Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2017

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Assessing NJ TRANSIT's Mobile App for Users' Receptiveness to Geotargeting	NJ TRANSIT customers can use a smartphone application ("app") to purchase tickets and access transit information. Most smartphones are equipped with technology that can determine the user's location; however, this feature is currently used in a limited capacity in NJ TRANSIT's app. By knowing a customer's location, NJ TRANSIT could potentially provide customized information directly to passengers based on their location, which is referred to as geotargeting. The objective of this research project is to assess NJ TRANSIT passengers' receptiveness to geotargeting in NJ TRANSIT's mobile app. A three-part method was used. First, an industry scan of transit smartphone apps was conducted by downloading publicly available apps from four peer transit agencies. The results reveal that most of the peer transit agency apps are location aware; however, this functionality appears to be used in a limited number of features within the app, such as detecting a user's location when they request nearby real-time vehicle arrival information. In the second part of the research, focus groups of NJ TRANSIT passengers were conducted, and the results of this qualitative research were used to guide the third part of the project, in which an online survey of NJ TRANSIT customers was conducted. The results of the survey reveal that most customers understand that their smartphone can detect their location, and most respondents find it acceptable for NJ TRANSIT's app to detect their location. After providing specific examples of potential geotargeted features in NJ TRANSIT's app to survey respondents, the most desired feature was targeted transit service alerts. Examples of targeted coupons and advertising were also presented to survey respondents; however, these received mixed feedback from participants. In summary, the results suggest that NJ TRANSIT passengers find it acceptable for NJ TRANSIT's app to know their location, and they are particularly receptive to receiving targeted transit information relevant to their NJ TRANSIT trip.	June 2017	College of New Jersey	Final Report; Public Transit; Mobile Applications; Geotargeting	Technology
Fiberglass Composite Materials Specification Redevelopment	Polymer based structural members have shown to be economically viable when used in marine environments. These polymer materials have higher initial cost than traditional materials (steel, concrete, and timber), but generate return on this investment with longer useful lives. These materials are currently being implemented in a variety of geotechnical structures in the state of New Jersey. This research was performed because the requirements of Section 916 of the New Jersey Department of Transportation Standard Specifications limited the State of New Jersey to a small subset of the commercially available products. Expanding the number of viable products allows for greater competition making it possible for the New Jersey Department of Transportation to spend funds more efficiently. A thorough literature review, an analysis of regional and national specifications for polymer composite materials, as well as an independent engineering design analysis were performed to determine the minimum required material properties for the polymer based structural members. Based on these results, a specification, product qualification standards, and product acceptance standards were created based on statistically determined material properties, maximum allowable degradation, and full-scale structural testing. When selecting material testing standards, it was found that no simple effective test could be performed on round fiber reinforced composite tubes. This lead to the development of two new standard tests. One tests a ring cut from the circular tube with two opposing forces. The other tests an arch segment in flexure.	April 2017	College of New Jersey; Hardesty & Hanover; Georgia Institute of Technology	Fiber-Reinforced Polymer (FRP); Composite Materials; Piling Systems	Infrastructure

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Year: 2016

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Research Process Improvement and Regulatory Compliance Updates	The New Jersey Department of Transportation identified critical issues related to compliance with changes to Federal regulations governing the distribution and expenditure of Federal funding used in transportation research activities. The Executive Office of Management and Budget (OMB) establishes uniform cost principles and audit requirements for all Federal awards to non-federal entities. Changes to the guidance provided under 2 CFR 200 (Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards) have impacts on existing policies and procedures for the NJDOT research enterprise. This report provides an assessment of existing business practices as they relate to compliance with 2 CFR 200 and offers recommendations for policy and documentation changes as needed. To assess these changes, the research team completed several activities, including a review of current business documents, a developed action plan to address the 2014 Research Subpart B Process Review findings, and the consideration of a process and tool for appropriately categorizing research projects.	October 2016	Cambridge Systematics	Research Administration; Supercircular; Risk Monitoring	Department Management
Cost of Roadway Construction, Operations and Maintenance in NJ	New Jersey's transportation systems comprises a vast array of infrastructure, The costs associated with planning, constructing, operating and maintaining New Jersey's transportation infrastructure is significant and can vary significantly from year to year. On average, 59 percent of total transportation-related expenditures in the New Jersey are for activities not directly associated with planning, constructing, operating, and maintaining roads and bridges under NJDOT's jurisdiction. The primary research objective for Phase I of this study was to estimate how much it costs on average to plan, construct, operate and maintain the roadways and bridges under NJDOT jurisdiction. Costs averaged around $1.5 billion annually. This equates to an average cost of $183,757 per lane mile, excluding debt service, to plan, construct, operate and maintain the roadways and bridges under NJDOT jurisdiction. When interest payments on bonds is added in, the total cost increases to an average of $212,927 per lane mile. These results provide a baseline understanding of average aggregate costs associated with NJDOT roadways and bridges. Additional analysis will be conducted as part of Phase II of the study in order to understand more completely the factors that influence cost efficiency of specific NJDOT projects and programs, and the costs associated with planning, constructing, operating and maintaining roadways under the jurisdictions of New Jersey toll road Authorities.	May 2016	Voorhees Transportation Center, Rutgers University	Highway Construction Costs; Cost per mile; Cost of highway operations and maintenance; infrastructure costs New Jersey; Cost per lane mile	Infrastructure; Department Management
Integration of Bus Stop Counts Data with Census Data for Improving Bus Service	This research project produced an open source transit market data visualization and analysis tool suite, The Bus Transit Market Analyst (BTMA), which contains user-friendly GIS mapping and data analytics tools, and state-of-the-art transit demand modeling microsimulation capabilities. BTMA combines both archived transit operations data (e.g., automatic fare-box data), and new open data resources, particularly GTFS and US Census.	April 2016	UTRC/ Albany Visualization and Informatics Lab	NJ TRANSIT, Bus Market Analyst, Microsimulation, Open Source, Open Data, Census, Demographics, ACS, CTPP, Open Trip Planner, GTFS, GTFS Editor, Regression Model, Fare Box, Survey Data.	Mobility; Technology
Design and Fabrication of Orthotropic Deck Details (Volumes I-VII)	The objectives of the research were to verify the design and fabrication of the orthotropic deck details proposed for the lift bridge, for infinite fatigue life. Multi-level 3D finite element analyses (FEA) of the proposed deck were performed to determine the critical stresses at the connections, the corresponding load position, and the deck specimen. To develop cost-effective connection details, three variations of rib-to-floor beam and rib-to-deck plate connection details, including the influence of different fabrication parameters, were explored in full-scale small size mockups. Subsequently, the infinite life fatigue performance of the connection details were evaluated by laboratory testing of a full-scale prototype. The fatigue testing was conducted under simulated rear tandem axle loading of the AASHTO fatigue truck with adequate boundary condition. The prototype testing was runout after 8 million cycles, verifying the infinite life fatigue performance of the deck design.	February 2016	ATLSS Center, Lehigh University	Lift span; Othoropic Deck; Rounded Bottom Ribs; Infitnite Fatigue Life; Full-Scale Prorotype; Fatigue Testing, AASHTO; Run-Outl Cost-Effective; Fabrication.	Technology; Infrastructure

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Year: 2016

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Highway Repair Consolidation Feasibility	Faced with growing number of work zones, the challenge for transportation agencies is to effectively manage the impacts of work zones to alleviate congestion and maintain the safety of motorists without disrupting project schedules. Coordinating work zone activities and improving communication among agencies have already been practiced by various State DOTs and transportation agencies. The main objective of this study is to understand the types of projects that can be coordinated and to evaluate the Effectiveness of coordinating short and long-term projects using a cost-benefit analysis approach to measure the efficiency of various combinations of projects relative to each other and the status quo. For this purpose the research team conducted an extensive literature review, determined the state of practice in other State DOTs and conducted interviews with NJDOT staff to investigate the types of projects undertaken by NJDOT and if there were already any practice of work zone coordination on NJ roadways. The team, after consulting with the project panel and the NJDOT Mobility and Systems Engineering division, devised a work zone coordination framework that utilizes one common work zone database, including OpenReach and Capital Program Management (CPM) Project Reporting System (PRS) databases. Work Zone Coordination Spreadsheet (WCS) tool was developed for providing NJDOT with an easy-touse tool to evaluate the feasibility and effectiveness of coordinating short and long term work zones and measure the benefits of various combinations of projects relative to each other and the status quo. This on-line tool is implemented with a web-based user interface. It integrates all scheduled and active construction projects from the OpenReach database and planned CPM projects from project reporting system (PRS) database. It then identifies conflicts between work zone projects and estimates the benefits of conflict mitigation.	July 2016	Rutgers University; New York University	Work zone, coordination, conflict, cost benefit analysis	Project Delivery; Infrastructure
Optimizing Work Zone Lighting	Work zones are inherently complex and confusing visual environments, where the usual patterns of traffic flow are perturbed, and where lights used by workers for task visibility can create glare not only to workers but to nearby drivers. The use of delineation and signage, in addition to warning lights that may be flashing, can all contribute to "visual chaos." The New Jersey Department of Transportation (NJDOT) commissioned the present study to address and begin to overcome these issues. The objective of the present study was to identify the needs of workers and drivers in different work zone environments, and to review existing knowledge about ways in which lighting practices and technologies can be deployed to provide workers with sufficient illumination while minimizing glare and confusion to all individuals in and near the work zone. Following a literature review of recently published information on lighting and traffic control in work zones, and a Questionnaire of safety engineers, technical analyses of illumination systems, signage and delineation materials, and warning lights were undertaken. The results of the technical analyses led to the development of several preliminary guidelines for illumination system selection/layout, application of sign and delineation devices and materials, and the use and control of warning lights to provide workers and nearby drivers with visual information in work zones. Implementation of the preliminary guidance in the present report can assist NJDOT in improving visual conditions in several different types of work zones through lighting that maintains visual performance while reducing glare and distraction from excessively bright lights.	October 2016	Lighting Research Center, Rensselaer Polytechnic Institute	Work Zone Lighting, Balloon Lighting, Warning Lights, Visual Performance	Technology

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Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Alternatives to Nuclear Density Testing	The performance of pavements is highly dependent on compaction quality control of unbound subgrade and base/subbase layers. Distresses in pavements can be directly linked to compaction defects within these layers. In current practice, the nuclear density gauge (NDG) is utilized for evaluating the compaction quality of these layers. Highway agencies, such as the New Jersey Department of Transportation (NJDOT), employ minimum density requirements, typically 95% of the Proctor maximum dry density (MDD), for evaluating the compaction quality of these layers. However, there are several concerns and safety risks associated with using the NDG. This study was initiated with the aim of replacing the NDG with non-nuclear alternative method(s) that can be used as acceptance tools during the compaction of unbound base/subbase layers. To achieve this goal, a laboratory procedure for compacting large samples was developed to facilitate testing using three non-nuclear devices: Briaud compaction device (BCD), light weight falling deflectometer (LWD), and dynamic cone penetrometer (DCP) on four types of aggregates, two subgrade soils, one dense graded aggregate (DGA), and one recycled concrete aggregate (RCA). Each device was evaluated for its sensitivity to moisture content, compaction effort applied, aggregate type, and testing time. Based on laboratory testing, a multiple linear regression model to predict DCP field measurements was developed. The model was then calibrated using field data. Using the calibrated model, minimum recommended DCP values that would ensure satisfactory compaction of pavement layers in the field were determined. A draft specification for use of the DCP was also developed within this report. Based on testing results and analyses conducted subsequently, the following conclusions were made: - The DCP was the most suitable device for capturing the change in moisture contents within the samples while all other devices showed mixed trends within their results, specifically when preparing samples at 2% below and 2% above OMC. - The DCP prediction model was found to be adequate at predicting laboratory and field DCP measurements. The model was also found to be significantly dependent on moisture content and material properties (i.e., %passing sieve No. 4 and sieve No. 200). - The DCP prediction model was used successfully for identifying a set of recommended DCP penetration rates that would ensure satisfactory compaction of unbound pavement layers in the field. - A specifications for using the DCP as a compaction acceptance tool for natural soils and engineered aggregates was successfully developed.	March 31, 2016	Rowan	MSCR, Binder specification, elastic recovery	Technology; Environmental
Heavy Vehicle Load Simulator for Bridge Deck Testing Application (Volumes I-II)	Given the importance of overcoming the challenges associated with aging and deteriorating bridges, and the need for a full scale proving ground for evaluation of new and advanced materials and devices, CAIT has procured a full-scale load testing equipment. The Heavy Vehicle Load Simulator for Bridge Deck Testing Application is a one-of-a-kind testing equipment that will evaluate full scale bridge elements and bridge decks in an accelerated manner. CAIT collaborated with Applied Research Associates (ARA) to prepare, design and fabricate the Heavy Vehicle Load Simulator. The equipment will evaluate the samples by applying realistic traffic and environmental loading conditions in a greatly compressed timeframe, simulating 15 years of deterioration in 6 months (30 fold). This equipment, for the first time, will allow the scientific study of deterioration processes on full-scale bridges. Since deterioration processes operate over long durations and at a glacial time-scale, time compression is highly desirable. The innovative manners, implemented in this laboratory, to accelerate deterioration processes without distorting them will provide bridge owners with critical information in the near-term. The equipment is a large complex system enclosing a 125’ long by 75’ wide footprint and standing 13’- 6” tall. The equipment consists of a load chassis applying a 60,000lb load in an enclosed environmental chamber that weathers the test sample, simulating seasonal temperature fluctuations (0oF to 104oF) and applying deicers(as per current practice during the simulated winter months). The physical and environmental loading on the test specimens will simulate actual stress and impact levels exerted by truck traffic on bridge decks and superstructure elements at a greatly accelerated pace.	October 2016	CAIT, Rutgers University	Bridge Testing; Deterioration; Nondestructive Evaluation; Durability Analysis; Advamnced Construction Materials.	Infrastructure; Technology
Laser Scanning Aggregates for Real Time Property Identification	The goal of this project is to develop a portable system for determining the mineralogical composition of aggregates in the field for quality control. Laser Induced Breakdown Spectroscopy (LIBS), which involves firing a laser pulse at a sample to determine its composition from light spectra emitted and interpreted using a spectrometer and a custom program, was chosen to be the basis of the portable system. Along with system development, results were analyzed via Partial Least Squares Regression (PLSR). The current analysis technique utilizes split-training and y-scaling to analyze spectra data and performs well for most samples. The results obtained from the LIBS system was compared with X-ray Fluorescence (XRF) data provided by the NJDOT.	December 2016	Dept. Civil Engineering, Rowan University	Aggregate Mineralogy, Material Testing, Laser Technology, LIBS, PLSR, Deployable MATLAB Software, Real time testing, Portable equipment	Technology; Environmental

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Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Worker Safety Issues of Wi-Fi Devices	The application of wireless devices for the transmission and reception of electromagnetic (E&M) energy is rapidly expanding. These devices use new protocols such as Bluetooth, Bluetooth Low Energy (BLE), cellular Long-Term Evolution (LTE), and Wi-Fi standards (802.11n and 802.11a) and produce measurable E&M power densities that add to already existing radiated Radio Frequency (RF) Spectrum. Radio Frequency Electromagnetic Field (RF-EMF) exposure occurs from the use of these devices. The New Jersey Department of Transportation (NJDOT) uses Bluetooth sensors to collect data for travel times on the State roadway systems and transmits this data to provide accurate real-time information to the motoring public. The research documented in this report answers questions related to the use and repair of these transmitters: (1) What are the RF-exposure health risks to NJDOT employee? (2) What steps can be taken to mitigate any risks from RF transmitted sources? This research also goes beyond Bluetooth and Bluetooth LE, and considers the risk from second generation (2G) and 3G cellular radiators and other 801.11 standards equipment now in production. In all cases the levels measured were well below the safe exposure levels established in the United States of America and international standards. Nevertheless, the effects of this exposure on worker health and safety are considered and how to mitigate any possible negative effects discussed.	December 2016	College of New Jersey	E&M Safety; RF-Exposure Health Risks; wIfI; Cellular US &European Standards; Bluetooth; Specific Absorption Rate; IEEE/ANSI C-95	Technology

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Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Study of Public Perception of Traffic Congestion in New Jersey	The objective of this research project was to enhance the capabilities of the Congestion Analysis Model currently used by the NJDOT Bureau of Commuter & Mobility Strategies. The enhancements included development of a corridor-level congestion analysis and updated methodology for calculating congestion performance measures in support of the NJDOT asset management goals and analysis framework. The enhanced performance analysis model provides estimates of economic impact of congestion to supplement "Hot Spot" Analysis, such as the Bottleneck Identification and Ranking capabilities of the I-95 Corridor Coalition's Vehicle Probe Project (VPP) Suite, thereby helping to better understand economic impact of recurring bottlenecks. Additional benefits of the model enhancements include: (a) improved capabilities for identifying needs and analyzing impacts of congestion mitigation improvements on a corridor level; (b) improved capability to effectively present the benefits of specific improvement and express their monetary value; (c) improved ability to provide readily available input to capital programming and project development process; and (d) extended useful life of the Cost of Congestion Analysis Model by addressing the software compatibility issues and migration to more robust database and analytical software platform.	January 2015	NJIT	Congestiona Management Systems; Performance Measures; User Cost; Traffic Congestion Analysis Model	Mobility;
Impact of Freight on Highway Infrastructure in New Jersey	Infrastructure systems, such as pavement, bridges, tunnels, and traffic systems, constitute a major part of the national investment and are critical for our society's mobility and economic prosperity. However, overweight vehicles deteriorate our infrastructure at a higher rate relative to other exposure and causes financial impacts that are not explicitly quantified. This project assesses the impact of overweight vehicles (both permitted and non-permitted) on New Jersey's infrastructures, specifically highway pavements and bridges. It conducts a detailed literature review about overweight vehicles on infrastructure from various states, then investigates deterioration models for various types of pavements and bridges, and quantifies the effect of overweight vehicles on service life of pavements and bridges. This study also performs Life Cycle Cost Analyses (LCCA) based on the proposed deterioration models to obtain the damage cost incurred by overweight vehicles. In addition, it develops both a decision-support tool based on the ASSISTME-WIM software and a unified database for the decision support tool that can be used by NJDOT personnel to assess and quantify the associated damage costs to NJDOT infrastructure network due to overweight trucks. The end result provides a tool that enabled the Bureau of Freight Planning and Intermodal Coordination at the New Jersey Department of Transportation (NJDOT) to combine NJDOT's freight and overweight vehicles data with maintenance and traffic data, to estimate the actual damage cost on NJ Highways due to overweight trucks. Using this tool, and based on the analysis of permit records, the estimated state-wide average cost of moving one ton of overweight load per one mile is about $0.33, in which about approximately 60% of the damage cost is attributed to pavement and 40% to bridges. Based on the current permit fee structure from NJDOT, the damage cost for loads exceeding legal limit is not covered by the weight-based fee. Future work is needed to establish a fee structure based on overweight tons as well as trip miles.	September 2015	RIME, Rutgers University	Overweight trucks; Economic Impact; Highway Bridge; Pavement; Life Cycle Cost Analysis	Infrastructure; Freight

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Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
State Channel Maintenance Capacity	The New Jersey Department of Transportation/Office of Maritime Resources (NJDOT-OMR), Richard Stockton College of New Jersey Coastal Research Center (CRC), and Ocean and Coastal Consultants (OCC) investigated the utilization of dredged holes in New Jersey's coastal bays for the dual benefit of restoring degraded habitat and alleviating shoaling of nearby navigation channels through the beneficial use of dredged material. This study created a geodatabase containing a total number of 122 dredged hole features that were identified and delineated from aerial photography, navigation charts, and previous investigations. Of the 46 features visited during field reconnaissance, three were previously investigated as part of a pilot study (Bass River and both Drag Island sites [Barone et al., 2013]), 28 received a basic site visit, 10 were surveyed as candidate sites and 5 were identified and surveyed as priority sites. Candidate sites were deep enough to warrant a bathymetric survey, benthic grab sample and bottom water quality reading at the deepest location within the dredged hole during the reconnaissance field survey. Priority dredged holes were identified from the candidate dataset as those that provide the greatest opportunities for the placement of dredged material to improve degraded marine habitat while continuing to maintain navigation channels to support commercial and recreational economies. Field visits of the priority sites consisted of more extensive water quality, sediment, submerged aquatic vegetation, and benthic analyses. The project team recommends five priority dredged holes for potential habitat restoration (18 [USACE 18], 25, 78, 86 [USACE 34], and 93). Water quality surveys and benthic grab samples confirm that hypoxia (dissolved oxygen content of less than 2mg/l) is occurring in these dredged holes and that the benthic habitat is azoic. Through the placement of dredged material the bottom elevation of these dredged holes can be increased to shallower depths that do not facilitate the stratification of the water column and subsequent stagnation and hypoxia of the waters in these features. An engineering feasibility analysis was completed by OCC for each priority site to identify appropriate dredged material placement methodologies and the need for any pre-placement dredging or engineering	January 2015	Stockton	Dredged Holes; Subaqueous Borrow Pits; Habitat Restoration; Dredged Material; Channel Maintenance.	Environmental
Channel Usage Research and Analysis	The NJDOT/OMR (Office of Maritime Resources) emergency response to Superstorm Sandy expedited the development of an asset management system to more efficiently manage NJ's Marine Transportation System. Storm response efforts included a preliminary economic value and vessel usage evaluation for most of the State's channels. Vessel usage was determined in part by compiling data on the availability of waterway services such as slips per marina per channel, residential docks per channel, boat ramps per channel, etc. However, usage is known to vary depending on numerous factors including but not limit to: weather, time of year, origin/destination, size and type of vessel, and availability of alternative routes. Actual vessel count data is required in order to validate the data that was collected and provide a more defensible assessment of actual channel usage. The objective of this research is: 1. To develop and implement a reliable, quality-based scientific method or SOP (Standard Operating Procedure) to efficiently and accurately collect vessel count information, and 2. To collect vessel count information utilizing the selected method on approximately 214 state channels within the state's Marine Transportation System.	February 2015	Cambridge Systematics	Channel; Marine; Vessel; Classification	Technology; Environmental
Impact of the Rail Grants Program	The New Jersey Rail Freight Assistance Program awards approximately $10 million annually in grants to freight rail operators for construction and improvement projects. The purpose of the rail investments is to promote and sustain economic development and maintain a balanced transportation system where rail is more economically viable than other transportation systems. However, the New Jersey Rail Freight Assistance Program (hereinafter the "rail grants program") does not currently evaluate the impact of the grants after they have been awarded. No study has been conducted to evaluate the long-term impact of the program on the state's transportation goals. New Jersey Department of Transportation (NJDOT) is now studying the past performance of the program to learn its effects on the NJ economy and transportation system to potentially modify the rail grants program. The research team recommends improvements to the NJDOT's program and selection methodology based on the findings of the research presented this report. This report compiles information from the literature, similar rail grant programs of other departments of transportation (DOTs), and other sources to comprehensively analyze and report on the economic,, traffic, and external impacts of the rail grants program. Several methodologies are reviewed and discussed throughout this analysis. Finally, the research team provides recommendations for improvements to NJDOT's program and application selection methodology.	March 2015	CAIT, Rutgers University	Rail Grant Program; Short Line Railroads; Benefit Cost Analysis; Assit-Me; IMPLAN	Freight; Department Mangement

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Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
My Tix: NJ Transit's Mobile Ticketing Application	The main objectives of this project were to 1) assist NJ TRANSIT in the demonstration of an NJ TRANSIT commuter rail electronic fare technology and 2) conduct an objective third-party evaluation of the selected technology's effectiveness. This report presents in detail the project team's involvement in assisting NJ TRANSIT to evaluate the mobile ticketing application as an impartial entity. NJ TRANSIT's mobile ticketing application, MyTix, was put into effect on the Pascack Valley Line on April 25, 2013. Currently, MyTix app can be used on all ten NJ TRANSIT commuter rail lines. The research team was involved in the evaluation process of the MyTix app, both in laboratory and field conditions. The team also conducted additional tests independent of NJ TRANSIT to increase the reliability of the results. A 3-stage evaluation process was conducted. Stage 1, which consists of alpha tests performed in laboratory settings, was designed to identify possible usability issues with the earlier versions of the MyTix app. Stage 2, which consists of beta tests, was designed to identify possible usability issues with the MyTix app by evaluating the app in field conditions. Stage 3 was the evaluation of the app both during the pilot test and after it was implemented in other commuter rail lines. User logs were analyzed to estimate the adoption statistics and the frequency of use of the MyTix app. The overall project was a remarkable success in terms of the successful deployment of this new electronic ticketing application as a result of very close collaboration between NJ Transit and the research team. NJ TRANSIT was able to quickly address some of the deployment issues that were independently identified by the research team as well as their internal project team, and MyTix app was gradually improved. This ensured acceptance of the app by commuters at a very high rate. As of January 2014, MyTix app was downloaded more than hundred and twenty seven thousand times, and about sixty nine percent of those downloads resulted in registered users.	March 2015	Rutgers University	Mobile Ticketing; MyTix; Electronic Fare Collection; Commuter Rail	Technology; Mobility
Evaluation of Surface Resistivity Indication of Ability of Concrete to Resist Chloride Ion Penetration	Concrete's ability to resist chloride penetration is a determining factor when evaluating durability performance. The Rapid Chloride Permeability Test (RCPT) has been established for assessing the chloride resistance of concrete, but it is ineffective and has many drawbacks; it is a laborious destructive test that provides an indication of chloride ion movement but with high variances. The main objective of this project is to evaluate the Surface Resistivity Test (SRT) in accordance with AASHTO TP 95-11, and to provide a SR threshold to update the NJDOT HPC Specifications. The SRT is non-destructive, requires less training, and provides higher accuracy with less single-operator and multi-laboratory variation in results, thus reducing construction disputes and litigation efforts. Testing time is reduced from 24 hours to 30 minutes and other agencies have reported savings upwards of $1.5 million annually. Due to its non-destructive nature, the SRT significantly reduces consumption of resources and raw materials as well as increases the reliability of results since the same cylinder may be used for other tests; such as the compression test. This study also investigated the effect of curing conditions as well as the effect of Supplementary Cementitious Materials (SCM) and admixtures in HPC on RCPT and SRT results. Laboratory mixes were utilized for parametric studies and for correlating SRT and RCPT results. Field concrete samples from various bridge projects in New Jersey were also collected and tested to validate the correlation and provide the SR threshold that will be used in the NJDOT HPC Specifications. The outcome of this study is a complete statistical analysis of test data on specimens collected from laboratory as well as field mixes as to validate the SRT in comparison with the RCPT. Results show that adopting SRT in lieu of RCPT would be more economical and effective in determining the quality of construction.	March 2015	CAIT, Rutgers University	Rapid Chloride Permeability; Surface Resistivity; High Performance Concrete	Infrastructure
Evaluation of Surface Resistivity Indication of Ability of Concrete to Resist Chloride Ion Penetration	Concrete's ability to resist chloride penetration is a determining factor when evaluating durability performance. The Rapid Chloride Permeability Test (RCPT) has been established for assessing the chloride resistance of concrete, but it is ineffective and has many drawbacks; it is a laborious destructive test that provides an indication of chloride ion movement but with high variances. The main objective of this project is to evaluate the Surface Resistivity Test (SRT) in accordance with AASHTO TP 95-11, and to provide a SR threshold to update the NJDOT HPC Specifications. The SRT is non-destructive, requires less training, and provides higher accuracy with less single-operator and multi-laboratory variation in results, thus reducing construction disputes and litigation efforts. Testing time is reduced from 24 hours to 30 minutes and other agencies have reported savings upwards of $1.5 million annually. Due to its non-destructive nature, the SRT	March 2015	RIME/ICS, Rutgers University	Rapid Chloride Permeability; Surfave Resistivity; High Performance Concrete.	Environmental

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HMA Pay Adjustment	The objective is to evaluate multiple quality characteristics of hot-mix asphalt (HMA) and develop performance-related pay adjustment. An extensive literature review was conducted to review the current state-of-practice on quality acceptance and performance-related specifications. Construction data and pavement performance data were collected for a large number of projects in New Jersey. The performance-related pay adjustment for in-place air void was developed using life-cycle cost analysis (LCCA). Laboratory tests were conducted to measure air voids and permeability of field cores taken at the longitudinal joint to determine the upper limits of air voids at the longitudinal joint. Alternative pay equations for air voids at the longitudinal joint were evaluated using risk analysis. Pavement structural analysis was conducted to predict the interface shear stress under vehicular loading to identify the minimum bonding strength requirement to prevent premature pavement failure. Future research is recommended to refine the longitudinal joint density specification and quantify the relationship between interface bonding and the expected pavement life.	June 2015	CAIT, Rutgers University	Quality Assurance; Pay Adjustment; In-Place Air Void; Longitudinal Joint; Interface Bonding; Life-Cycle Cost Analysis; Pavement Performance	Infrastructure, Department Management
NJDOT Highway Maintenance Crew Worker Title Consolidation	N/A	March 2015	Cambridge Systematics	Highway Maintenance Crew Worker Title Consolidation	Department Management
ADA Paratransit Facility Alternatives	Several transit agencies nationwide have owned ADA-complementary paratransit facilities since the mid-1990s. A few others have taken to facility ownership within the past decade. NJ TRANSIT has always leased its facilities for Access Link, the ADA-complementary paratransit service provided in parts of 18 New Jersey counties. Currently the Access Link service area is divided into five service regions for six “operating regions,” with each operating region having a facility of its own. The facilities are leased through private service providers from landlords. This study was conducted primarily to examine the advantages and disadvantages of NJ TRANSIT owning one or more Access Link facilities. The study additionally identified optimum locations for Access Link facilities in the six operating regions.To fulfill the study’s objectives, several tasks were undertaken, including a review of literature and practice, site visits to all six Access Link facilities, interviews with the facility general managers, structured telephone interviews with ADA division officials from 11 transit agencies nationwide, accessibility analysis to identify optimum facility locations within each region, analysis to compare leasing and owning costs for two actual and three potential Access Link facilities, forecasting the growth of each region in terms of riders and size, and the estimation of costs of new facilities in each region. The results from various types of analysis are summarized in this report. Electronic files containing different types of analysis and results have been separately provided to NJ TRANSIT and NJDOT. Based on the results, eight recommendations were made. Justifications for each recommendation are provided. One of the key recommendations for the NJ TRANSIT ADA Division is to seriously consider ownership of one facility and assess the outcome. It is also recommended that the agency coordinate with other divisions of the agency and conduct appropriate real estate appraisals for the identified properties by using the findings of this study as a guide.	December 2015	Voorhees Transportation Center, Rutgers University	ADA; Paratransit; Facilities; Lease; Ownership; Location Analysis	Mobility

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2015

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Appropriate Implementation of Pavement Preservation Treatments	This research conducted an extensive literature search of national, state, and industry pavement preservation and rehabilitation centers' libraries for applicable treatments (pavement preservation, rehabilitation, and reconstruction) that New Jersey DOT could use on their high volume state-maintained roads. Reports in PDF format were collected and stored in an Access database to allow easy searches by DOT staff. A survey of all state DOTs was conducted to determine their use of these treatments. Fourteen states responded. The survey is summarized in volume 2 of this report. Our research partner, Deighton Associates conducted a survey and interviews of the state DOT contacts that use dTIMS PMS software. A review of their PMS database identified what treatments were used, the treatment's trigger, condition reset, life extension and costs. Summary tables are listed in this report. Based on the literature search and survey results, NJDOT selected seven treatment types that could be used in NJ. These included Fog Seal, Slurry Seal, Micro-Surfacing, Chip Seal, Cold In-place RecyclingFoamed Asphalt, Cold In-place Recycling-Asphalt Emulsion, and Hot In-place Recycling. Material and construction specifications, test methods (mix design, where applicable) and usage guides were developed. These are provided in volume 2. This research also summarized the effect of available suppliers and contractors on implementation. Some states limit the use of certain treatments based on the availability of contractors in their state. Demonstration projects which included CIR, FDR, Asphalt Rubber Chip Seal, Slurry Seal and Microsurfacing treatments provided training opportunities for NJDOT staff	April 2015	CAIT, Rutgers University	Pavement Preservation; Crack Seal; Slurry Seal; Microsurfacing; Chip Seal; Thin Overlay	Infrastructure
Performance Testing for HMA Quality Assurance	An extensive research effort was conducted to evaluate performance-based asphalt mixture design concepts for the New Jersey Department of Transportation (NJDOT). The NJDOT have utilized performancebased design procedures for their "Specialty" asphalt mixtures since 2006. However, performance criteria had not yet been developed for NJ's "Conventional" asphalt mixtures, which includes dense-graded, stone matrix asphalt (SMA) and open-graded friction course (OGFC) mixtures. The research study also looked at the proposed method of "Balanced Mixture Design", which does not utilize air voids at the determinate for optimum asphalt content. Instead, the procedure determines the range of asphalt contents where both rutting and fatigue cracking performance is satisfied and recommends the middle of that range as the optimum asphalt content. Lastly, the study evaluated the Overlay Tester equipment from a second manufacturer, Troxler Electronics, and how well this new unit compared to the original device manufactured by Shedworks, Inc. A mini Round Robin study was conducted to compare the two pieces of equipment and a brief statistical analysis comparing the test data was conducted. The research study resulted in a proposed performance-based criteria for "Conventional" asphalt mixtures that is sensitive to both traffic level and location in the pavement (surface, intermediate or base). The criteria also maintains consistency in test procedures and limits with other performance-based asphalt mixtures in NJ. The Balanced Design methodology indicated that NJDOT's dense-graded asphalt mixtures fatigue life would greatly benefit from a one percent increase in VMA, while resulting in very little decrease in rutting resistance. Upon review of the Troxler Electronics Overlay Tester and comparing it to the Shedworks device through round robin studies confirmed that the Troxler device could be utilized to determine the fatigue life of asphalt mixtures in accordance with the NJDOT B-10 test procedure. After evaluation, the unit was delivered to the NJDOT, where a 2-day training course was held to familiarize the NJDOT engineers with the sample preparation, testing, and data analysis required.	September 2015	CAIT, Rutgers University	Performance-based Specifications; Balanced Mix Design; Overlay Tester; Effective Asphalt Content.	Infrastructure
Rejuvenating Agents with RAP in Hot Mix Aslphalt (HMA)	One potential method to aid in the blending of the RAP and virgin binders, as well as the general softening of the RAP binder, is to utilize a rejuvenating agent. An asphalt rejuvenator is a manufactured product which has the ability to absorb or penetrate into the asphalt mixture/material and potentially restore those reactive components, or rebalance them, which have been lost due to oxidation. The benefit of utilizing the rejuvenating agent is that it can be either preblended with the virgin asphalt binder, or added during the mixing process, instead of requiring the use of a softer PG graded binder that would require an additional storage tank on site. Therefore, to look at potentially adopting rejuvenating agents for use in higher RAP mixtures, the NJDOT needs guidance as to which rejuvenating agents are more practical, environmentally friendly, and work best in obtaining the NJDOT specified properties while being used in conjunction with higher RAP percentages. A research study was conducted to evaluate the effectiveness of various rejuvenators currently on the market.	August 2015	CAIT, Rutgers University	Rejuvenator; Fatigue Cracking; Master Curves; Blank Space	Infrastructure

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2015

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Oversize/Overweight Public Documentation Benchmarking and EFFECTIVENESS Study	Operating commercial vehicles in the United States requires an understanding of complex Federal and State regulations and policies which often differ from state to state and even at the municipal level within a state. Operators of oversize and overweight vehicles face additional regulations and requirements that are often presented in dense, legal documents that are difficult to read and understand. Due to these issues, this research attempts to identify national best practices for information dissemination on size and weight limits and recommends both material and methods that can be employed by State DOTs to better educate operators, and thus increase compliance with regulations.	August 2015	Cambridge Systematics	Oversize; Overweight; Information Dissemination; Permitting; Regulations; Benchmarking.	Freight
Effect of WMA on RAP in Hot Mix Asphalt	The use of warm mix asphalt (WMA) is becoming more popular in the asphalt industry. The promise ofreduced energy consumption, reduced emissions, and a more workable product is very appealing to an industry pressured by environmentalists with sustainability agendas and state agencies applying pay adjustments based on ride quality and pavement density. However, the use of WMA may require the modification of current HMA mixture design procedures to ensure the WMA technologies are not detrimental to volumetric and performance criteria. Poorly dried aggregates may create issues of moisture damage with some water based WMA technologies, while other WMA technologies advertised as an anti-strip may actually improve the resistance to moisture damage. Reduced production temperature may also limit the amount of RAP asphalt binder transfer into the asphalt mixture, but at the same time aid at reducing the degradation of SBS polymer in polymer modified asphalt binders. In conjunction with these potential issues, recent research conducted during NCHRP Project 9-43, A Mix Design Procedure for Warm Mix Asphalt (WMA), suggests that WMA mixtures should be designed separately from hot mix asphalt. In an effort to answer some of these questions, a research effort was undertaken to evaluate the impact of WMA production and technologies on asphalt mixture design and performance. Gel Permeation Chromatography (GPC) testing suggests that the reduced production temperatures associated with WMA will help to limit polymer degradation when using polymer-modified asphalt binders. Some of the WMA additives improve the resistance to moisture damage, while other technologies provide no additional benefit to moisture damage resistance. Both Sasobit and Rediset demonstrated anti-strip ability, similar to that advertised by Evotherm. The laboratory WMA design process was found to reduce the optimum asphalt of the mixture when compared to the identical mixture design under hot mix asphalt conditions. This is most likely due to the increase in compactability the WMA techonologies provide. Performance testing showed that WMA mixtures designed with 25% RAP met all permanent deformation and stripping requirements. A database of WMA and companion HMA projects produced in New Jersey have demonstrated that WMA performs as well as HMA.	September 2015	Rutgers University	Warm Mix Asphalt; Moisture Damage; Mix Design; Blending Potential	Infrastructure; Technology

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2014

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Title VI Agency Policy Examination and Best Practices Review	In order to meet MAP-21 guideline and remain in compliance with FHWA's Title VI requirements, the New Jersey Department of Transportation (DOT) Title VI Unit was instructed to re-examine their existing Title VI policies and regulations. Through this process they were charged with identifying the strengths and weaknesses of the Department's existing Title VI practices, in addition to the strengths and weakness of Title VI practices when coordinating with sub-recipients. Since each Federal recipient is charged with developing their own plans, policies, and requirements that assist in achieving Title VI compliance; no specific or consistent guidance or best practices are available as a resource.	December 2014	Cambridge Systematics	Title VI; Compliance	Department Management
Restricted-Use Licenses for Suspended NJ Drivers	The goal of this research project was to conduct an analysis of the issues and implications of implementing a restricted-use license program for suspended New Jersey drivers. The research project examined the key issues associated with restricted-use license programs. This report presents (1) current practices and experiences with restricted-use driver license programs from the literature, (2) the characteristics of driver license suspensions in New Jersey, (3) a national survey of State motor vehicle agencies, (4) evaluation of Restricted Use Licenses for drivers with commercial driver licenses, (5) crash and violation risk of drivers with non-driving suspensions, and (6) a survey of the perceptions of NJ Police Chiefs regarding a Restricted Driver License.	November 2014	Rowan University	Restricted Use Licenses; Suspended Drivers; Highway Crash; Fatality and Injury.	Mobility; Department Management
Snow Model Analysis	This study developed a new snow model and a database which warehouses geometric, weather and traffic data on New Jersey highways. The complexity of the model development lies in considering variable road width, different preading/plowing patterns for mainlines and ramps, actual (traffic dependent) and recommended plowing/spreading speeds and the use of mixed truck types. On the other hand, the complexity of the developing database lies in extracting geometric details of study road sections, estimating/mapping traffic speed considering the severity of weather (i.e. snow intensity), time of a day (i.e., peak/off-peak period and weekday/weekend), and roadway type (i.e., urban/rural freeways/arterials). The eveloped model was applied to three maintenance yards in New Jersey which demonstrates its dynamic and flexibility in adapting to various circumstances (i.e., geometry, weather, and traffic) in estimating needed fleet size for salt spreading and snow plowing operations for various scales (i.e., section, crew, yard, region, and statewide). The model outcomes can be used to assist managers to determine the required number of contractor trucks before a winter season and during/after a snow storm based on forecasted weather and traffic condition. The objective of this study is to assist the New Jersey Department of Transportation (NJDOT) in developing a method to estimate quantity of salt and fleet size for winter highway maintenance in the State of New Jersey.	January 27th, 2014	NJIT	Salt Spreading; Snow Plowing; Fleet Size; Winter Highway Maintenance; Weather and Traffic Condition; GIS	Mobility; Project Delivery

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2014

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Video Cameras in Access Link Paratransit Vehicles	New Jersey Transit (NJ TRANSIT), under purview of the Americans with Disabilities Act (ADA) paratransit requirement, operates a fleet of 360 Access Link vehicles. The current Access Link paratransit fleet uses a shortsegment video monitoring system. This system captures 20-second video clips generated upon G-force or manual triggers. Since implementation in the Access Link fleet, there have been significant changes to the technologies available and to contract cost structures of vendors. In addition, newer technologies on the market—especially continuous video monitoring systems—provide a greater amount of information and features than the currently installed systems. The research team conducted a national survey of transportation providers and found that 86 percent of the survey respondents use a continuous video monitoring system. Nearly all operators with a continuous video monitoring system reported satisfaction with their respective system, regardless of vendor. Continuous video monitoring system users cited many occurrences of their system capturing events and sequences that would not be triggered with a short segment system, including actions that lead up to an event. This additional footage greatly aided event investigation, incident resolution, and employee training efforts. Many benefits are difficult to quantify in dollars saved due to their relationship to employee safety, oversight, customer relations, etc. Therefore the benefits quantified focused on the reduction in liability and insurance claims. Overall, a continuous recording system provides additional features and captures significantly more events. This creates a potential for additional savings, which may be greater than increased costs of the more expensive system. Based on the results of the research, NJ TRANSIT could expect that: 1) without a system they would incur a liability/claim cost of $706,644 per year, 2) current segmented recording installation they incur a liability/claim cost of $293,519 per year, and 3) replacing their segmented system with a continuous recording installation “could” further reduce their liability/claim cost to $145,335 per year. This data is speculative and is statistically sensitive to claim trends and extreme claims resulting in large one-time payouts that vary significantly from the average claim cost. However there are many additional tangible benefits associated with the additional information collected by a continuous system.	September 2014	Rutgers University	Transit Video System; Bus; Cameras; Paratransit.	Technology; Mobility
Streamlining the Project Management Process at NJDOT′s Bureau of Research	In order to enhance customer service and strengthen the capacity of the Bureau of Research to ensure the quality of research products, the Bureau initiated a project to rethink and improve the existing data organization, sharing, and processing systems. The ultimate objective of these improvements is to integrate the existing information resources into a centralized project benchmark tracking, document bookkeeping, and performance monitoring system. This system will synthesize the Bureau’s research project management processes so as to facilitate effective and efficient communication and information sharing among Bureau staff. This project completed the first phase of the system development, which consisted of: analyzing the current processes and staff activities within the Bureau of Research and identifying the underlying information flow;identifying the system logic that replicates activities conducted by the Bureau’s staff in the research project management process; streamlining the information sharing and reporting functions among different activities; developing a decision support methodology that will use project benchmarks to calculate performance measures; developing reporting requirements according to the needs of the Bureau’s staff; developing a methodology to streamline submittal of quarterly reports and requests for time extension and budget modification by participating faculty and researchers, and other NJDOT Research Partners.	February 14th, 2014	NJIT	Research Administration; Data Management	Department Management; Project Delivery; Staffing

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2014

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Environmental Management System for Transportation Maintenance Operations	The New Jersey's Global Warming Response Act, enacted in 2007, mandates reductions in greenhouse gas (GHG) emissions to 1990 levels by 2020, approximately a 20 percent reduction, followed by a further reduction of emissions to 80% below 2006 levels by 2050. The legislation required several State agencies, including the Department of Transportation (NJDOT) to assess the GHG emissions related to their operations, and develop methods to meet and exceed the 2020 target reductions. To achieve this goal, NJDOT focused on assessing and monitoring the GHG emissions of both its Capital Program and Operations. The purpose of this research project is to support this effort by focusing on effective monitoring of GHG emissions produced by Operations Maintenance activities and identifying solutions for their reduction. The project evaluates emissions generated by vehicles, equipment, and materials used in maintenance operations projects by applying the life-cycle analysis approach. The literature review focuses on identifying the sources of data and methods for evaluating carbon potential of materials mostly used in highway maintenance projects, such as asphalt, concrete, and steel. The review is further expanded to identify potential methods and strategies that will help reduce the GHG emissions of highway maintenance projects, focusing primarily on construction processes and aggregate industry, especially asphalt and bitumen. The emissions generate by vehicles and equipment are also analyzed, along with the strategies for reducing the related carbon emissions through introduction of more fuel-efficient or hybrid engines and alternative fuels. Based on the methods developed in this study and the collected data, a decision support software tool is developed to guide NJDOT in monitoring and assessing alternatives for reduction of GHG emissions related to Operations Maintenance. Both the analysis framework and the decision support tool will provide means for quantifying the effects of different strategies for reducing GHG emission, and will ultimately be useful tools in developing Department-wide GHG emission reduction strategies.	May 27th, 2014	NJIT	Greenhouse Gas Emissions; Transportation Maintenance Operations.	Environmental
Landfill Closure With Dredged Materials - Desktop Analysis	This report describes a Rutgers University project for the New Jersey Department of Transportation (NJDOT) designed to analyze the potential for closure of New Jersey landfills using dredge material from existing Confined Disposal Facilities (CDF). The project included an update of the existing New Jersey Department of Environmental Protection (NJDEP) landfill database, the development of a rating system to identify sites with the highest potential to utilize dredged material for their closure, and the identification and preliminary investigation of the top five candidate landfills based on this rating system. Due to information developed during the project it was determined that all but four of the landfills assessed or closure were considered unsuitable for closure as a result only four landfills were selected and investigate further. The results of this project can be used by the NJDOT to facilitate the efficient closure of selected landfills, the beneficial reuse of the materials in CDFs, and the continued use of the state's CDFs and dredging activities.	September 2014	UTRC, Rutgers University	Confined Dredge Facilities; Landfill Closure; Dredged Sediment	Environmental
Criteria for Multimodal Project Rehabilitation vs. Maintenance	The purpose of this research project is to help the Bureau of Multimodal Grants and Programs to resolve conflicting information regarding the types of projects that qualify for grants supported by the New Jersey Transportation Trust Fund (TTF). Specifically, the threshold between "routine (or scheduled) maintenance," which the TTF cannot support, and "rehabilitation" project, which can be supported by the TTF, appears to be inconsistent. The ultimate goal of this research is to develop criteria for the New Jersey Department of Transportation (NJDOT) to use that reflect the spirit of the TTF and Multi-Modal Grants program legislation and rulemaking, are harmonious with other states, and rational for grant applicants. This research project is being completed in three tasks: conduct literature review and interviews; develop recommended definitions and threshold criteria, establishing bounds for which activities qualify as rehabilitation versus maintenance; and prepare a final report	August 2014	Cambridge Systematics	Maintenance; Rehabilitation; State Grants; Multimodal Grants	Department Management

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2014

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Feasibility and Efficacy of Public Transportation Partnerships (Volumes I-II)	The overall objective of this research was to identify and assess examples of local government and public transportation agency partnerships and the funding mechanisms used to improve or expand public transportation. In addition, the research sought to identify what needs to be done to ensure successful partnerships can be pursued on a continuous programmatic basis. A comprehensive literature review, identifying partnerships developed through the use of value capture strategies, both within and outside of public transit was performed. A survey of State Departments of Transportation and Transit Agencies was performed to identify and assess both successful and not so successful partnerships developed to finance public transportation improvements. The survey identified 12 partnerships and case studies of these partnerships were performed. An assessment of the partnerships showed successful partnerships had elements such as: Strong leadership skills of project champion; Support from stakeholders; Innovative enabling legislation; Scale of the project was appropriate to meet the specific need; and Public partner was responsive to private partner's time schedule and needs. The research provides recommendations regarding project identification, statutory environment and capacity building that should be in place to ensure successful partnerships can be pursued on a continuous programmatic basis. Volume I contains the research approach and findings, Volume II contains the detailed case studies of select partnerships.	July 2014	NJIT	Public-Private Partnerships	Mobility
Local Pavement Management Systems	This research identifies a path toward the advancement and standardization of the management of subregional (primarily county) pavement investments in New Jersey. The research is comprised of three primary elements: 1) research on the state of the practice in local pavement management (literature review), 2) direct outreach to subregional pavement managers to better understand current practices and needs, and 3) formulation of a framework for subregional pavement management in New Jersey and a corresponding pathway for implementation.	September 2014	Cambridge Systematics	Pavement Management; Asset Management; Best Practices; Framework; Implementation Pathway; Pavement Distress; Local; County; Subregional	Department Management
Steel Erection Out of Plumb	This study reviews available research papers, reports, presentations, Design and Construction guidelines from various agencies and universities related to the construction engineering of curved and/or skewed steel I-girder highway bridges, with a main focus on the recently published NCHRP Report 725 - Guidelines for Analysis Methods and Construction Engineering of Curved and Skewed Steel Girder Bridges. This study also compiles design and construction engineering guidelines/checklists to address out-of-plumb issues based on literature review and the authors' past project experience from both design and construction inspection projects of curved and/or skewed steel I-girder bridges.	October 2014	Cambridge Systematics	Steel I-girder; Curved; Skewed; Out-of-Plumb; Web Layover; NLF; SDLF; TDLF; Cross Frame	Infrastructure
Impact Analysis of Recreational Transit Services on Local Community Economic Development, Employment and Spending	Public transit service provided by NJ TRANSIT is used throughout the state of New Jersey by a large number of persons to visit recreational activities. Such activities include beach-related recreation and amusement, sporting events, concerts, and various types of shows and other events. By focusing on three separate transit markets related to recreational activities in New Jersey, this study quantifies the local economic benefits generated by the expenditures of public transit users as well as the environmental and congestion-reduction benefits due to the avoidance of automobile use by the same. The three transit markets considered are: (a) the North Jersey Coast Line (NJCL) summer weekend service to the shore areas of Monmouth and Ocean Counties, (b) transit service to professional hockey games and concerts at the Prudential Center in the City of Newark, and (c) the Express Bus #316 summer weekend service provided by NJ TRANSIT between Philadelphia and the Wildwood/Cape May area in Cape May County. This research involved a review of literature; interviews with stakeholders; focus groups; and surveys of NJCL riders, hockey spectators, concert goers, and bus riders. The focus groups pertained only to the NJCL, whereas the interviews and surveys pertained to all three markets. While local economic benefits from the transit users' expenditures were estimated for all three transit markets, the environmental and congestion-reduction benefits were estimated for the NJCL service and the transit service to the Prudential Center, but not for the Wildwood/Cape May express bus service because of the modest number of bus riders. The R/ECONTM Input-Output model	October 2014	Voorhees Transportation Center, Rutgers University	Public Transit; Recreational Activities; Economic Benefits; Input-Output Model; Congestion Relief.	Mobility

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2014

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Safety and Accessibility of Dynamic Message Signs (DMS)	The MUTCD provides guidance on the installation of permanent DMSs considering factors such as: identifying locations to enable road users to select alternate routes or take other appropriate actions; factors related to safety and avoiding driver overload. No guidance, however, is provided to ensure the safety and accessibility to overhead DMSs for the required regular maintenance of these signs. Occupational Safety and Health Standards (OSHA) Part 1910.23 provides standards on “Walking-Working Surfaces” which should be adhered to by employees accessing DMSs. The standards require that catwalks include handrails capable of supporting 200 lbs. of force, with means of egress be from/to permanent or stationary structures. Although DMSs in New Jersey are now designed to meet OSHA requirements for employee access of overhead signs during maintenance, older generation signs exist with limited or no safe access. For some older generation signs, walkways are not provided in accordance with OSHA regulations, may not be wide enough or may be loose and not properly supported. In addition, for some older DMS signs, hand-rails may not meet OSHA standards and although gates in front of the sign are provided, these gates can be loose or do not close. In this research, an evaluation of all older sign designs was performed to identify safe maintenance practices and to develop engineering solutions or alternative solutions to allow employees to safely access overhead DMSs in New Jersey. An inspection of one hundred and seventy locations throughout the State of NJ was performed to ensure that New Jersey staff will be able to safely perform maintenance on DMSs in the future.	August 2014	NJIT	Dynamic Message Signs (DMS); Sign Maintenance	Mobility; Technology
Offshore Wind Development Research	Offshore wind (OSW) development is a new undertaking in the US. This project is a response to New Jersey’s 2011 Energy Master Plan that envisions procuring 22.5% of the state’s power originating from renewable sources by 2021. The Offshore Wind Economic Development Act called for at least 1,100 MW of Offshore Wind generations to be subsidized by an Offshore Wind Renewable Energy Certificate program. The overreaching goal of this research is to provide information and recommendations for the maritime aspects, both vessel and port interface. The study, using the European experience, identifies vessel types, vessel installation methods, needs and operating characteristics through all phases of OSW development. It also identifies regulatory or legislative requirements and/or other road blocks to the use of particular vessels. The study seeks competitive advantages and disadvantages of vessel acquisition, lease, construction or other alternatives. The study proposes solutions and recommendations that best position the State of New Jersey to be the national leader in OSW development, including potential interstate or cooperative endeavors. Financial aspects and considerations of vessel acquisition are presented. The research also proposes a port/OSW industry interface strategy for short-, mid-, and long-term industry development. In general, the study identifies the maritime port life-cycle requirements for installation, construction, operation and maintenance based on geographic factors, and the potential for multi-use development at New Jersey’s East Coast ports. Finally, the study highlights the economic impact of OSW development on the state population and the energy-generating industry. The study recommends the development of a clear OSW policy with a commitment of budgets and in partnerships with industry and other stakeholders.	April 2014	State University of New York Maritime College		Environmental

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2013

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Recycled Concrete Aggregate in Portland Cement Concrete	Aggregates can be produced by crushing hydraulic cement concrete and are known as recycled concrete aggregates (RCA). This report provides results from a New Jersey Department of Transportation study to identify barriers to the use of RCA in new Portland cement concrete and to provide a recommendation as to whether this material should be permitted on Department of Transportation projects. The report includes a review of previous studies of RCA, a summary of the experiences of other transportation agencies with the material, and summary of the additional laboratory and field trials performed as a part of this study. A recommendation is made to allow RCA to be used in non-structural roadway applications. Recommended specifications are provided.	January 2013	Rowan University	Recycled Aggregates; Portland Cement Concrete	Infrastructure
Oversize/Overweight Permitting Practices Review - Phase II	This study explores a more detailed analysis of the permitting process in the Mid-Atlantic Region and delves into operational practice, and theory and history of the practice among states. The states practices examined in greater detail include Connecticut, Delaware, Maryland, New Jersey, New York, Pennsylvania, and Virginia. Information previously gathered in Phase I provided a starting point for this more comprehensive analysis in Phase II including an extensive regulatory review and analysis for each of the states in the study including fee structure, fine structure, escort policy, non-interstate road jurisdiction, and routing considerations. A summary of findings and a series of recommended actions and implementation steps have been provided to assist New Jersey DOT in more closely aligning their regulations and operations to those of the surrounding states in an effort to support industry needs while continuing to prioritize safety in the state of New Jersey	February 2013	Cambridge Systematics	Oversize; Overweight; OS/OW; Permitting; Permit Types; Permit Issuance; Automated Permitting Systems; Performance Measures; Superloads	Freight
State DOT Use of Web-Base Data Storage	This study explores the experiences of state departments of transportation (DOT) in the use of web or cloud-based data storage and related practices. The study provides results of a survey of State DOTs and presents best practices of state governments who are leaders in cloud-based services and relates these experiences to New Jersey's data storage needs. The study identifies key actions that New Jersey may wish to take advantage of opportunities in this area.	February 2013	Cambridge Systematics	Cloud; Internet; Data; Storage; infrastructure; Service; Software	Technology
Go Bus Impact Analysis	NJ TRANSIT launched two relatively new enhanced bus services: GO 25 serving the Springfield Avenue corridor in 2008 and GO 28 serving the Bloomfield Avenue corridor in 2009. As an enhanced but not full Bus Rapid Transit (BRT) service, GO Bus features include improved bus stops with redesigned shelters, limited stop services to reduce running time, traffic signal priority, branding for visibility, and other features that provide a convenient commuting experience and efficient connections for corridor residents and commuters. NJ TRANSIT is interested in the shift in travel patterns that have occurred as a result of the GO Bus, including auto diversions and induced ridership. This study also sought to understand the impact of BRT-like elements on ridership and customer satisfaction. The results are documented in this final report. The research team conducted an onboard survey on GO Bus and its parallel local routes, held focus groups, and conducted a stated preference survey to understand the value customers place on various attributes of service. The results of this research reveal that GO Bus service has been successful in attracting travelers from other modes, with 13% of GO Bus customers having switched from driving alone or carpooling. Additionally, the research showed that customer satisfaction levels were higher among GO Bus customers than local bus customers traveling in the same corridors. This research also identified that while branding elements were an important factor in drawing awareness and visibility to the GO Bus, customers were primarily concerned with attributes having to do with travel time, frequency of service, and convenience.	August 2013	NJIT	Go Bu; Premium Bus; Bus Rapid Transit; Select Bus Service; On-Board Bus Usrvey; Stated Preference Survey	Mobility

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2013

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Stormwater System Monitoring and Evaluation - Implementation	To improve the quality of highway runoff and meet the new stormwater management requirements, the New Jersey Department of Transportation (NJDOT) has installed numerous prefabricated stormwater treatment systems throughout the state produced by a range of manufacturers. The use of such systems, known as Manufactured Treatment Devices (MTDs), is expected to continue in the foreseeable future. As the responsible party for the maintenance of these MTDs, NJDOT is interested in determining optimum maintenance intervals and expected maintenance costs for the range of. In the previous research project, twelve stormwater manufactured treatment devices (MTDs) along New Jersey highways were selected for monitoring over one year. In this implementation phase of the project, the twelve devices were monitored for an additional three years or till they reached the maximum allowable sediment storage capacity. Depths of the sediment accumulated on bottom of the devices were measured every three months. The time interval for required cleanout was determined by comparing the measured sediment depth and the maximum allowable depth. Information on the devices as well as data on the drainage area were also collected. Through the statistical analysis, it was found that the cleanout interval was correlated well with the number of vehicles on the road(s) and the impervious land surface area. This relationship can be used to project the MTD cleanout interval, prepare for the maintenance budget, and optimize the maintenance schedule.	December 2013	CAIT, Rutgers University	Stormwater; Maintenance; Stormwated and Roadways; MTD	Environmental; Infrastructure
Stormwater System Monitoring and Evaluation	To improve the quality of highway runoff and meet the new stormwater management requirements, the New Jersey Department of Transportation (NJDOT) has installed numerous prefabricated stormwater treatment systems throughout the state produced by a range of manufacturers. The use of such systems, known as Manufactured Treatment Devices (MTDs), is expected to continue in the foreseeable future. As the responsible party for the maintenance of these MTDs, NJDOT is interested in determining optimum maintenance intervals and expected maintenance costs for the range of MTDs utilized by the Department. Twelve stormwater manufactured treatment devices (MTDs) along New Jersey highways were selected for monitoring and analysis. The selected MTDs were cleaned out for subsequent monitoring from a clean state. The water, sediment, oil, and floatable debris pumped out from the MTDs were quantified and analyzed. Analysis of the data shows that sediment, oil, and floatable debris accumulation varies greatly from one site to another. Sediment collected by the devices showed heavy metal below allowable limits in all cases, which indicates the sediment does not need to be treated as hazardous waste and does not need special handling. Combining the sediment depth measurements before and after the cleanout yielded a recommended maintenance interval of about four years, but with a shorter maintenance interval of one and half years where severe land surface erosion problems were observed. Types of information necessary for properly inspecting and maintaining stormwater manufactured treatment devices (MTDs) were also identified through this field monitoring and evaluation project.	December 2013	CAIT, Rutgers University	Stormwater; Maintenance; Stormwated and Roadways	Environmental; Infrastructure
Measuring Benefits of transit Oriented Development	Transit-oriented development (TOD) in New Jersey is evaluated using a variety of methods and different outcome measures. Data was gathered from respondents residing around eight train stations in New Jersey and up to two miles away from those stations. Additional data was gathered from four focus groups of those living near various train stations with some development and interviews with stakeholders engaged with the land development process. Three areas were also selected for a detailed case study analysis. Qualitative analysis focused on the perceptions of the benefits of TOD and any shortcomings that are seen. Analytical work included an analysis of travel behavior, including frequency of walking, driving and using transit; potential health benefits associated with living in proximity to a train station; social capital or civic engagement in areas proximate to the train station; traffic safety associated with proximity to the train station and other built environmental measures; residential property valuation associated with train station access and TOD amenities; benefits to users of rail transit for commute access to New York City and other destinations; and, an analysis of regional impacts using a regional travel demand model to examine changes in train usage and highway congestion. Beneficial effects	June 2013	Voorhees Transportation Center, Rutgers University	Transit-Oriented Development; Transit; Train Stations; Rail Stations; Pedetrians; Travel Behavior; Traffic Safety; Social Capital; Public Health; Travel DeMAND Modeling; Hedonic Analysis.	Mobility
Teen Driver Safety Metrics: Effectiveness of NJ's GDL Law in Improving Teen Driver Safety	The goal of this research program was to determine the effectiveness of New Jersey's Graduated Driver License (GDL) law in reducing motor vehicle crashes, injuries, fatalities and property damage for novice drivers, typically 16-20 years of age. The specific objectives were to (1) evaluate NJ crash data to determine if teen driver crashes and fatalities in New Jersey have significantly declined since enactment of a GDL law in 2001, (2) evaluate Motor Vehicle Commission driver history data to determine if teen driver traffic violations in New Jersey have significantly declined since enactment of a GDL law in 2001, (3) evaluate the effectiveness of the September 2008 directive banning pleabargains for drivers with a Graduated Driver License, (4) evaluate effectiveness of new May 2010 GDL regulations on additional hour of curfew and passenger restrictions, (5) conduct an analysis of recidivism among teen drivers	June 30th, 2013	Virginia Tech	Graduated Driver License; Teen Crashes; Highway Crash; Fatality and Injury	Mobility

Research Themes: **Environmental, Mobility, Infrastructure, Project Delivery, Staffing, Department Management, Technology, Freight**
Year: 2013

Report Title	Abstract	Date of Completion	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Key Words	Research Theme
Correlation Between Multiple Stress Creep Recovery (MSCR) Results and Polymer Modification of Binder	Nationwide traffic loads are increasing, pushing conventional asphalt to its limit. In New Jersey matters are made worse by the heavy use of the Northeast Corridor. Polymer modification of asphalt, which can improve both low and high performance, is already available; however, in many cases traditional Superpave testing is not sensitive enough to quantify the impact of modification, dimensioning its use. Elastic Recovery and Forced Ductility, Superpave Performance Grade Plus tests, are sensitive to polymer modification but are time intensive and costly. These obstacles have lead the New Jersey Department of Transportation to require styrene-butadiene or styrene-butadiene-styrene to be incorporated in all modified binder to ensure performance, causing supply shortages and rising cost in the state. A relatively new test developed by the Federal Highway Administration, Multiple Stress Creep Compliance (MSCR) offers a simpler procedure using the Dynamic Shear Rheometer (DSR), thus it does not require the expense of purchase additional testing equipment. The objective of this study is to determine the feasibility of using MSCR as a specification for binder testing. Upon testing a variety of binders it has been determined that MSCR binder testing is sensitive to flow time results. Binders with non-recoverable compliance value (Jnr) of less than 0.5 kPa-1 appear to show better high temperature performance. The MSCR elastic curve requirement appears to be the most stringent of the requirements to evaluate elastic response as compared to elastic recovery at 25ºC and phase angle of 75º. An MSCR recovery at 3.2kPa greater than 40% will ensure that it is above the MSCR elastic recovery curve. This could serve as an alternative specification to the MSCR elastic recovery curve. The guidelines set forth by AASHTO MP 19-10, in which the binders are graded according to traffic (ESALs) by using Jnr is recommended. Additionally 1) The New Jersey DOT should use the access database system as a prescreening process for binder selection, alleviating extraneous binder testing and the cost associated with them. 2) New Jersey DOT could eliminate the use of elastic recovery, thus saving almost $15,000 dollars on capital cost of equipment and up to $500 per binder characterization considering labor and depreciation cost. These could lead to considerable savings of thousands of dollars over several years.; 3) Additional testing, including field performance should be conducted on binders with low Jnr (less than 0.5 kPa-1) and with a lower PG-grade, such as PG 64-28 versus PG64-22. and 4) This can be addressed by closely looking at the ODSR result of binders. For example, at 64˚C, if the G*/sin(δ) is below 2.0 kPa, it is unlikely to pass a higher grade and withstand heavy traffic., and 5) Low non-recoverable creep compliance (Jnr < 0.5 kPa-1) coupled with high MSCR recovery at 3.2 kPa (recovery greater than 40%) and G*/sin(δ) high enough to pass the next high grade will ensure that the binder selected will withstand heavy and extreme traffic levels	September 30th, 2013	Rowan University	MSCR; Binder Specificationl Elastic Recovery	Infrastructure
Work Zone Safety Analysis	This report presents research performed analyzing crashes in work zones in the state of New Jersey so as to identify critical areas in work zones susceptible to crashes and key factors that contribute to these crashes. A field data collection on New Jersey roadways was performed for a select number of work zones to provide a better understanding of driver behavior in New Jersey work zones. The research also sought to identify where data needs are limited in evaluating work zone crashes in New Jersey and make recommendations on how the gaps in these needs can be addressed. Innovative strategies that hold potential for reducing work zone crashes were also identified. Crash frequency and crash severity models were developed to identify factors that contribute to number and severity of crashes in work zones. Negative binomial models were used to estimate: total number of crashes; frequency of injury crashes; and frequency of property damage only crashes. Binary logistic regression models were used to estimate severity for crashes where the driver is at fault, for drivers and for occupants in crashes at work zones. Recommendations on the operation and design of the work zone to reduce crash frequency and severity are presented based on the findings of the study.	November 2013	NJIT	Work Zone; Safety; Crash	Department Management

Research Theme	Environmental	Mobility	Infrastructure	Project Delivery	Staffing	Department Management	Technology	Freight
Rutgers University	X	X	X	X	X	X	X	X
NJIT	X	X	X	X	X	X	X	
Rowan University	X	X	X			X	X	
College of New Jersey			X				X	
College of New Jersey; Hardesty & Hanover; Georgia Institute of Technology			X					
UTRC Rutgers University/ University of Albany Visualization and Informatics Lab		X					X	
City University of New York							X	
Lehigh University			X				X	
Rensselaer Polytechnic Institute							X	
State University of New York Maritime College	X							
Stockton	X							
Virginia Tech						X		
Cambridge Systematics	X	X		X		X	X	X

Research Trends	Lead Researcher (NJIT, Rutgers, Cambridge etc.)	Departments/Research Institutions within University	Research Theme(s)
Verify the design and fabrication of the orthotropic deck details	Lehigh University	ATLSS Center	Techonology; Infrastructure
Lighting Transportation Safety Innovations; Update of the existing New Jersey Department of Environmental Protection (NJDEP) landfill database, the development of a rating system, and the identification and preliminary investigation of the top five candidate landfills based on this rating system; Impacts of TODs; Stomwater & Runoff Management (x2); Model for Transit; Rail Freight Improvements; Electronic Fare System; Evaluation of Concrete and Surface and best practices (x6); Video Cameras; Highway Infrastructure; Bridge Condition and Improvements; Bus Condition, Improvements, and Innovations; Contractor Analysis	Rutgers University	CAIP; CAIT; RIME; ICS; UTRC; Voorhees Transportation Center	Technology; Environmental; Mobility; Infrastructure; Freight; Project Delivery; Department Management; Staffing
Understanding and Assessing Policy Requirements & Best Practices; Improvements for Regulatory Compliance Updates; Post-Storm Asset Management Practices	Cambridge Systematics		Project Delivery; Department Management; Technology; Environmental; Freight; Mobility
University Transportation Research Center Technology Transfer program for the 2011/12 Fiscal Year	City University of New York		Technology
Assessment of Mobile App; Materials Analysis	College of New Jersey		Infrastructure; Technology
Polymer materials against traditional materials (steel, concrete, and timber)= generate return on this investment with longer useful lives	College of New Jersey; Hardesty & Hanover; Georgia Institute of Technology		Infrastructure
Environmental impacts on infrastructure; Assessment of new technologies; Assessment of existing licensing program; Analysis of existinf infrastructure (2)	Rowan University	Department of Civil Engineering	Infrastructure; Mobility; Department Management; Techonology; Environmental
Work Zone Lighting	Rensselaer Polytechnic Institute	Lighting Research Center	Techonology
Bus System Assessment; Crash and work zones analysis; Environmental impacts and practices; Safety and Accessibility; Highway and Deck repair and best practices; Understanding and Assessing Policy Requirements & Best Practices; Real Time Techonologies;	NJIT		Mobility; Technology; Project Delivery; Staffing; Department Management; Environmental; Infrastructure
Provide information and recommendations for the maritime asp	State University of New York Maritime College		Environmental
Assessment of utilization of dredged holes in New Jersey's coastal bays for the dual benefit of restoring degraded habitat and alleviating shoaling of nearby navigation channels through the beneficial use of dredged material	Stockton		Environmental
Develop an open source transit market data visualization and ar	UTRC Rutgers University/ University of Albany Visualization and Informatics Lab		Mobility; Technology
Determine the effectiveness of New Jersey's Graduated Driver License (GDL) law in reducing motor vehicle crashes, injuries, fatalities and property damage for novice drivers	Virginia Tech		Department Management