Key Highway Technologies		
New Technology	Notes	Unit/Division
Warm Mix Asphalt	Lower energy consumption & Improves compaction.	Construction Unit/Materials and Tests Unit
Geopak Corridor Modeling	Creates a 3-D image to be transferred to contractors for grade control.	Roadway Design Unit
GPS surveying	Help with contractor oversight by eliminating the need for additional inspectors, since contractors can be monitored from one central location	Construction Unit
Advanced Hydraulic Engineering Models	Assess flood impacts to bridge scours, adjoining buildings	Hydraulics Unit
LED roadway lighting	huge energy savings	Roadway Design
Gator Getter	For automated debris removal. Allows pick up of large debris at highway speeds safer.	Maintenance Unit
Radar capable unit	Gives the ability to monitor the speed of incoming vehicles and hold the light green or yellow if it sees the vehicle can't clear the intersection thus reducing angle collisions	Traffic Management Unit/Traffic Safety Systems Section
Automated truck roll-over warning system	Determines the speed of the truck, and when speeds are high and likely to cause the truck to roll over, activates flasher to alert trucker to slow down	Traffic Safety Systems Section
Recycled Roofing Shingles in Asphalt Mix	Reduces costs by providing another source of reclaimed asphalt and aggregate.	PDEA/ Materials and Tests/Construction Unit
Sonar	For deep water surveys & sonar bathymetric surveys/evaluate scour around bridge piers	Location and Surveys Unit/ Hydraulics Unit
Self-restoring crash cushions	Resets itself after being hit. Reduces maintenance cost. Is cost effective at locations that are likely to get struck more than once every three years	Maintenance Unit/Construction Unit
Diverging Diamond Interchange design	Reduces delay and increases efficiency and safety while optimizing use of existing right of way	Roadway Design Unit/Transportation Mobility and Safety Unit/Feasibility Studies Unit
Higher Retroreflective sign sheeting	Allows us to use less energy on overhead signs by cutting off the lights.	Safety and Risk Management Unit
Robotic Total Station Equipment	Reduce the number of people required on survey crews and to improve accuracy	Location and Surveys Unit

Data Collection/Remote Sensing		
New Technology	Notes	Unit/Division
New and better LiDAR	Light Detection and Ranging - remote sensing - Quality Level 2	Traffic Safety System Section/Traffic Management Unit/Feasibility Studies Unit/ Photogrammetry Unit
911 Statewide Color Orthophotos	Includes technical support for "pushbroom" camera utilization	Traffic Safety System Section/Traffic Management Unit/ Photogrammetry Unit
LiDAR Modeling	Light detecting and ranging using a laser	Traffic Safety System Section/Traffic Management Unit/ Photogrammetry Unit
Increased used of mobile UDAR	Broadened how it is used -- for pavement surveys, noise walls, overhead structures clearances	PDEA/ Utilities Unit/ Structures Management Unit
Embedded data collectors	Used in concrete bridge piles - for real-time monitoring of bridge bents	Maintenance Unit/Geotechnical Engineering Unit
Development and use of GPS and Field Inventory	Procedures to electronically collect the location of hydraulic structures	Location and Surveys Unit
Non-metric cameras	research/testing	Transportation Mobility and Safety/ Photogrammetry Unit
Digital camera	For photogrammetry	Photogrammetry Unit
Traffic camera communication	using cellphone data connections to allow technicians to upgrade software in remote areas	Traffic Safety System Section/Traffic Management Unit
Speed Detection System	Currently under contract along I-26 in Henderson County	Traffic Safety System Section/Transportation Mobility and Safety
Automated pavement condition survey	This technology is at the forefront: line sensor technology, high definition photography, 3-D imaging, and the latest in crack detection algorithms.	Maintenance Unit
Real Time Kinematics (RTK) Satellite Navigation	Enhances the precision of position from satellite-based positioning systems (GPS) and differentially corrects in real time; useful for wetland and stream delineations	Natural Environment Section

Planning and Analysis Methods		
New Technology	Notes	Unit/Division
Project Prioritization (P3.0)	In support of Strategic Mobility Formula	Priority Projects Unit/STIP/ Feasibility Studies/SPOT Unit
Project Prioritization (P3.0)	TREDIS	Priority Projects Unit/STIP/ Feasibility Studies/SPOT Unit
SPOT Online	GIS-based web application for scoring and capturing data for evaluating projects under STI. This application includes the automated Cost-Estimation Tool developed by Engineering Applications. .	STIP/Feasibility Studies/SPOT Unit
UVF (ultraviolet fluorescence)	Sampling for petroleum in soil and water	Materials and Tests Unit/Geotechnical Unit
New Methods for Calculating Scour	Using Effective Diameter Methodology	Hydraulics Unit
New Methods for addressing Hydroplaning Calculation		Traffic Safety System Section/ Transportation Mobility and Safety/ Division of Aviation
NCDOT Performance Dashboard	Work plans, analytics, reporting	Traffic Safety System Section/ Safety & Risk Management/ Transportation Mobility and Safety/ Division of Aviation/ Contract Standards and Development
GPS data collection equipment	For asset management	Location and Surveys/ Transportation Asset Analytics
2-D Hydraulic Models		Hydraulics Unit
Use of complex computer modeling software	To evaluate flood impacts in coastal areas	Hydraulics Unit/Structures Management Unit
GIS applications	For data storage and modeling related to photogrammetry, hydraulics, various environmental analyses, resource identification, etc	PDEA/Hydraulics Unit/ Location and Surveys/Feasibility Studies
Environmental Screening of STIP Using GIS	Allows batch processing of STIP to screen for potential environmental issues	Natural Environment Section
Environmental Impact Projections for STIP Using GIS	Provides data for use in developing wetland and stream mitigation by NCDOT and NCDEQ-Division of Mitigation Services	Natural Environment Section

Construction Methodology/Products		
New Technology	Notes	Unit/Division
Expanded Use of Microsoft Access	To create, maintain, and manage database to house all mitigation sites with excess mitigation and permitted debits associated with TIP projects	Natural Environment Section
Non-tracking tack coats	Prevents tracking of liquid asphalt tack materials on projects by vehicles onto adjacent roadways, bridges and intersections.	Materials and Tests Unit/Construction Unit
GeoGrids		Materials and Tests Unit/ Geotechnical Engineering Unit
All-electronic tolling technology		Construction Unit/Feasibility Study Unit
Use of material transfer vehicle	Remixes asphalt mix at roadway to prevent heat loss and segregation. Required in specific laydown applications during asphalt construction (vs optional)	Construction Unit/Materials and Tests Unit
LED lighting in species sensitive areas	To be used instead of low-sodium vapor lights (Bonner Bridge)	Construction Unit
Reflectex non-woven geotextile	In lieu of 3" PADC (being tested on I-3802A)	Construction Unit/Geotechnical Engineering Unit
Micropile foundations	For bridges	Structures Management Unit/Geotechnical Engineering Unit
Public Private Partnership	As a contracting tool	Construction and Design
Hydraulic settlement gauge		Geotechnical Engineering Unit/ Construction Unit
Cured-in-place pipe repair		Materials and Tests Unit/ Maintenance Unit
International Roughness Index (IRI)	Final surface testing for pavement smoothness run at highway speeds.	Construction Unit/ Materials and Tests Unit
Temporary speed bumps	For use on flagging operations. Increases safety in a cost-effective way by not making permanent changes to road	Construction Unit/ Safety and Risk Management
Seismic dowels and shear keys	Used in lieu of traditional anchor bolts on the Yadkin Project	Construction Unit/Materials and Tests Unit
Automated Machine Guidance for roadbed grading operations	Reduced the amount survey staking required on the projects to provide more efficient contractor operations	Construction Unit
GPS distance meters for our state vehicles	To measure linear distance along our roads	Construction Unit/ Maintenance Unit

Construction Methodology/Products		
New Technology	Notes	Unit/Division
Backup alarms on trucks	New to DOT operations - Improves safety	Construction Unit/Maintenance Unit
Fuel system upgrade	Increases efficiency in tracking fuel usage and saves time fueling vehicles; what was a 2-day delay for fueling data retrieval has been reduced to a 4-hour delay, and will eventually be real-time.	All NCDOT
LED Stop/Slow paddles for work zones	Increases visibility and safety	Construction Unit/Maintenance Unit/ Traffic Management Unit
Installation of dynamic curve warning signs and chevrons	Along US 23-441 in Jackson/Macon Counties and NC 143 in Graham County.	Traffic Safety System Section/ Safety & Risk Management/ Transportation Mobility and Safety
Dynamic All Red traffic signal	Will save lives by detecting people who will likely run the red light and not allow side street traffic to get the green and pull in front.	Traffic Safety System Section/ Safety & Risk Management/ Transportation Mobility and Safety
Low maintenance crash cushions	Takes less man power and parts to reset. Reduces maintenance cost and is cost effective at locations that are likely to get struck more than once every 5 years.	Construction Unit/ Maintenance Unit
Flashing Yellow arrows	more efficient use of signals by providing more operational options than standard five section ("dog house") signal heads	Traffic Safety System Section/ Safety & Risk Management/ Transportation Mobility and Safety
Wireless detector pucks	less cost to install and maintain vehicle detection for traffic sensing	Traffic Safety System Section
Highly reflective elements	Increase life and improve life cycle cost	Construction Unit
Fusible PVC pipe for water and sewer installations by Trenchless Method	(Previously used only HDPE) and distributed antenna system installations on NCDOT ROW by encroachment.	Division Offices/Utilities Unit
Safety Edge	A paving technique that provides a gradual transition from pavement onto the shoulder of the road and back onto pavement	Construction Unit
Electronic Inspection	Utilizing iPads in the field and SharePoint Teams sites for data collaboration and document management	Construction Unit / IT

Design Concepts		
New Technology	Notes	Unit/Division
Accelerated Bridge Projects	"slide-in" bridge, for example	Construction Unit
Increased Use of Pavement interlayers		Materials and Tests Unit/Construction Unit
Turbine or Whirlpool design interchange		Roadway Design Unit/ Structures Management Unit
Roundabouts		Roadway Design Unit
Standard Designs	Such as Temporary Shoring	All Design Units
Sustainable Welcome Centers		Structures Management Unit
Empirical Bayesian analysis in traffic safety evaluations	Help insure that we are getting the expected return on our safety investments. Procedures for statistical inference in which the prior distribution is estimated from the data.	
Application of traffic demand modeling in work zone traffic management planning	Instead of using simple traffic volumes to plan for traffic control, as we have historically done, we can look beyond the actual work zone at potential effects the work zone will have on other routes and on the network as a whole.	Construction Unit/ Transportation Mobility and Safety/ Traffic Management Unit
Dynamic Work Zone speed limits	Rather than having a lower speed limit for the entire work zone, we use dynamic speed limits to lower the speed limit only where there are lane closures or other activities needing the lower speed and allow the higher speeds in other portions of the work zone	Safety and Risk Management/ Transportation Mobility and Safety/ Traffic Management Unit
Unconventional Intersection Treatments	5 Alternatives: Median U-Turn, Bowtie, Superstreets/ Synchronized street, Jughandle, and Continuous Flow Intersection. Purpose: reduce delay for through vehicles and conflict point, spacing out any remaining points as much as possible. Also incidentally increase safety	Roadway Design Unit

IT Technology		
New Technology	Notes	Unit/Division
SharePoint	For collaboration and document-sharing. Allows more effective project collaboration with external contractors and consultants	Value Management Group/ Construction Unit/ Hydraulics Unit/ Division of Aviation/Materials and Tests Unit/ Feasibility Studies Unit, etc. – Most DOT Units
Electronic plan submittal		Consultants/All Design units
Electronic, searchable plans		All Design Units/ Construction Unit
Electronic Seals and Signatures on documents and plans (DocuSign)		All Design Units/ Contract Standards and Development/ Feasibility Studies Unit
Inside NCDOT/Connect (includes Inside Team Sites)		All NCDOT
Delegated User Administration through Optimal IDM	Allow external partners to manage their own employees' access to DOT project documentation.	All NCDOT
Standard Service Interfaces	Access project data through Biz Talk which allows for more rapid delivery of information.	All NCDOT
A comprehensive view of Project information by applying Metadata Management, Master Data Management, Data Quality Services and Dynamic Reporting	Statewide Transportation Operations Center	All NCDOT
Use of tablets and SharePoint team sites		Construction Unit/ Contract Standards and Development/ Value Management Unit
Conversion of land line control of traffic devices to wireless data plans		Traffic Management Unit
APlus	An in-house developed application to automate the assembly of the proposal document in support of contract lettings	Contract Standards and Development
Department Use of YouTube, Twitter and other social media		IT
Approved Product Lists for Geosynthetics, Grout, Rock slope repair products		Construction Unit/ Maintenance Unit

IT Technology		
New Technology	Notes	Unit/Division
Use of web-based GIS Environmental Sensitivity Maps	IT web-based solution that optimizes the collection of environmental data for design and permitting. Also, Identify State's environmentally sensitive areas	PDEA
Use of web-based Wave Vulnerability and Storm Surge Model	To develop Bridge Design Reports in Coastal areas	Structures Management Unit
Use of web-based US Geologic Survey's published Stream Stats application	To develop Bridge Design Reports	Structures Management Unit
Use the new Quality Level II LiDAR data	To develop the hydraulic computer models for FEMA's approval	Transportation Mobility and Safety
Web-based Flood Risk Information System data	For FEMA compliance	NC Division of Emergency Management
Web-based design reference manuals	For the development	Federal Highway Administration
3-D Visualization in CADD		All Design Units
3D Engineered Models		
Video camera pipe inspection		Materials and Tests Unit
Video training online		All NCDOT
Electronic proposal submittals	includes the majority of USACE and NCDWR permit applications	Consultants/All Design units
Electronic permit submittals		Consultants/All Design units
Electronic invoicing from firms		
GIS Wave Atlas for Coastal Bridges	Provide state-of-the-art wave height, water velocities, and storm surge information for bridge design	Structures Management Unit
Development of databases to track and retrieve information for FEMA compliance through Access and SharePoint databases		Value Management
Mobile GPS devices		Construction Unit
Mobile apps		Construction Unit/Geotechnical Unit/Hydraulics Unit/ Maintenance Unit/Materials and Tests Unit
Smart boards		All NCDOT
Large touchscreen monitors	for use at public hearings/ meetings presentations	All NCDOT

IT Technology		
New Technology	Notes	Unit/Division
iPads/tablets	Used for a variety of field applications (e.g., data collection for secondary road pavement condition surveys, construction inspection and monitoring, on-site data/information/GIS accessibility, materials and products inspection, etc.)	All DOT
Spatial Data Viewer (SDV)	For viewing, manipulating GIS layers	Location and Surveys/ Feasibility Studies Unit
Go-To, Meet Me and MS Lyne meeting software	for virtual meetings	PDEA/ Value Management/All DOT
Livestream	Used to broadcast the reading of bids	Contract Standard and Development
glNT Professional Plus	Boring log database that allows us to store subsurface information across the state	Geotechnical Engineering Unit
Electronic submittal of "New Products" by vendors	for evaluation and inclusion on NCDOT's Approved Products List for use in construction projects	Value Management Unit (PEP)
GPS-guided grading equipment	Automated Machine Guidance for roadbed grading operations has reduced the amount survey staking required on the projects, resulting in more efficient contractor operations	Construction Unit/ Location and Surveys Unit
Local Project Management System		Division Offices/ Project Management Unit
Automated schedule change request and approval application		All NCDOT
Stormwater Control Management System	IT solution to facilitate the tracking and management of structural stormwater control measures for NPDES permit compliance	PDEA

IT Technology		
New Technology	Notes	Unit/Division
Multi Precipitation Estimator (MPE)	IT solution that was developed with researchers at NCSU and the NC State Climatic Center that uses NEXRAD Radar and ground-based rain gauge stations to deliver accurate and defensible rainfall information for any location in the state for Hydraulic studies and NPDES stormwater permit compliance.	Hydraulics Unit/ PDEA
Social media	As a tool for project information (Public Engagement Toolkit)	Communication Office/PDEA (Public Involvement Group)
Use of radio to advertise public meetings	New application	PDEA (Public Involvement Group)
Arc-GIS on-line	cloud-based to serve up map services - pilot for NC 12	Location & Surveys Unit
Updated versions of GPS	Started in the 1990s that helps us apply this in new ways - now using GNSS {Global Navigation Satellite System)	Location and Surveys Unit/ Geotechnical Engineering Unit
Using Wi-Fi-like systems	Allows communication between the field survey crews and the field office (instantaneous data drops)	Construction Unit/Geotechnical Engineering Unit/Hydraulics Unit/Location and Surveys Unit/Photogrammetry/ Field Services/Field Support
Height Modernization	In progress to improve vertical accuracy on surveys	Location and Surveys Unit
Application of Google Maps and Google Earth	For survey planning	Location and Surveys Unit/ Feasibility Studies Unit
Survey applications of ground-based photogrammetry		Photogrammetry
Demographic Tool that allows faster and easier access to Census data by staff and consultants when preparing reports		All NCDOT
Annualized Growth Calculator to assist staff and consultants with calculating population and employment trends		Transportation Planning Branch/Transportation Program Management/Traffic Management Unit
Creation of GIS data layers for farmland soils across the state	New data layers	PDEA/Roadway Design Unit
Corridor Modeling		Roadway Design Unit
Pilot use of GIS information for Alternate Selection		Photogrammetry
Use of mobile LiDAR to scan 1-40 gorge for slope movement		Maintenance Unit

IT Technology		
New Technology	Notes	Unit/Division
Teleconferencing using MS Lync, audio and video, both internal to the unit between offices and external to other entities		All NCDOT
Training using MS Lync videos created internally	These can be sent to people and attached to help buttons within a database form.	All NCDOT
Project database on sequel server	project records can be accessed quickly between distant offices	All NCDOT
Automated Dynamic Cone Penetrometer	Automated a manual process for easy access locations (like graded subgrade)	Geotechnical Engineering Unit
Automated flaggers for lane closures in rural areas		Construction Unit/ Maintenance Unit
CT Shoring software	Shoring design	Construction Unit/ Utilities Unit
PLAXIS software for numerical modelling		Geotechnical Engineering Unit
BOMGAR	Remote Support allows IT to provide remote assistance through firewalls to any remote desktop, server, POS system, or mobile device.	IT
Mind Mixer for engaging public	This is an application that allows for sharing information with the public and stakeholders and collecting their comments online; it also allows for an ongoing dialogue about projects, etc.	PDEA (Public Involvement Group)
Citrix applications	Including remote access to HiCAMS and SAP, allowing quicker information retrieval and issue resolution	All NCDOT
Expanded use of BEACON	(such as Individual Time Entry) which eliminates paper timesheets and manual time-entry by a third person	All NCDOT
Virtual weigh station	Uses weigh in motion and does not require a building	Facilities Management Unit
Automated licenses plate reader	used for presence detection, and for virtual weigh station	Facilities Management Unit
Ethernet communications in traffic signals	A modern communication method with a newer application to signals to improve efficiency	Traffic Management Unit/ Traffic Safety System Section/ Transportation Mobility and Safety

IT Technology		
New Technology	Notes	Unit/Division
Video data collection for traffic counts and other data collection	Provides cheaper, better documentation, and is more efficient. This is one reason we are able to purchase traffic counts today at nearly 50% less than we were 6 years ago.	Traffic Management Unit/ Traffic Safety System Section/ Transportation Mobility and Safety
Digital ball bank indicators	For determining advisory speeds (a few installations) This is a tool that uses accelerometers to measure the forces applied to the vehicle when going through a curve. Improves safety by allowing the driver to watch the road as it records the necessary data to be read later.	State Traffic Engineer's Office/ Traffic Management Unit/ Traffic Safety System Section/ Transportation Mobility and Safety
Use of Cone technology for work zone data collection,	Uses a portable data collector inside a construction drum to collect operational data.	Construction Unit/ Traffic Management Unit
Application of vehicle probe technology	For work zone monitoring	Construction Unit/ Maintenance Unit
Mobile reflectometer for highway speed reading of retroreflective pavement markings	For monitoring and construction approval. This device reads how well the pavement marking is performing, including how well you can see it at night. Using this device, we can measure it during the day at highway speeds.	Construction Unit
Mobile reflectometer for highway sign sheeting	This is still in the development stage	Traffic Safety System Section
Solar powered internally lit pavement markers	In development	Traffic Safety System Section
Transmodeler software	For project development analysis	Traffic Safety System Section/ Traffic Management Unit/ Transportation Mobility and Safety/Feasibility Studies Unit
Increasingly sophisticated use of GIS technology	**In** • Prioritization (P3/P4 process) • Planning and Program Development • Environmental Analysis • Asset condition assessment • Maintenance operations planning • Asset inventory	PDEA/ Research and Development/ Contract Standard and Development

IT Technology		
New Technology	Notes	Unit/Division
Optimizing fuel-efficiency of vehicles	Installed 150 units on light duty pick-ups from "Derive Technologies" this is a product that re-flashes the trucks manufacturer settings and is promoted as a fuel savings device that reduces idle, sets max speed limit, adjusts spark advance	All NCDOT
GPS initial pilot on 30 vehicles	(Spring 2014) has now been expanded to 250 vehicles (just beginning install). We have looked at projected return on investment (ROI), we are conducting a pilot to establish actual ROI.	All NCDOT
Radio-frequency identification (RFID) and Barcode devices	Integration of tablets and smart phones with handheld scanners to identify individual manufactured items and samples on project sites that have been tagged. Streamlines the materials receipt process and provides real-time feedback to project personnel on acceptability of materials.	Materials and Tests Unit
Converted county maps to a GIS data-driven format		All NCDOT
An enterprise database system for active and historical ROW data		Right-of-Way Unit/PDEA
A system for external ROW contractors to submit their work electronically		Right-of-Way Unit
Implemented diagnostic laptops in our shops with manufacturer software	This allows us to diagnose and repair equipment more efficiently and at a significant cost savings.	Maintenance Yard Shops
Use of LiDAR (including new QL2 data)	For environmental analysis/wetland detection	Natural Environment Section
SAS Visual Analytics	Used to analyze and create visualizations of potential environmental impacts of new road projects	Natural Environment Section

IT Technology		
New Technology	Notes	Unit/Division
Integration of the Mitigation Geodatabase with SharePoint and ArcGIS	Allows Central Planning, Divisions, and Regulatory Partner agencies to access location of NCDOT Mitigation poperties, related permits, and documents. Compliance with 2008 Federal Mitigation Rules and permit conditions	Natural Environment Section/IT/GIS Unit

Others		
New Technology	Notes	Unit/Division
All ECAP procedures are now available via the internet to facilitate interactions with private consulting firms, Division personnel, and local planning organizations (MPO/RPO's)		All NCDOT
Procedures Manual is online which allows the consultants to follow our directions without having to depend on getting with the project manager for some guidance		All NCDOT
Development of Post-Construction Stormwater Program in coordination with DENR for efficient delivery of stormwater requirements on TIP projects		Information Technology (SPECS)
Utilized GIS to map physical plant and leased space, create hyperlinks with databases from other state agencies, and store site- and building-specific information/ documentation.		Information Technology (SPECS)
Aerial Spraying with Drone	Autonomous Flights using drone application to control the spread of invasive plants in sensitive wetland mitigation areas	Natural Environment Section
AFRA (Application Funding Request Application)	Allows all NCDOT staff to request funds connected to the enterprise business services (ebs) web.	Project Management Unit/ Division of Planning and Programming
PAAFTS: Parcel Advanced Acquisition Tracking Funding System	Parcel GIS Web-based Application connected to the ArcGIS online. Allow only internally for NCDOT staff to review parcels status for specific project. (prototype)	Project Management Unit/ Division of Planning and Programming/Right of Way /Divisions/OIG
SAS & SAS Visual Analytics	CASH Model Visualization (partner with Fiscal Unit)	Project Management Unit/ Division of Planning and Programming/Division of Financial Management

ePBATS: Electronic Powell Bill Allocations Tracking System	Powell Bill GIS Web-based Application connected to the ArcGIS online. Allow only internally for NCDOT staff to review Powell Bill maps and local streets. .(prototype)	Powell Bill Unit/Division of Planning and Programming/ Divisions/OIG
DOT GRANTS Management System	Public Web-based GIS for Powell Bill program. Includes Powell Bill Reporting System.	Towns/Cities/Municipalities; NCDOT Commercial Accounts Payable & OIG/Division of Financial Management
Radar-base Vehicle Detection System	Adopted for rail use at seven highway-rail crossings. The evaluation is completed and as of today, the final report has been issued. Its future use is pending FRA approval of the system. If accepted by FRA, the system would allow us, with the railroad's concurrence, to place four-gated crossings into a dynamic exit gate descent mode using a non-intrusive detection system versus a pre-timed mode.	Rail Division