

In addition to erosion, sediment migration, and waterway management strategies, SSML has a host of conventional geotechnical testing and rheological material analysis capabilities. Researchers also are delving into issues like bridge scour, soil engineering, and sediment stabilization and/or decontamination that will allow...
Admiral Thad Allen, retired U.S. Coast Guard ranking officer, has seen his share of disasters. He’s an undisputed expert on managing them before, during, and after they happen. Having been the appointed leader of response efforts in some of America’s most devastating events—of note, Hurricane Katrina in 2005 and the Deepwater Horizon oil spill in 2010—gives him the authority to speak on the “during” and “after,” but it’s his reflective candor that helps us learn about the “before”: how to prepare for emergencies.

For this reason, Admiral Allen was chosen as the keynote speaker at the 2nd Annual Maritime Risk Symposium, Developing Public-Private Partnerships in Homeland Security: How Risk Impacts Government Policy and Business Requirements, held at Rutgers, November 7–9, 2011.

The symposium was a collaborative effort with the U.S. Coast Guard (USCG) and CAIT’s Laboratory for Port Security (LPS); Rutgers’ Command, Control, and Interoperability Center for Advanced Data Analysis (CCICADA); and the Center for Discrete Mathematics and Theoretical Computer Science (DIMACS).

Nearly 100 security, risk assessment, and emergency response professionals attended the symposium and benefited from the admiral’s wisdom and experience in adaptable risk management operations. Recounting recent events—like the tornado in Joplin, Missouri, and the Gulf of Mexico oil spill—Allen did not critique preparation or the actions of responders, but rather focused on the importance of resiliency and the ability to act quickly when things don’t go as planned.

Even with an airtight plan in place, Allen said, things sometimes just go awry. “I talk about black swan problems,” Allen told the crowd. “A black swan is an event that can’t be predicted by past data. And frankly, these are increasing in number, not getting [more rare].” The lesson, Allen said, is that you have to look at relationships the same way you look at preparations such as supply chain issues. “You can’t have enough of that kind of thinking in the world right now.”

Hurricanes, oil spills, tornadoes, and other natural disasters destroy all sorts of infrastructure, but they aren’t the only threats. Terrorists, cyber attacks, and pirates all can cause catastrophes. In our new global existence, increased exposure means increased risk, be it from malicious humans, accidents, or Mother Nature.

Some of the most vulnerable areas are ports and other maritime assets, largely because of the international nature of their daily operations, high-volume movement of massive vessels, and the opportunity they provide for stealthy water access both within the port and to surrounding transportation and other critical infrastructure.
For example, there are more than 20 major bridges and tunnels within 10 miles of the air and marine port complex managed by the Port Authority of New York and New Jersey (PANYNJ). This includes the three major access points to and from New York City—the George Washington Bridge and the Holland and Lincoln Tunnels—for which PANYNJ is responsible. A disaster that shut down any of these crossings would paralyze the region.

Another example of vulnerability: 80 percent of the Northeast’s oil refineries are situated on the Delaware River and Bay. Churning out nearly one million barrels of crude oil a day, an incident that cut off access to those refineries would dry up gasoline supplies within hundreds of miles in just a few days.

Given ports’ critical role in regional and global supply chains, we simply cannot afford to be complacent when it comes to keeping them safe and secure.

And that is the main concern of CAIT’s Laboratory for Port Security (LPS). According to Tayfur Altiok, Ph.D., director of the program, “At LPS, we examine crucial issues related to maritime logistics, safety, and security. We were honored to co-host the Maritime Risk Symposium. This symposium brought together professionals from government, the maritime industry, and academia for a comprehensive view of maritime security issues. It was an important opportunity to exchange domestic and international perspectives and ideas regarding best practices and methodologies in managing maritime risks, preparing for emergencies, and developing response strategies.” Altiok co-organized the event along with the USCG’s Joseph DiRenzo, Ph.D., chief of the Ops Analysis Division.

Panel sessions during the first two days offered perspectives from government agencies, industry, and researchers. Panelists from organizations such as the USCG, Fire Department of New York, and PANYNJ spoke on public-private partnerships, and government and industry representatives tackled balancing risks and business requirements and the roles that each plays in managing risks. Midday speakers, USCG Admiral Peter Neffenger and Lawrence Small from the RAND Corporation, kept attendees engaged even during lunch.

The final day of the symposium was dedicated to sharing relevant research advances and offered summations in risk analyses, resource allocation, port/waterway logistics, security, and economic impacts.

The research day began with an in-depth look at risk management strategies by keynote speaker retired USCG Captain Robert G. Ross. Ross outlined a seven-point “Total Risk Management Cycle.”

Speakers presenting on topics related to resiliency, resource allocation, risk and economic analysis, as well as marine port operations, safety, and security throughout the research day included Fred Roberts, director of CCICADA and DIMACS at Rutgers; David Ebert, director of VACCINE at Purdue; Thomas Wakeman, deputy director of CMS at Stevens Institute of Technology; Tish Pohl from University of Arkansas; Iris Heckmann from Karlsruhe Institute of Technology; Adam Rose and Isaac Maya of CREATE at University of Southern California; Jesus Rios of IBM; Ronald Pelot of Dalhousie University; Jim Rice from CTL at MIT; and Rutgers LPS researchers.

The 2nd Annual Maritime Risk Symposium was supported with funding from the National Science Foundation and the U.S. Department of Homeland Security.

More on the web: Presentations, participants, and a detailed agenda at cait.rutgers.edu/maritime-risk-2011. Information on LPS port logistics and security research at cait.rutgers.edu/lps.

Top: Keynote speaker Admiral Thad Allen (USCG Retired), who has led response efforts in some of America’s most devastating recent disasters, shared his extensive knowledge on emergency preparedness.

Bottom: Attendees got an up-close look at the USCG MH-65 helicopter from Air Station Atlantic City, which landed on campus the first day of the Maritime Risk Symposium. The helicopters are typically used in short-range recovery operations to transport people and materials during emergencies.
Hats off NYC, / Showing your artsy side with / safety poetry.

That’s a haiku—a poetry form consisting of three lines of 17 syllables in a pattern of five, seven, five. Poems are an unlikely delivery method for safety messages, but that’s exactly what New York City Department of Transportation (NYCDOT) is using for a safety education campaign announced at the end of November 2011, *Curbside Haiku*.

The *Curbside Haiku* series of 12 different signs features colorful artwork and haikus by artist John Morse and important messages about pedestrians, cyclists, and motorists safely sharing city streets. In all, 216 signs that draw attention to critical issues for all street users will be installed at high-crash locations across New York City, strategically placed based on a citywide analysis of crashes near various cultural institutions and schools.

Half of the signs will be hung in pairs, with the image and haiku text below; the remainder of the series feature an image with a QR code on the sign that leads viewers to the corresponding safety message via their smartphones.

“We’re putting poetry into motion with public art to make New York City’s streets even safer,” said NYCDOT Commissioner Janette Sadik-Khan. “These signs complement our engineering and education efforts to create a steady rhythm for safer streets in all five boroughs.”

The idea for *Curbside Haiku* came from artist John Morse’s 2010 art installation, *Roadside Haiku*, which consisted of 500 signs he created and installed across the city of Atlanta. Morse’s Atlanta installation was inspired by bandit signs—the small advertisements you see staked into the ground or stapled onto utility poles along roadways and at busy intersections—that normally exclaim dubious promises, like “LOSE 30 POUNDS IN 30 DAYS!” or “MAKE MONEY AT HOME IN YOUR SPARE TIME!” In a way, bandit signs are a commentary on our collective anxieties; similarly Morse’s take on them offered compact observations about modern life, but largely with a positive bent, for example one that reads, “MEET LOCAL SINGLES!! / EASY: STAND NEAR OTHERS, / HANG UP YOUR CELL PHONE.”

“*Curbside Haiku* seeks to merge public art with public awareness to infuse a bit of beauty and joy into the public sphere with the images, while underscoring the realities of the message with poetry,” said Morse. “I’m aiming to engage, edify, and inform, and nothing does that better than art.”

*Curbside Haiku* is the newest tool in NYCDOT’s growing safety education portfolio, and is the second program launched through a joint effort between the agency’s Safety Education Division and its Urban Art Program. The campaign was paid for using a state grant from DWI funds.

A poster of the series and copies of the 8-by-8-inch signs are available for purchase; proceeds benefit the Safe Streets Fund, New York City’s public-private partnership dedicated to traffic safety education and awareness.

More on the web: Poster and signs available for purchase at safestreetsfund.org/store.

Watch a short film about Morse’s Atlanta project at vimeo.com/14337511.
ESETM to the point we can take it to the field and do in-situ testing, from which we can learn even more that will help us maintain and improve the economic viability and health of the region’s waterways.”

**What do we do with all this stuff?**

Beneficial reuse of dredge material is especially important in New Jersey and the surrounding area. Between New York Harbor and the Delaware River networks alone (the two major commercial waterway systems in the state), 9 to 12 million cubic yards of sediment are removed every year. To give you an idea of how much material that is, the volume of the Empire State Building is about 1.37 million cubic yards.

The abundance of dredge is a space problem and an economic drain. Costs to transport and store this material can range anywhere between $30 and $120 per cubic yard, depending on fuel costs, hauling distance, and market factors. This massive amount of material is generally useless, and sadly—due to the New York metro area being the oldest industrialized watershed in the country—much of it is contaminated or even toxic. Establishing criteria for using sediment will save hundreds of millions of dollars by reducing the need to move and store dredge in landfills or confined disposal facilities.

In general, waterway sediments lack the geotechnical properties necessary for structural landfill, topsoil, and transportation and construction fill.

Maher said, “In a nutshell, the focus of this lab is better understanding of sediment behavior and, furthermore, finding ways to treat and stabilize it so it can be used beneficially. In addition, we hope with the help of Mr. Weeks and his family to enhance technologies like the ESETM to the point we can take it to the field and do in-situ testing, from which we can learn even more that will help us maintain and improve the economic viability and health of the region’s waterways.”

Above: Using two million cubic yards of dredge, the Bayonne Landfill was transformed into the highly exclusive Bayonne Golf Club. In this instance, rather than paying for fill, the developers were paid to use the dredge, allowing them to offset construction costs.

*Photo courtesy Evan Schiller, golfshots.com, all rights reserved.*

Right: Guests from Rutgers, NJDOT, and Weeks Marine, Inc., gathered December 12, 2011, to dedicate the Richard N. Weeks Soil and Sediment Laboratory. Pictured left to right are: Vice President of Weeks Marine Dredging Division Stephen Chatry, Weeks Marine CFO Matthew Reece, School of Engineering Dean Thomas Farris, Weeks Marine President Richard S. Weeks and his wife Candace, Chairman Richard N. Weeks and his wife Virginia, NJDOT Program Manager Scott Douglas, and CAIT Director Ali Maher.
material (how much sand, silt, and/or clay is contained) and whether or not it is contaminated, dredge can be amended and potentially used for beach or other habitat renewal and restoration, landfill or brownfield cover, or highway and other construction fill. As an example, using two million cubic yards of dredge, the Bayonne Landfill was transformed into the highly exclusive Bayonne Golf Club. In this instance, rather than paying for fill, the developers were paid to use the dredge, allowing them to offset construction costs. Finding the most effective ways to incorporate dredge material for construction applications will help alleviate the vast amounts of space needed to properly dispose of these materials and can turn something that is otherwise a useless waste product into a profitable commodity.

**Bridge trouble over turbulent waters**

Another important function of SSML research is what it can teach us about bridge scour—an issue that impacts all bridges that traverse bodies of water, more than 80 percent of the country’s 600,000 bridges. Bridge scour refers to holes gouged by swift-moving water in the rocks and soil around bridge piers and abutments. Scour can seriously compromise the integrity of a structure and is one of the three main causes of bridge failure: By some estimates, up to 60 percent of bridge failures are related to scour and other hydrologic phenomena. Research to increase understanding of the dynamics of scour and how to mitigate it is obviously crucial to the safety and preservation of our nation’s bridges. In this way, work being done by SSML complements CAIT’s bridge research, such as its work on evaluation of scour countermeasures being done in connection with the FHWA Long-Term Bridge Performance (LTBP) program.

**SSML partners and supporters**

CAIT’s SSML is working hand-in-hand with USDOT, NJDOT, FHWA, New Jersey Department of Environmental Protection, other federal and state agencies, and the maritime industry. In addition to Weeks Marine, Inc., support through grants and research contracts also has been provided by the Port Authority of New York and New Jersey, Environ, Inc., Geo-Hydro, Inc., and a number of other industry partners. Together, we are confident we can make responsible sediment and erosion management a reality.
Pulsing with vibrant communities, New Brunswick—aka “the healthcare city”—is the heart of the region, fed by a network of transportation “veins” including the Northeast Corridor rail line; the New Jersey Turnpike, Garden State Parkway, I-287, and other major highways; and a tangled web of smaller streets that make it walkable, but potentially problematic.

Home to theaters, international cuisine, and a legendary music scene, New Brunswick is Central Jersey’s answer to big-city entertainment for those who don’t want the hassle of going into New York City. Located smack in the middle of the state, New Brunswick serves a diverse community of students, artists, medical and law professionals, corporations, small business owners, and lifelong residents.

The eclectic character of the city requires agencies in charge of its roadways take special care maintaining and improving safety for the sometimes-competing parties that use them. The Middlesex County Planning Board and the City of New Brunswick had particular concerns regarding a heavily used stretch of road downtown that seemed to be plagued with a high number of crashes. They decided to intervene in hopes of improving safety. Enter CAIT and their Road Safety Audit (RSA) team.

RSAs are roadway evaluations conducted by a multidisciplinary, independent team of professionals in order to formulate cost-efficient, implementable recommendations that will improve safety for all road users. Since 2009, CAIT has offered this free service to towns and counties across the state. RSAs typically include three stages: data analysis to identify potential issues, an observational site visit, and post-evaluation.

Using the Transportation Safety Resource Center’s (TSRC) crash data analysis software, Plan4Safety, the team identified particular types of crashes happening along a segment of Livingston Avenue, a main thoroughfare in the cultural district. At the request of the county planning board and the city, CAIT researchers examined data collected over approximately two years and found that the site in question had multiple recurring safety incidents, many of which occurred in the evening. The TSRC team did a geographic assessment along with the data analysis, noting the complex mix of bus stops, businesses, residences, offices, restaurants, and entertainment venues frequented by a varied populace, and paired that information with data that showed 113 crashes occurring from 2007 through 2009. Sixty-eight percent of those crashes happened at night; 33 percent were “right-angle” crashes (or crashes occurring during right turns at intersections); and 23 percent were crashes involving pedestrians or bicyclists.

Armed with this information, CAIT coordinated a site visit with members of the Middlesex County Planning Board, New Brunswick Police Department, Puerto Rican Action Board, and Rutgers’ Voorhees Transportation Center. With “eye-witness” observation, the RSA team identified potential safety issues that most likely would not have been evident from the crash data alone. They evaluated signage and lighting, transit stops, crosswalks, visibility issues, and vehicle speeds, noting the factors that were most likely contributing to the specific types of crashes.

After a full-day field inspection, the RSA team compiled its findings and formulated countermeasure recommendations, which ranged from engineering solutions to public awareness and

RSA Chronicle #2: New Brunswick, NJ
CAIT engineers assess walkability in Central Jersey’s culture hub
enforcement programs. In all, the team outlined about 25 possible remedial actions the client could use to improve safety on Livingston Avenue, many of which could be classified as low-cost/high-impact solutions. Now under NJDOT review, specific recommendations included: installing high-visibility crosswalks and signals in areas where visibility is obstructed or road markings are faded or missing; improving and/or replacing bus shelters to better protect public transit users; clearing pedestrian signals/buttons of obstructions like posted ads or trash cans and repairing broken buttons; deploying “your speed” variable message signs to urge speeding motorists to slow down; and updating “school zone” signage, among others. Dedicated bicycle lanes and hiring consultants for in-depth lighting analysis were also part of the team’s recommendations.

Once approved by the NJDOT, the team’s final report to the client will detail all the safety concerns and a vetted list of suggested countermeasures, including potential costs and benefits. The team also will help Middlesex County and the city identify state and federal funding sources to offset the cost for improvements, such as funds from NJDOT Local Aid, Safe Routes to School, Safe Routes to Transit, and Local Safety Program grants. As a final service, after the client decides which safety options it wants to implement, post-evaluation data analysis can be performed to determine effectiveness of the safety measures adopted as evidenced by crash reduction.

More on the web: Information on RSAs at cait.rutgers.edu/tsrc/audits.

CAIT UTC Student of the Year

Considering his relative youth, Brian Pailes has accomplished a lot, and you don’t need nondestructive evaluation tools to detect his talent.

A doctoral student at Rutgers, Pailes has been part of CAIT’s nondestructive evaluation (NDE) team for almost two years and now can add CAIT University Transportation Centers (UTC) Student of the Year to his already impressive résumé. Like the other outstanding students named by 60 UTCs around the country each year, Pailes is being recognized for his academic accomplishments, leadership qualities, the technical merit of his research, and the potential he’s demonstrated to make significant impacts in his career.

Pailes’ research focuses on using a combination of NDE techniques to gather data—like ground penetrating radar, impact echo, half-cell potential, electrical resistivity, and surface-wave testing—in order to better detect and characterize damage of reinforced concrete bridge decks. Using the strengths of each test method and combining the data from several tools results in more reliable and detailed condition assessments.

Pailes is involved in three major research endeavors at CAIT: the FHWA Long-Term Bridge Performance (LTBP) program, the Automated Nondestructive Evaluation and Rehabilitation System (ANDERS) project funded by NIST, and a SHRP2 project that is using NDE to identify deterioration in concrete bridge decks.

Pailes has done NDE testing on many different types of bridge structures throughout the United States. He also has been studying the effectiveness of bridge deck overlays in preventing water from penetrating into the deck by using several different kinds of embedded sensors and NDE tools to look at moisture content of the deck and the overlay and to record how the moisture is changing over time. In the past, he worked with the Transportation Infrastructure Systems Engineering program at Virginia Tech on a project using impact echo to detect delamination and severe cracking of the decks of bus terminal ramps on the George Washington Bridge and was involved in testing and evaluation of pile jackets that were installed to help prevent corrosion on the Admiral Clarelly Bridge in Pearl Harbor. He also worked as a co-op student employee at engineering firms such as Parsons Brinckerhoff and Simpson, Gumpertz & Heger, Inc.

A native of Southwest Harbor, Maine, Pailes received his M.S. in structural mechanics at the University of Virginia and his B.S. in civil engineering from Northeastern University. He hopes to finish his doctoral dissertation by spring 2014.
In 2010, Kristen Derewicki was CAIT’s UTC Student of the Year and the recipient of a scholarship from the New Jersey Asphalt Pavement Association. She’s been on the dean’s list more than five semesters and graduated magna cum laude in May 2010. Now, she’s been named Student of the Year again, this time by the University Transportation Research Center Region II, based at The City College of New York.

Derewicki’s graduate thesis is on developing specifications to use 4mm dynamic shear rheometer (DSR) parallel plates to grade asphalt binder performance and relating her research results to those of other existing tests. The hope is that the process she’s investigating will make it possible to reduce the amount of material needed for forensic testing of binders, therefore reducing the amount of solvents used to extract the binder from asphalt samples. In the end, this will make forensic testing less expensive and more environmentally friendly. She has been working in CAIT’s Pavement Reference Program’s AASHTO-accredited asphalt laboratory for more than two years.

Derewicki is active in the Rutgers community as a Bunting-Cobb Graduate Mentor for Women in Science, Technology, Engineering, and Math, where she supports the academic, professional, and personal development of the residents through regular interactions, programming, mentoring sessions, and leading by example.

As an undergraduate, Derewicki worked as a construction engineering aide for the Port Authority of New York and New Jersey. She was active in the Rutgers Women in Engineering Leadership League and was on the university’s ASCE concrete canoe team.

In the little bit of spare time she has left after studying, research, and mentoring activities, Derewicki volunteers as coach for the Rutgers Women’s Rugby Club and enjoys playing rugby herself.

The 7th Annual New Jersey Safety Forum, hosted by the Transportation Safety Resource Center (TSRC) at CAIT, was held October 19, 2011, at Mercer County College. The event drew educators, law enforcement, emergency responders, and engineers from public and private transportation agencies—all uniting around the theme “Maximize Safety, Minimize Dollars,” which focused on strategies to keep safety programs afloat despite a down economy and dwindling resources.

The welcome by NJDOT Commissioner James Simpson made clear to over 200 attendees that moving “toward zero deaths” was one of the state’s priorities. With humor and emotion, Simpson recounted his colorful 25-year career in transportation, during which safety played a huge role. “We’re the densest state in the country, and we have a lot going on—everybody’s in a hurry, and our roads are congested. ... You folks are the reason we have a state as safe as it is,” Simpson commended the crowd.

Next up, administrator of the FHWA New Jersey division office Ernie Blais stressed that more work still needs to be done, despite economic setbacks. “The challenges are diverse, but everyone has an opportunity to play a part in the solution. ... We’re in a new economic climate ... we need to find new opportunities, new ways to fund [safety] projects,” Blais said.

The forum included sessions led by experts from county, state, and federal agencies across New Jersey and covered key topics for every sector of the audience. For educators, developing a safety program; for law enforcement, data-driven approaches to crime and traffic safety and red-light running guidelines; for engineers, low-cost safety solutions; and for emergency responders, traffic safety guidelines.

The main attraction was the afternoon panel, “Accessing State and Federal Funds,” which explained the “how-to” and “why” of state and federal grant eligibility, regulations, and selection. The session was led by highly sought-after experts from FHWA, NJDOT, the Division of Highway Traffic Safety, National Highway Traffic Safety Administration, and members of New Jersey’s metropolitan planning organizations. Panelists offered innovative ways to seek out funding—even from sources outside of the government, such as corporations like CVS and PepsiCo.

TSRC honed outstanding achievements during the Traffic Safety Excellence Awards ceremony, demonstrating to the crowd that even if cash is short, safety can always find a way. Winners included: the City of Hoboken for their pedestrian daylighting program; the New Jersey Trauma Unit at the University of Medicine.
and Dentistry of New Jersey for their elementary school pedestrian education program; the Toms River Police Department for their data-driven approaches to crime and traffic safety; the Linwood and Northfield Police Departments for their collaboration; and the New Jersey Division of Traffic Operations for their outstanding response and road recovery efforts during Hurricane Irene. Hunterdon County’s HART Transportation Management Agency received an honorable mention for their multicultural approach to pedestrian safety.

The Annual New Jersey Safety Forum is created with guidance from FHWA, NJDOT, the New Jersey Transportation Planning Association, the South Jersey Transportation Planning Organization (SJTPO), and the Delaware Valley Regional Planning Committee. This year’s event was made possible with generous support from the Construction Industry Advancement Program (CIAP) of New Jersey; Maser Consulting, PA; and American Traffic Solutions, Inc.

13th Annual NJDOT Research Showcase

On October 27, just a week after TSRC’s Traffic Safety Forum, nearly 250 attendees gathered for the 13th Annual NJDOT Research Showcase.

Hosted by the New Jersey Local Technical Assistance Program (NJ LTAP), the conference serves as a yearly opportunity for NJDOT customers and public and private agencies to learn about the broad scope of transportation research projects sponsored and funded by the NJDOT Bureau of Research.

“The aim of the showcase is to show NJDOT customers that there is a wide array of research activities being conducted under their discretion. It’s not about studying traffic—there are projects dealing with the environment, with safety and perception, with multimodal systems, and with infrastructure materials and design,” said NJ LTAP Director Janet Leli.

High-profile speakers welcomed the crowd, kicking off a day of presentations and poster sessions from students and researchers. The keynote speaker, Ernie Blais from the FHWA New Jersey division office, spoke about research successes that could expedite project delivery and technological innovation.

Chris Hedges, senior program officer of Cooperative Research Programs at the Transportation Research Board (TRB), gave an all-encompassing look at TRB perspectives on new and existing transportation research. Hedges, a 25-year research veteran, offered insider advice to the audience.

“This year I will concentrate on the NCHRP, which is of greatest interest to the states, and is truly a cooperative research program funded by voluntary contributions of state DOTs,” Hedges said, explaining that collaborative efforts often make things possible that one DOT could not achieve individually.

NJ LTAP’s resident engineer Ted Green kicked off the morning with a multimedia approach to international innovations—“Technical Solutions in Transportation: Here and Abroad,” a one-hour session that segued into afternoon breakouts on multimodal systems, traffic safety, infrastructure, and environment. Topics discussed before the close of the day included teen driver safety metrics, transit signal priority applications, and automated distress survey equipment evaluations.

Up-and-comers in transportation research were honored during the 2011 Outstanding Student in Transportation Awards ceremony led by Andrew Swords, director of NJDOT Division of Statewide Planning. Winners included Rutgers’ CAIT-TSRC intern Thanh Le for her work in road safety audit (RSA) initiatives. Other winners were Luis Gaitain of Rowan University; Xiaochen Xu of The City College of New York; Dan Kravetz of Rutgers; Haiheng Yu of the New Jersey Institute of Technology (NJIT); and Sami Demirogluk of Rutgers.

The Annual NJDOT Research Showcase was created with guidance from the NJDOT Bureau of Research. A wide range of agencies were represented at the conference, including: FHWA, NJ Transit, CUNY, Rutgers’ CAIT, Rutgers’ Voorhees Transportation Center, Rowan University, and local municipalities and counties. Private industry participation included Cambridge Systematics, Dewberry, Remington & Vernick, HAKS, Naik, and WSP Sells.

More on the web: Presentations from the New Jersey Safety Forum available at cait.rutgers.edu/tsrc, and from the NJDOT Research Showcase at cait.rutgers.edu/njltap/highlights-13th-annual-njdot-research-showcase.
Warm mix asphalt (WMA) can be mixed and applied at lower temperatures, reducing energy consumption and emissions, but it carries potential for compromised performance. The winning research paper concluded that proper moisture content of the aggregate contributes greatly to how well WMA pavements hold up.

CAIT Director Ali Maher, Thomas Bennert, director of CAIT’s Pavement Resource Program, and Robert Sauber, formerly of NJDOT’s Bureau of Materials, received the K.B. Woods Best Paper Award for their peer-reviewed technical paper, Influence of Production Temperature and Aggregate Moisture Content on the Performance of Warm Mix Asphalt.

The K.B. Woods Award was established by the TRB Executive Committee in 1971 and is given annually for an outstanding paper published in the field of transportation facility design and construction. Bennert and Maher also were honored with the Woods Award in 2008 for their paper, Field and Laboratory Evaluation of a Reflective Crack Interlayer in New Jersey.

Warm mix asphalt (WMA) can be mixed and applied at lower temperatures than traditional hot mix asphalt (HMA) and it is becoming more popular for several reasons. Reduced energy consumption, reduced emissions, and a more workable product are appealing characteristics for an industry that is mindful of sustainability and environmental impacts, as well as ride quality and pavement density. The original intent of WMA was to provide better workability and compaction (more densely compacted asphalt pavement generally performs better because it’s less prone to fatigue and rutting).

But, the lower production temperatures for WMA may result in softer asphalt due to reduced oxidative aging of the binder and poorly dried aggregates that may create issues with moisture damage.

The researchers set out to evaluate how WMA mixing temperature and aggregate moisture content influence the general permanent deformation, fatigue cracking, and susceptibility to moisture damage of the final product. Ultimately, the hope is that these research results will help state agencies develop criteria for using WMA in the future as well as develop appropriate quality control methods and standards.

To quantify these issues, WMA mixtures containing various asphalt additives were tested. Potential for stripping also was evaluated using pre-wetted aggregate blends and modifying the mixing procedure in the lab to more closely simulate drum-plant production.

The experiments using the Asphalt Mixture Performance Tester (AMPT) and dry Hamburg Wheel Tracking tests, clearly indicated that
as mixing temperatures decreased, so did rutting resistance and stiffness. Meanwhile, experiments using the Overlay Tester showed fatigue-cracking resistance increased. Tensile Strength Ratio (TSR) and wet Hamborg Wheel Tracking tests indicated that TSR and rutting values yielded only “passing” results at conventional HMA mixing temperatures and with dry aggregates.

The information gleaned from the study clearly indicates that the mixing temperature of WMA and initial moisture content of the aggregate blend have a significant impact on the final performance, especially regarding the pavement’s potential for rutting or moisture damage.

So, state agencies considering using WMA should be aware of: the influence of different technologies; the production temperatures required to achieve benefits of WMA (i.e., reduced emissions and energy consumption and improved workability); and that better aggregate stockpile management (and/or the addition of anti-strips) may be required to minimize the potential for moisture damage.

More on the web: Download the paper at pubsindex.trb.org/view/2011/C/1093387.
Three CAIT products shown at TRB Safety Conference

The Transportation Research Board hosted an international conference devoted to "Improving Roadway Safety Programs Through University-Agency Programs," November 2–3, 2011. More than 100 participants from across the country participated in an intense and informative conference agenda that included dynamic workshops and breakout sessions.

The conference was a forum for roadway safety practitioners and researchers to review new safety tools and concepts and highlight successful university-transportation agency partnerships. Stakeholders from state departments of transportation, University Transportation Centers, Federal Highway Administration, and public health representatives engaged each other in best practices discussions and the development of future policies to be used by transportation agencies.

CAIT was a proud three-time participant in the conference’s poster session, presenting on its Transportation Safety Resource Center (TSRC), Road Safety Audits program, and Plan4Safety crash data analysis tool.

TSRC was acknowledged as a shining example of a resource program that provides technical assistance, training, data analysis, and traffic safety programs that are invaluable NJDOT as well as other local and state transportation agencies. The center is an excellent example of a university-agency partnership focused on roadway safety.

CAIT’s dynamic and talented Road Safety Audits (RSAs) team presented their holistic approach to safety, which includes as many expert viewpoints as possible. RSAs bring together a multidisciplinary team of experts to examine and identify any deficiencies in intersection or other road projects and formulate countermeasures that can address the problems. RSAs are available to towns and counties throughout the state. (Read more about RSAs on page 10.)

Plan4Safety was once again recognized on a national level for its role as multilayered decision support tool for the state’s transportation engineers, planners, enforcement, and decision makers. A collaborative effort between the NJDOT and CAIT, Plan4Safety has emerged as a vital tool for constituents who need crash data to make data driven decisions that yield safety and infrastructure improvements throughout their communities.

NJ LTAP receives national award for work zone safety program, but real prize is saving lives

Every other year, the Roadway Safety Foundation and the Federal Highway Administration (FHWA) recognize exemplary highway projects and programs from across the country with the National Roadway Safety Awards. This year, CAIT’s New Jersey Local Technical Assistance Program (NJ LTAP) was one of nine organizations honored at an awards ceremony November 15, 2011, in Washington, D.C.

The FHWA awards committee judges submissions from transportation safety agencies and organizations throughout the United States for effectiveness, innovation, and impact on traffic safety. Committee reviewers seek projects or programs that fall into one of four categories: program planning, development and evaluation, infrastructure improvements, and operational improvements.

Developed, maintained, and led by NJ LTAP, the Work Zone Safety Education Program provides a multilevel, interactive, state-certified collection of educational training courses and organizes a major statewide annual conference for state transportation agency officials, law enforcement, highway construction managers, work zone personnel, engineers, and highway contractors. The objective: Reduce work zone related injuries and fatalities.

Annually, the program educates an average of 1,000 work zone safety professionals from every corner of the state. It’s no surprise that New Jersey work zone fatalities have decreased despite the increase in highway construction projects. Working on safety curriculum with NJDOT, New Jersey State Police,
CAIT newsletter and posters pull in another couple awards

Transportation Today and a series of 10 posters about CAIT programs (samples pictured right) were selected from more than 9,000 entries in the Graphic Design USA (GDUSA) American Design Awards, a national competition open to ad agencies, design firms, and corporate, nonprofit, and educational organizations in North America. The CAIT projects are in good company; other winning submissions included design work for Amtrak, Goldman Sachs & Co., and Microsoft.

The winning entries were published in the GDUSA November/December 2011 issue. These same two projects were selected earlier this year for the American Inhouse Design Awards, which are open only to inhouse corporate and nonprofit communications departments.

OSHA, and the Turnpike Authority, course attendees receive up-to-date, state-approved safety information and protocol mandates in interactive, hands-on classes designed to simulate the working environment.

NJ LTAP has been heading work zone safety professional development programs since the inception of its New Jersey Traffic Control Coordinator Program courses in 1990.

Courses in the program include the flagship “Traffic Control Coordinator” (TCC) program and its follow up refresher course, an OSHA 10-hour training course, the work zone safety “Train-the-Trainer” course for law enforcement, and the “Work Zone Safety Awareness” training course, which is tailored to specific audiences, such as police, public works, or the construction industry.

In addition to these training opportunities, NJ LTAP hosts an annual Work Zone Safety Conference during National Work Zone Awareness Week. It addresses current trends in work zone safety, making the latest information available to workers who are at the greatest risk in highway construction zones.

The 2011 National Roadway Safety honorable mention is just the latest award NJ LTAP’s work zone safety efforts have received; earlier this year, the program was recognized in a legislative proclamation from the New Jersey Senate formally naming the NJ LTAP and the Work Zone Safety Partnership as hosts for the official Work Zone Safety Awareness Conference each year.

with gratitude

CAIT thanks professional photographer and golf professional Evan Schiller for permission to use his photo of the Bayonne Golf Club on page 8. Schiller has photographed hundreds of championship courses around the world including St. Andrew’s and Pebble Beach, where he is the official photographer. Schiller’s work regularly appears in national magazines such as LINKS, Golf Digest, and Golf Magazine. His new book, Golf’s Unfolding Drama, is available on iTunes for viewing on your iPad at itunes.apple.com/us/book/golfs-unfolding-drama/id486531636?mt=11. You also can see more of his stunning golf landscapes at golfshots.com.

TSRC thanks the Construction Industry Advancement Program (CIAP) of New Jersey, Maser Consulting PA, and American Traffic Solutions, Inc., for their generous support of the 7th Annual New Jersey Safety Forum, which was held on October 20, 2011.
New civil engineering faculty, in the house!

When two new faculty came to Rutgers’ Department of Civil and Environmental Engineering in September 2011, they also signed on as CAIT resident researchers.

**Eric Gonzales, Ph.D.**, (below, top) focuses his research efforts on the operation, management, and design of urban transportation systems (including public transit), network modeling and control, and transportation economics. He will help CAIT expand projects on managing multimodal transportation systems and city street spaces.

Studying intricacies of transportation within urban settings is important and will only become more so in the future as the trend toward population density accelerates. Cities worldwide already face a growing demand for mobility with limited—and in some cases, degrading—transportation infrastructure. Understanding movements of people and goods within cities and building accurate predictive models can help determine how street space should be allocated and how transport modes should be operated—and priced—depending on physical characteristics of the urban environment and the needs of the people who live and work in them.

Gonzales came to Rutgers, where he is now an assistant professor of civil and environmental engineering, following his active and distinguished undergraduate and graduate careers. He was named as the University of California Transportation Center’s 2011 Outstanding Student of the Year, 2010 Outstanding Graduate Student Instructor, and an Eno Transportation Foundation Fellow (enotrans.com), also in 2010. He has given presentations and been invited to speak on his research expertise nationally and has authored or co-authored peer-reviewed journal articles and conference proceedings. Gonzales is a member of the Institute of Transportation Engineers, American Society of Civil Engineers, and other professional groups.

Gonzales earned a B.S. in civil engineering from Carnegie Mellon University in 2006 and an M.S. in civil and environmental engineering from UC Berkeley just one year later. He completed his Ph.D. in civil and environmental engineering at UC Berkeley in the spring of 2011. He was active in several engineering honors societies including Chi Epsilon and Tau Beta Pi, as well as Mortar Board, a community service honor society.

**Hao Wang, Ph.D.**, (left) conducts research in sustainable materials, nondestructive evaluation techniques, and computational modeling and their applications, pavement design, maintenance, and management. He is a welcome addition to CAIT’s research initiatives in health monitoring, pavement engineering, and advanced materials.

Keeping infrastructure functioning and in a state of good repair is a high priority research mission throughout CAIT’s entire program collective. Wang’s post-doctorate and graduate research in pavement modeling and testing, asphalt materials evaluations, and tire-pavement interaction will contribute greatly to CAIT research in surface and subsurface evaluations, and in developing newer and more resilient infrastructure materials.

Wang’s extensive educational and professional background led him to Rutgers, where he serves as an assistant professor in the Department of Civil and Environmental Engineering.

Earning a B.S. in civil engineering and an M.S. in transportation engineering from Nanjing, China Southeast University, Wang continued his studies in the United States, completing an M.S. in civil engineering from Virginia Tech, and his Ph.D. in civil engineering at the University of Illinois at Urbana-Champaign (UIUC). During his graduate career, Wang received several honors, awards, and grants for his graduate research, including an Eisenhower Graduate Fellowship Grant from FHWA and first prize in the Airport Design Challenge from FAA. He also was named to a Pratt Fellowship at Virginia Tech and the Yee Memorial Fund Fellowship at UIUC in 2004 and 2010, respectively.

Wang has co-authored more than 10 publications on pavement design, materials, and evaluation research.

In addition to his academic research and instruction at Rutgers, Wang acts as a peer reviewer for several journals, including the *International Journal of Pavement Engineering* and *Transportation Research Record: Journal of the Transportation Research Board* (TRB), as well as the *Journal of Material in Civil Engineering and the Journal of Transportation Engineering* from the American Society of Civil Engineers (ASCE). He holds memberships in several professional engineering associations and the ASCE TRB committees on pavements and materials.
Electric vehicle (EV) charging stations are not new technology, but they are still a fairly rare sight when it comes public use.

Late last summer—in a cooperative effort with Rutgers School of Engineering and University Facilities—two ChargePoint® EV chargers were installed outside CAIT as part of a research project that will collect data on EV usage and environmental benefits.

Any EV driver can use the chargers for free until 2013 (a Rutgers parking permit is required, but temporary tags are available at CAIT for non-Rutgers users). The two stations (Level 1 and Level 2) are capable of charging four vehicles simultaneously and are listed on EV-charging locator sites like openchargemap.org and carstations.com.

The stations have drawn a lot of curiosity from passers-by. Michael Thwaite, an EV advocate and president of the New Jersey Electric Vehicle Association, charges his Tesla Roadster at the CAIT stations every week, and was especially thankful for them during and after Hurricane Irene and the freak Halloween snowstorm, when his residence was without power for well over a week total. Because of these stations, said Thwaite, “I could have carried on for weeks without any significant change to my daily routine. [Plus I really enjoy] chatting to the many students and faculty who stop by. There really is a huge interest in EV tech from ‘Generation Y.’ I am far less worried for my children’s future than I have been in the past.”