

TranSearch

DELAWARE CENTER FOR TRANSPORTATION

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MESSAGE FROM THE DIRECTOR



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Ardeshir Faghri, Director

Welcome to the first issue of TranSearch – the official newsletter of the Delaware Center for Transportation. In September 2001, the Delaware Transportation Institute (DTI) moved and was re-established as the Delaware Center for Transportation (DCT). DCT is now located in Suite 355 DuPont Hall, in the Department of Civil and Environmental Engineering at the University of Delaware.

This first issue of our newsletter introduces the main components of DCT and brings our readers up to date on the news, events, and accomplishments of the past twelve months.

DCT's primary goal is to serve as the research and educational arm of the Delaware Department of Transportation (DelDOT). We promote, organize, coordinate, and support research, development, and educational activities to address the transportation needs, challenges, and opportunities facing the State of Delaware, the mid-Atlantic region, the nation, and, indeed, the world.

Transportation plays a vital role in this age of information technology and a global community, and top-quality transportation research and education cannot be provided in isolation. At DCT, we maintain a continuous partnership with all the parties involved in transportation. We also strive to integrate all transportation-relevant research and education

at the University with the ongoing activities of the Center, so that our undergraduate and graduate students, as well as transportation professionals, can take advantage of what we have to offer in a mutually helpful environment.

Our goal is simple – to be the best transportation research and education center in the world. To that end, we have many ongoing and new initiatives that we think will help us achieve our objectives, as outlined in the box. More information about these objectives is provided in the various sections of this issue of TranSearch and can also be found at our web site (www.udel.edu/dct).

Thank you for taking the time to get to know us. Your opinion is important to us, so please contact us and let us know how we can improve our services and be more responsive to the citizens of our state, region, nation, and beyond.

Delaware Center for Transportation Initiatives

Research. Selecting, conducting, and disseminating multi-disciplinary research is perhaps the most important function of DCT. Every year, through a systematic methodology, projects are identified, prioritized, and funded. The active projects for 2002-2003 are listed on page 4.

Education. Semester-long courses, short courses, workshops, seminars, and conferences constitute the educational component of DCT. These educational opportunities are available to the university community, DelDOT, other DOTs, and government agencies, as well as private organizations dealing with transportation issues. Examples of our educational offerings are listed on pages 6-7.

Technology Transfer. The T² Center was formerly within DelDOT and is now part of DCT. The T² Program organizes annual workshops for transportation providers, a "circuit rider" who visits Delaware's towns and cities to offer tech-

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nical assistance with transportation issues, and distribution of research and other reports from universities and government agencies.

Distinguished Guest Speaker Series. Several times each year, guest speakers from around the globe are invited to visit the Center and present talks about important transportation issues.

Technical Assistance. DCT carries out short-term projects for DelDOT and other organizations. Examples include conducting literature searches and providing hands-on training for a specific software, hardware, or method of carrying out a task. The literature search projects the Center is currently working on are listed on page 7.

Industrial Collaboration/Private Partnership. DCT's executive directorship has a strong desire and interest to invite members of the private companies and consulting firms to join the Center and become actively involved in decision making processes. There is a great deal of mutual benefits that can be realized from our industrial collaboration/private partnership program.

Global Research. Partnership with top-quality worldwide transportation education and research institutions includes the exchange of ideas, exchange of scholars, sharing research findings, and conducting joint research projects, conferences, seminars, and workshops.



Left to right: Wanda Taylor, Jerome Lewis, Ardeshir Faghri, Larry Klepner

MEET THE PEOPLE AT DCT

Ardeshir Faghri *Director*

Dr. Faghri is also the Associate Chair and a Professor in the Department of Civil and Environmental Engineering. He has been teaching transportation engineering courses at the University of Delaware since 1990. Dr. Faghri was the Interim Director of DTI from 1995-1996.

Jerome Lewis *Associate Director*

Dr. Lewis is also the Director of the Institute of Public Policy and a Professor in the College of Human Services, Education and Public Policy. Dr. Lewis was the Interim Director of DTI from 1993-1995.

Wanda Taylor *Assistant to the Director*

Mrs. Taylor currently assists the Director in all aspects of the DCT. She has a Masters in Public Administration and has been with the DTI/DCT since 1996.

Lawrence Klepner *T² Program Coordinator*

After thirty-two years with DelDOT, Mr. Klepner and the T² Center have recently moved to the DCT. Mr. Klepner will continue to carry out the technology transfer programs within the University of Delaware.

CENTER FOR INNOVATIVE BRIDGE ENGINEERING

For students wanting to learn more about bridges, for bridge owners interested in using the latest advanced materials for construction and repair, and for companies seeking experts to conduct collaborative research, the Center for Innovative Bridge Engineering (CIBE) at the University of Delaware is a unique and valuable resource.

"We have a strong history of working with DelDOT and other bridge owners and consulting firms to solve bridge-infrastructure-related problems," says CIBE Director Dennis Mertz. "One of our most notable collaborations was the installation of an all-composite bridge deck on Business Route 896 in Glasgow, Delaware, late in 1998."

The primary focus of CIBE is on the application of high-performance materials—including steel, concrete, and advanced composites—to bridge infrastructure. Center-affiliated researchers have successfully demonstrated rehabilitation and strengthening of a steel bridge using advanced composites, rapid replacement of a concrete deck with a composite deck, and installation of a composite slab on steel girders.

Although CIBE is only in its first year of operation, more than 20 UD faculty from several departments have already participated in collaborative research in this area or have expressed an interest in future participation.

"The success of the Center will depend on interaction with government agencies such as state and federal DOTs and industry to help direct research and educational activities," says Professor Michael Chajes, Chair of the Department of Civil & Environmental Engineering and an affiliated faculty member in the Bridge Center.

"We plan to establish a partnership program and will work closely with this group to identify research needs and to transfer technology through research reports, short courses, and symposia and conferences." Partners may be involved through financial contributions and membership fees, participation in joint research projects, sharing of research equipment, and donation of equipment and materials.

A strong academic program for undergraduate and graduate students in the various areas comprising bridge engineering is a major component of the Center's mission. Through CIBE, the Department of Civil and Environmental Engineering is home to a Research Experiences for



Undergraduates (REU) Program funded by the National Science Foundation. The program enables 10 undergraduates from schools all over the country to spend the summer immersed in a challenging 10-week research experience in bridge engineering.

"We applied for the grant based on the large need for bridge engineering research and for trained professionals in this area—needs that have been created by the deteriorating condition of our nation's bridges," says Chajes, who is the faculty advisor for the program. "We hope that the REU Program will encourage these students to continue their education and contribute to the field through advanced research."

"The area of bridge engineering is more diverse than most people realize," says Mertz. "It includes not only all fields of engineering but also economics, history, and social science. We're providing the REU participants with the experience of a multidisciplinary research environment, where they work on a specific problem with a team of faculty, post-docs, and graduate students."

Adding to the educational experience is a Bridge Design Laboratory in DuPont Hall, which was funded through a Unidel grant. "The lab provides our students with a working environment that mimics as closely as possible the conditions encountered in an engineering consulting firm," says Chajes. "It's equipped with computer hardware and software for design and presentation, and we're adding a variety of resource materials such as design guides, codes and specifications, reports, and other references. We're also planning to purchase equipment to enable remote monitoring of sensing systems on various bridges and highways in the region."

"We've defined a number of goals for the Bridge Center," says Mertz, "but what it all comes down to is providing two basic resources to the bridge engineering community—people and knowledge."

For more information about the Center for Innovative Bridge Engineering, contact:

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Undergraduate researchers in a summer program at the University of Delaware inspect a bridge during a tour hosted by DelDot.

Research

Engineering projects and projects related to highway transportation have been the major emphases in the past. These areas will continue to be strongly represented; however, growth in sponsored research in other research subject areas (e.g., economics, business practices, policy studies, and human resources) and transportation modes (e.g., marine, bicycle/pedestrian, rail, and transit) are a major goal for DCT. Continued growth in engineering and highway applications, especially from new sponsors, is also a DCT goal. In general, DCT will focus on core areas of concern for Delaware and the region and the areas of expertise or desired specialization at the University which involves political science, economics, mechanical engineering, urban planning and other disciplines, as well as civil and environmental engineering.

In addition to this year's annual research program, we are also doing many short, literature-search projects. We want to provide information to the State on both short- and long-term technology needs.

The current active research projects include:

Estimating Current Modal Splits

This project will produce a new, more reliable estimate of travel mode choice in Delaware to be used for planning and evaluation of services and assist in the establishment of systems to better judge the consequences of alternative solutions to transportation problems.

Principal Investigator: David Racca, Center for Applied Demography and Survey Research
Project Manager: Michael DuRoss, Division of Planning and Policy

Evaluation of Training Methods

This project will examine ways to most effectively train DelDOT and local government employees, e.g., classroom, distance learning, Internet, etc.; and give an evaluation of the options.

Principal Investigator: Kathleen Werrell, College of Engineering
Project Manager: Larry Klepner, T² Program

Service Life Assessment of Concrete with ASR and Possible Mitigation

The aim of this research is to develop testing method(s) that can be used to indicate the degree and status of ASR in existing Portland cement concrete structures in Delaware; proposed guidelines for prevention of ASR in new concrete pavement structures in Delaware; and guidelines of how to rehabilitate concrete pavements in Delaware with ASR problems.

Principal Investigator: Nii Attoh-Okine, Dept. of Civil and Environmental Engineering
Project Manager: Chao Hu, Division of Preconstruction

Paratransit Services Study

This project will examine the existing framework of DART First State's paratransit services, the policy environment within which these services are provided, comparative practices in other jurisdictions, and to provide a review and evaluation of policy options.

Principal Investigator: Douglas Tuttle, Institute of Public Policy
Project Manager: Stephen Kingsberry, Delaware Transit Corporation

Delaware Department of Transportation Soft Skills Workshop Series

Since engineers are lacking in soft skills, this project will design and deliver a series of coordinated workshops that address soft skills such as: leadership development, negotiation techniques, effective communication and problems skills, conflict resolution processes, and ethics and tools for leading effective meetings.

Principal Investigator: Kathy Wian, Institute of Public Administration
Project Manager: Carolann Wicks, Chief Engineer

Sealing Materials Research

The purpose of this project is to document and compile information on high performance sealant material which is economical enough to utilize extensively.

Principal Investigator: Nii Attoh-Okine, Dept. of Civil and Environmental Engineering
Program Manager: Glenn Pusey, Division of Highway Operations

Data for Trip Generation Models: Trip Attraction Rates for Delaware Condition

Two types of development create special circumstances, large commercial shopping complexes, and very compact multi-use developments. It would be useful to have Delaware-specific trip generation rates for these.

Principal Investigator: Shinya Kikuchi, Dept. of Civil and Environmental Engineering
Program Manager: William Brockenbrough, Division of Project Development

2002-2003 GPS Travel Time and Delay Data Collection and Analysis

This project uses the state-of-the-art equipment in receiving satellite position information for collecting real-time state-wide traffic data. The data is then analyzed and displayed by Geographic Information Systems software.

Principal Investigator: Ardashir Faghri, Dept. of Civil and Environmental Engineering
Program Manager: Dan LaCombe, Intermodal Programs

Enhancing Delaware's Highways: A Natural Vegetation Project

This project is in the process of developing and introducing alternatives to current roadside management strategies to restore Delaware's roadside landscapes to a more natural state reflecting the regional flora.

Principal Investigator: Susan Barton, Plant and Soil Sciences
Project Manager: Chip Rosan, Roadside Environmental Supervisor, Field Services

EDUCATION

T² PROGRAM

The T² (Technology Transfer) Center at the DCT is associated with 57 other centers throughout the United States. There is a center in each state, at 7 Native American tribal groups, and in Puerto Rico. Primarily funded by the Federal Highway Administration and the state departments of transportation, each center serves multiple transportation agencies. In Delaware, the center works with DelDOT, DART First State, regional transportation planning agencies, and city and town public works departments.

The Center's main objective is to help all of these transportation providers to learn and to use the newest and best transportation technologies. We offer the following services:

- A quarterly newsletter mailed to more than 500 federal, state, and local transportation specialists; elected officials; consultants; and others;
- About 30 annual workshops (see upcoming events calendar for more details);
- An annual Roadway Management Conference sponsored by the centers in DE, MD, PA, VA, and WV;
- A "circuit rider" who makes on-site visits to Delaware's towns and cities to offer technical assistance on a variety of issues such as pavement repairs, utility control policies, and contract preparations.
- Distribution of research and other reports from universities, state departments of transportation, federal agencies, and the Transportation Research Board.

Except for the Roadway Management Conference (hosted by DE in 2004), Delaware's public sector agencies do not pay for any of these services.

The national T² Center program began in 1981 when 10 pilot states were named. The Delaware center was established in 1988 at DelDOT. In 2002 it relocated to the DCT to more readily access and offer the innumerable resources available at the University of Delaware.

For more information about the T² Center, or to get a free subscription to our newsletter please call (302) 831-6241.

September 18-20	Load Resistance Factor Design*
October 2	Fundamentals of Highway Construction for Local Governments*
October 21-23	Planning, Analysis, Design of At-Grade Intersections*
October 22-23	Accident Reconstruction*
October 23	Geosynthetic Applications for Local Governments*
October 24	Drainage Issues for Local Governments*
November 14	Pavement Rehabilitation for Local Governments*
November 20	Context Sensitive Solutions*
November 25-26	Asset Management Issues*
December 17	Preventive Maintenance for Local Governments*
January 6-8	Traffic Engineering Short Course*
January 12-16	Annual TRB Meeting, Washington, DC
February 20	Design/Construction Workshop*
March 16-19	2002 Roadway Management Conference, Wheeling, WV*
April 21-24	Traffic Engineering Short Course*

* T² Center event. Call (302) 831-6241 for details.

Most educational needs at DelDOT, except those that fall under the Human Resources Programs, are sponsored and managed in the Delaware Center for Transportation. Semester-long courses, short courses, including month-long, two- and three-day long courses, workshops, seminars, and conferences, are what constitute the educational component of the DCT. Below is a list of courses that have been offered during the past year with some interesting attendance statistics. The list of upcoming courses is also listed.

During the first year of DCT, we were pleased to offer the following courses:

"Construction Methods & Management"

A semester long course taught by Robert Muir, P.E., Project Manager with Greggo & Ferrara, Inc. This course was attended by 50 students – 75% UD students, 20% DelDOT, 5% private consulting firms

"Intelligent Transportation Systems"

A semester long course taught by Dr. Shinya Kikuchi, Professor in the Dept. of Civil and Environmental Engineering, University of Delaware. This course was attended by 20 students – 80% UD students, 10% DelDOT, 10% private consulting firms

"TTS-Managing Traffic Congestion"

A three-day short course for engineers, planners and ITS operators taught by Holly Rybinski, P.E., Assoc. V.P. and Manager of Traffic/ITS at Edwards and Kelcey, Inc. This course was attended by 30 students – 50% DelDOT, 40% private consulting firms, 10% UD students

"Traffic Engineering Workshop"

A five-week short course taught by visiting professor, Dr. Abishai Polus, from Israel Institute of Technology. This course was attended by 30 students – 70% DelDOT, 20% private consulting firms, 10% UD students

"Transportation Planning"

This is a semester long course which started this fall, being taught by Dr. Partha Chakroborty, Visiting Professor, India Institute of Technology. This course is being attended by 12 students – 50% UD students, 50% DelDOT and DART

"Geometric Design of Highways & Streets"

This is a semester long course which started this fall, being taught by Ray Harbeson, P.E., R K & K Engineering, and former Chief Engineer of DelDOT. This course is being attended by 35 students – 75% UD students, 25% DelDOT

"Pavement Design and Management"

A semester long course taught by Dr. Nii Attoh-Okine, P.E., Professor in the Dept. of Civil and Environmental Engineering, University of Delaware. This course is being attended by 15 students – 50% UD students, 50% DelDOT

"Introduction to Transportation and Traffic Engineering"

A semester long course taught by Mark Lucysz, P.E., Manager, Traffic Operations, McCormick Taylor, Inc. This course was attended by 35 students – 90% UD students, 10% private consulting firms

UPCOMING COURSES

"Highway Capacity Manual and Software" taught by Holly Rybinski

"Construction Scheduling" taught by Dr. Nii Attoh-Okine

"Traffic Computer Simulation" (being planned)

"GIS in Public Policy" taught by Vernon C. Svatos

"Government, Planning and Management" taught by Dr. Robert Warren

"Land Use & Environmental Planning" taught by Dr. David L. Ames

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"Resources, Development and the Environment" taught by Dr. Yda Schreuder

"Measuring and Defining Planning Problems" taught by David Hugg

"Introduction to Comprehensive Planning" taught by David Hugg

"Introduction to Zoning and Land Use Controls" taught by David Hugg

DCT and the T² Program will be offering more courses this year and in the future. Please check our web site, <http://www.udel.edu/dct>, for a complete list of courses being offered.

Intelligent Transportation Systems: Unique Laboratory Outsmarts Traffic



Professor Shinya Kikuchi teaching students in the ITS Lab.

Traffic gridlock, poorly timed red lights, and long waits for overcrowded buses could become things of the past if the new Intelligent Transportation Systems (ITS) Laboratory in the Department of Civil and Environmental Engineering ultimately achieves its goals.

Although no one believes that traffic or mass-transit problems will ever disappear entirely, the department's ITS

Lab stands at the center of modern transportation engineering and planning. In cooperation with state transportation officials, the lab uses leading-edge communications and information technologies to obtain data on traffic flow conditions and transit vehicle movement. This information will be used to smooth the flow of traffic and improve safety throughout Delaware. According to the lab's director, Professor Shinya Kikuchi, ITS is a worldwide effort "to take advantage of the fusion of information, communications, and communications technology in transportation to improve efficiency, safety, and mobility of people and goods."

The ITS Laboratory is located on the third floor of DuPont Hall. It will be used for research, student education, and the training of DelDOT personnel. Kikuchi believes it to be one of just three university-based transportation control laboratories of its type in the nation, along with ITS labs at the University of Virginia and the University of California at Irvine. Delaware students who work or receive training in the lab will have a distinct advantage as they enter a profession that is increasingly relying on ITS technologies.

In the lab, three large projection screens face a bank of computer work stations. Fiber-optic cable links the lab directly to the DelDOT Transportation Management Center in Smyrna, enabling the laboratory to receive video images of current traffic conditions and real-time data from traffic detectors and signals. Researchers at the lab then use the data collected from Delaware roadways to study the behavior of drivers, travel time, and traffic flow patterns. The findings are incorporated in traffic behavior simulation models that are then applied to test the effectiveness of various improvement strategies in a variety of locations. For example, at a busy intersection where rush-hour congestion stalls commuters on a regular basis, the models can be used to predict the effects of changing the timing of lights or altering the geometric design of the intersection by creating additional turning lanes.

Delaware Center for Transportation

"We can develop traffic signal control strategies and incident management strategies based on this analysis," Kikuchi says. "We can predict delays, queue lengths, and when the lines will disappear."

In addition to developing new software, researchers in the lab can make use of products developed elsewhere to investigate and visualize traffic conditions. For example, software donated by Gannett-Fleming, a consulting firm based in Harrisburg, Pennsylvania, allows researchers in the lab to simulate a driver's experience as he or she travels a specific route. "Visualization is becoming an integral part of the planning process," Kikuchi explains. "This software allows transportation planners to see how changes in signage or vegetation or the addition of noise barriers will appear to drivers. These considerations are important for both safety and aesthetic reasons."

The lab will also be involved in implementing ITS applications to improve the efficiency of public transportation. For example, Delaware's transit vehicles are equipped with Global Positioning Systems (GPS), and, using ITS technologies, staff at the laboratory will be able to track on-time performance and develop a system to let passengers waiting at the various stops know when the next bus will arrive.

Within the University, the laboratory will involve several disciplines and departments, Kikuchi says. These include electrical engineering, mechanical engineering, urban affairs, economics, communication, computer science, and mathematics. A joint proposal with the Geography Department to study the effects of inclement weather on traffic is currently pending at DelDOT.

Funding for research, data acquisition, and additional hardware and software for the ITS Lab will be facilitated by the Delaware Center for Transportation. "We regard the ITS Lab as one of the most important components of the Delaware Center for Transportation," Faghri says. "Since it is one of the very few such labs in the USA, it has the potential for generating so many projects in collaboration with other departments and transportation agencies throughout the Northeast. And one of our top goals is to generate more private sector involvement in transportation operations."

Kikuchi notes that he is also interested in making the lab's resources available in collaborations with consulting firms in the area and in working actively with department alumni employed in these firms. He invites alumni to contact him for a demonstration of the lab's capabilities.

TECHNICAL ASSISTANCE

Short-term projects, for which DeIDOT needs answers on a relatively quick time frame, or projects for which a full fledged research is not needed, fall under the Technical Assistance category. These projects are usually completed within 6-9 months. The list of Technical Assistance Projects for the 2002-2003 fiscal year are as follows:

- **Adding pedestrian facilities on existing bridges**
This project will examine the many locations in Delaware where the pedestrian way is interrupted by a bridge that has no sidewalk. Adding pedestrian facilities with traditional materials and methods has been very expensive. The project will examine possibilities to develop a more cost-effective method and materials to help complete the State's network of pedestrian transportation facilities.
- **Succession planning**
This project will examine DeIDOT's need to develop a plan for hiring and retaining staff that will replace eminent retirees. What kind of talents should they have? What changes in personnel policies and practices DeIDOT needs to adopt?
- **Patent financial allocation**
This project will examine the number of patents filed each year; the amount of revenue that the State of Delaware and the universities receive from patents derived from transportation research; and if the State's share should be returned to the universities to increase research projects.
- **Assistance of disabled during inclement weather (for transit use)**
This project will conduct a survey to determine the level of assistance that disabled persons receive during inclement and normal weather conditions.
- **DELTRAC Investment. What are the benefits?** This project will do an assessment of improvements/benefits realized from the DELTRAC investment. DELTRAC is DeIDOT's Intelligent Transportation Systems Program which includes the Integrated Traffic Management Center in Smyrna, Delaware, and the affiliated infrastructure and organizations.
- **Flowable fills**
This project will develop a specification to address areas where material would be most beneficial (for example, pipe backfill, bridge approach base, etc.). Flowable is also known as Controlled Strength Material. It is used in place of ordinary geotechnical fill. There are two classes of flowable fills available: excavatable and non-excavatable. Excavatable fill has strength less than 100 psi and non-excavatable fills have strength greater than 100 psi.
- **Use of slurries for improving hot-mix pavement**
This project will do an evaluation of possible use of slurries to improve the quality of hotmix pavements. A slurry seal is a homogeneous mixture of emulsified asphalt, water, well-graded fine aggregate and mineral filler which has creamy fluid-like appearance when mixed in proper proportions. Three gradations are used for slurry seals and this is based on the function served by the slurry seal. Type I is used to fill fine surface cracks and provides thin overlay. Type II is slightly coarser than Type I for use when moderate to severe raveling has occurred due to oxidation of the asphalt and to resolve or improve slud resistance. Type III seal is for pavements with severe surface irregularities.
- **Increasing the depth of rolled curbs and its effect on longevity**
This project will do an evaluation of the benefit in added life; reduced fracturing of integral rolled curb and gutter of thicker cross-section, i.e., increase standard minimum depth from 6" to 8", 6" to 10". This could have significant benefit in reducing annual curb replacement costs on subdivisions.
- **Research on salt additives**
This project will address the effect of different de-icing agents on bridges and load transfer devices in rigid pavements.
- **Mechanical means of applying snow-melting materials**
This project will review the current technologies for application of snow melting material to determine which systems are most capable of accurately metering, application rates and which unloading systems yield the best utilization of truck GVW and body cubic volume.
- **Evaluation of contractors' past performance**
This project will do an evaluation of contractor performances for use in qualifying contractors for bidding.
- **Assessment of different public involvement methods**
The project will evaluate the effectiveness of different public involvement methods for transportation planning, design and construction, as well as public transit projects.
- **Electric buses**
This project will evaluate the current status of electric busses, look at current operations and costs, and state of the art.
- **Aging population and traffic**
This project will examine the problems of the aging population in Delaware. What particular steps should be taken in the areas of traffic engineering (signal timing, pavement markings, letter sizes on signs) that would address aging drivers.

CONTACT INFORMATION

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The mission of the Delaware Center for Transportation is to improve the movement of people, goods, and ideas within, to, and through the State of Delaware, the mid-Atlantic region, the nation, and the world through research, development, and education.

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