

# CONTINUOUS IMPROVEMENT PROJECT DATABASE

## DOLLAR SAVINGS PROJECTS

Project Name	Project Description	Division	Project Year	Contact Name	Contact Number
Attenuator Upgrade	<p>Within the Roadside Environmental Pesticide program two of our challenges are water supply and traffic control. We send out advance warning vehicles and quite often an attenuator. We will sometimes send out a water truck to act as a nurse truck for the sprayer. This is generally a flatbed with a 1000 gallon or larger water tank.</p> <p>We have long wondered why not place a water tank on the attenuator in place of the ballast it carries. After being told there could not be a loose tank on the truck, we responded that it would be attached to the body of the truck. Then we found out there is a minimum weight for the attenuator. Next we discovered there was a maximum weight that was less than the GVWR of the truck on which the attenuator was mounted. D-2 Equipment Superintendent Buddy Dixon contacted the attenuator manufacturer and they helped us by finding that there was not a problem with the maximum weight until we got over 67,000 pounds. This helped a lot since the GVWR on the truck we use is 33,000 pounds. Then we discovered that the height of the attenuator from pavement level could not change more than a specified amount with the tank empty or full. After research we found this to not be a problem as we were within the manufacturer's guidelines.</p> <p>The equipment shop removed the existing ballast from the attenuator truck and installed our 1,000 gallon tank along with enough weight to keep the truck within minimum guidelines when the tank is empty. After this truck was retrofitted, we prepared to place a tank on a second attenuator. We planned on using a 1500 gallon tank. The height of the tank proved to be too high for the attenuator unit to fold up, so we thought we were back to a 1000 gallon tank. Brian Dixon of the Greenville Equipment Shop said he could build us a tank from steel that would hold 1500 gallons and would be heavy enough that no additional ballast would be needed. This unit has proven to be much more effective than the 1000 gallon tank as we can fill our smaller sprayer three times instead of two and the 1500 gallon tank is approximately the same size as our larger trucks.</p> <p>The approximate \$2,500.00 cost of placing the tank on the attenuator is easily offset by the \$281.60 daily savings* of not having another truck and employee on this task. * Based on an 8 hour day.</p>	Div 2	2009	John Wells	(252) 830-3146
Construction Waste Reduction	<p>NCDOT has an aging building stock. Based on that reality, there was a potential to do a great deal of environmental damage by putting this material into the landfills. In addition to the environmental damage, the cost of putting construction waste into the landfill is increasing, and, in the foreseeable future, this material will not even be allowed in the landfill.</p> <p>Solution: Create an ad-hoc team to develop and implement a Construction Waste Reduction and Recycling Program, implemented state-wide, for all NCDOT building demolition, renovation, and new construction projects.</p> <p>Results: The Construction Waste Reduction and Recycling Program has been in place for two years, continues to successfully create significant reductions in the amount of material going to the landfills, continues to create savings and generate revenue for NCDOT, and, most importantly, continues to enhance, not degrade, the natural and built environment.</p> <p>The program continues to foster a team effort between NCDOT as Owner/designer, and the General Contractors, in taking joint responsibility for this environmental stewardship.</p> <p>The five pilot projects documented in this CPI entry resulted in the following avoided cost, savings, and revenue to NCDOT a net total of \$92,183.02. These projects diverted the following total material from the landfill: 1,652 tons.(with a diversion rate of 82.5%) The original goal was to divert at least 50% of the waste material from the landfill the resulting 82.5% diversion rate greatly exceeded the original goals, and appears to be a realistic goal for the future</p>	General Services	2009	John Sharp	(919)715-3708

Asphalt Surface Treatment	<p>Over the years Division 11 has tried to develop and improve its chip seals. It is important that this be done before water, traffic, salt and cold weather have a chance to worsen the situation.</p> <p>The goal was to find a better patch that will extend the life of the pavement regardless of weather conditions. Find a cost-effective way to patch and out last conventional hot mix patching.</p> <p>Division 11 has been successful in applying a Latex Polymer Liquid Asphalt and a light weight aggregate that can be 66% more cost-effective. After many years using AST patching, the life of the pavement has been extended by 3 to 5 years. The need for patching has decreased by 30% and the number of claims for damage to vehicles from loose stone was reduced by 80%.</p>	Div 11	2009	Matthew Oliverson	(336) 903-9235
Mulching Plant Beds	<p>Division 10 has 55 acres of plant bed area that are maintained by the state. Approximately one-third of this area needs to be mulched annually to keep it presentable. Division 10 needs 21,780 cubic yards of mulching material for 18 acres. A tractor trailer can bring 100 cubic yards of mulch in a single delivery at a cost of \$900 per load. 218 loads would be needed to achieve this level at a cost of \$192,200.</p> <p>Division 10 acquired a mulching material through Triangle Brick in Wadesboro. They have a hardwood mulching materials that is used in their brick process. They do not use all of the hardwood mulch which means that leftover mulch is a waste product for them.</p> <p>This past year, approximately 4,000 cubic yards of mulch from Triangle Brick has been hauled, at no cost to the state. This resulted in a savings of about \$36,000 worth of mulch that Division 10 will not have to purchase.</p>	Div 10	2009	Tim Simpson	(704) 982-1028
Sign Repair	<p>DOC crews were constantly requesting new signs for trash pickup. We began questioning the need for so many signs. They told us that their signs were tattered and torn. We asked the DOC to bring us their worn and torn signs.</p> <p>We decided that these signs were repairable and began taking them to a local upholstery shop.</p> <p>Each sign was repaired for an average cost of \$8.50 versus \$115 for a new sign. This saved the unit money as well as the taxpayers.</p>	Div 11	2009	B.K. Hamby	(336) 903-9103
Rescue of US70 West of Kinston	<p>Proposed removal of 1 mile of west-bound 2-lanes of US 70 west of Kinston would involve \$100,000 costs, extensive obliteration/construction time and inconveniences to affected local businesses and workforces.</p> <p>Suggestions have been forwarded to Wilson construction Office, Division 4 to revise plan designs to retain and slightly adjust down-graded portion of US 70.</p> <p>Currently awaiting review, evaluation and possibly redesign by NCDOT engineering staff as a value engineering proposal.</p>	Div 4	2009	Jonathan Barnes	
Clear Savings on Windshields	<p>Several years ago we noticed that we were replacing more and more windshields due to road hazards. We decided to see if we could get a company to come around to state locations and repair windshields before they started cracking. We began research and shopping around for the best cost, good quality repairs, and a company that would be able to drive to all DOT sites in our area. In 2008 we rescued 34 windshields from being replaced and saved approximately \$8,000.</p>	Div 10	2009	Robert Waterhouse	(704) 596-2131
Paperless Solutions for Documents Sent to PMU	<p>Project Management funds over 1800 projects annually through various project phases Preliminary Engineering, Right Of Way, Construction, and Mitigation. Each project contains from 80 to over 300 pages of documentation needed for project funding. As society becomes more technologically advanced, cost wise, and conservative in expending our natural resources, Project Management felt there was a better way to proceed regarding document management.</p> <p>As a result of SAP and IXOS integration, it was decided that it would be beneficial to encourage a paperless way of sharing needed information/documentation via the document originator scanning the document to the 3rd Level WBS Element of the appropriate project phase, and notifying the recipients electronically.</p> <p>As a result, cost, labor, and environmental savings can be realized by reduction of hardcopy distribution. Each recipient receives from 144,000 to over 540,000 pages annually of essential funding documentation. Taking these numbers into account and considering that most distribution lists contain an average of 10 recipients, there can be a median annual cost savings of \$30,590.00 per recipient.</p>	Project Management Unit	2009	David Rhodes	(919)733-2039

<p>Repotting of Bare Root Forestry</p>	<p>In late winter, early Spring 2008, one of our maintenance units went out and disturbed a quarter acre of land that had been reforested with loblolly pines. The land owner requested that we replant this area in loblollies again. I contacted the Forestry Service to find some trees and they advised me to call their Goldsboro office and try to get some of the throwaways. I later learned that they cleaned out the coolers in May. The Forestry Service was agreeable to us coming and getting their throwaways. In May 2008, we sent a flatbed to Goldsboro, primarily to get loblolly pines but also to get whatever they had in the coolers that were to be thrown away. Our guys came back with 100 white ash, 200 black cherry, 200 pin oaks, 100 locusts, 100 button bush 250 loblolly pine, 500 long leaf pine, 1000 white pine, 500 Virginia pine, 100 rebbuds, 200 dogwoods and 200 shumard oaks. The nursery was able to pot up all of these trees and, so far, we have been able to plant the loblollies back for the landowner. We are preparing a bed at the Welcome Center on I-77 and will use a lot of the redbuds and dogwoods at this location, with the rest being planted at the I-85 and I-485 interchange in the coming weeks. Some of the other pines and oaks will need another year of growth before using them, but they will offer up good trees in ensuing years at no cost to the taxpayers. The estimated value currently on all of the obtained trees in 2008 is \$35,000. This is a growing asset for the state, the plants that we do not wish to use this year will be a larger plant in future years, ergo a more valuable asset to the state when it is planted along state right of way. We plan to continue this program and will pursue obtaining more trees this spring for planting in the future.</p>	<p>Div 10</p>	<p>2009</p>	<p>Tim Simpson</p>	<p>(704) 982-1028</p>
<p>Asphalt Pavements Online Study Course &amp; Exam</p>	<p>Due to budget constraints, the units had to find a more cost effective way to provide the course to Technicians who are required to complete it. The solution Develop an online course that would reduce costs for both the Department and Industry.</p> <p>Application fee per student was reduced from \$100 to \$50          Passing rates rose from 80-90% to 95-100%          The transferable format can be used for other certification classes</p>	<p>Construction &amp; Materials and Tests</p>	<p>2009</p>	<p>Wiley Jones</p>	<p>(919)733-2210</p>
<p>Equipment Trailer Safety Step</p>	<p>Problem:          Trailers with factory installed steps are often welded to the trailer tongue, which is hard to use when the equipment is loaded.</p> <p>The steps are also more susceptible to damage from bumping the ground. Employee complaints and accident reports regarding factory steps were becoming frequent issues.Solution:          Division 5 Equipment Shop designed a step which can be installed anywhere on any model trailer and only costs \$45 per step.</p> <p>It can save the Department up to \$213,195 in parts and labor if used on the 699 trailers currently in service.</p>	<p>Division 5 Equipment Unit</p>	<p>2009</p>	<p>Adrian Rigsbee</p>	<p>(919)477-2128</p>
<p>Utility Savings</p>	<p>In the past NCDOT has been charged water and sewer rates for all the water used at the Selma Rest Area, located on I-95 in Johnston County.</p> <p>In an effort to reduce costs separate water meters were installed at each building at the site. These meters reflected the amounts of water used and amounts that would discharge into the sanitary sewer. An agreement was made with the Town of Selma to separate the billing rates.</p> <p>During the first full year of use, NCDOT was able to save \$4,197.50 for water not charged with sewer rates.</p>	<p>Div 4</p>	<p>2009</p>	<p>George Harrell</p>	<p>(252) 237-6164</p>
<p>Self-Contained Hydraulic System for PM's</p>	<p>The old process for performing salt spreader PM's required taking a truck, loader, and additional operator out of regular service. The salt spreader was then installed on the truck in order to perform the semi-annual PM's.</p> <p>To solve this problem a self-contained hydraulic pumping system was developed to eliminate truck, loader, and additional operator. One single transportation worker can now perform the PM's.</p> <p>Use of the self-contained hydraulic system has generated annual savings to Division 3 of \$23,553 per year. This is a result of saved equipment costs and added labor. The cost of the system is prorated for a five-year life.</p>	<p>Div 3</p>	<p>2009</p>	<p>Allen Brinson</p>	<p>(910) 347-5223</p>

Dynamic Message Sign Installations	<p>The previous practice of Dynamic Message Sign (DMS) installations was to install overhead sign structures with ground-mounted control cabinets. The cost of these structures averaged \$50,355.</p> <p>The ground-mounted control cabinets were prone to flooding and damage by mowing crews.</p> <p>To alleviate concerns with overhead installations, the ITS Section has changed the practice to place the DMS's on the roadway shoulder using Pedestal or Butterfly type structures. The DMS displays are mounted 25 feet above ground and the control cabinets are attached near the base of the structures.</p> <p>This has resulted in improved visibility of the DMS from all travel lanes, ease of installation and maintenance and a 50% reduction in the cost of DMS structures and approximately \$1,500 cost savings on the control cabinet installation. This equates to approximately \$25,000 cost savings per DMS installation.</p>	ITS and Signals	2009	Greg Fuller	
Contaminated Waste Minimization	<p>Problem:</p> <p>US Highway 17 Bypass in Beaufort County crosses an unregulated abandoned landfill and an actively monitored US EPA Superfund Site. Material in the landfill posed an environmental risk, a constructability risk for proposed 30- inch concrete piles to support the Pamlico River Bridge. The Superfund site contained documented herbicides and pesticides in both soil and ground water, originating from a former agricultural supply facility at the site, which posed health risks to site workers, nearby residents and business patrons. The amount of material recommended for removal and disposal was estimated at 57,000 cubic yards at an estimated excavation and disposal cost of \$4 million.</p> <p>Solution:</p> <p>A comprehensive Contaminated Waste Minimization Plan was successfully developed by the Geotechnical Engineering Unit, in coordination with state and federal regulators and the Design Build contractor, to address concerns regarding waste disposal, workers' safety and project schedules. Through utilization of this plan, the amount of material requiring disposal was reduced by 99% to only 600 cubic yards of landfill debris. All contaminated material excavated from the Superfund site was incorporated into the roadway fill under a 12-inch compacted cap to act as a physical barrier to prevent health risks to the site workers, nearby residents, and businesses. The waste minimization resulted in a cost avoidance of almost \$4 million.</p>	Geotechnical Engineering Unit	2008	Cyrus Parker	(919)-250-4088
Division One Brine Systems	<p>Problem: Conventional snow/ice control methods yielded unsatisfactory results. Other Divisions were instituting brine operations, and achieving much improved removal of snow/ice from roadways. Division One desired to utilize brine on a Divisionwide basis, but purchase of prefabricated units for a project of this magnitude was deemed unfeasible.</p> <p>Solution: The Division decided to pursue construction of homemade units, based on designs observed in other Divisions. Estimates for the materials were computed, and approval to proceed was obtained. Materials were purchased, and the production and distribution systems were constructed.</p> <p>Results: After the work was completed, the total cost for the project was \$197,993.09, a savings of \$350,843.30 over prefabricated systems. The Division now has the capability to treat all necessary routes prior to events. This results on enhanced safety for employees, motorists, and enhanced public image for the Department.</p>	Div 1	2008	Win Bridgers	(252)-332-4021
Installation of four (4) test piles & PDA on Ocracoke Island	<p>Problem: As a result of bids being received at 675% above the Engineer's estimate and a extremely compressed schedule/deadline it was evident that the Division could not contract the installation of four test piles and the associated PDA testing required. Due to the restrictive time schedule and the necessity of the data provided by the PDA testing, an out of the box solution had to be formulated and quickly implemented.</p> <p>Solution: The Division consulted with the Geotechnical Unit and decided to perform this work with Division forces. Due to the crane size necessitated due to the pile and hammer size the Division had to contract (using a fully operated rental agreement) for an 80-ton track crane. Another rental agreement was utilized to provide a D30-32 Impact Hammer, a D19-42 Impact Hammer, and all required hardware for the diesel hammers. Division personnel requisitioned the 4 concrete piles along with the 4 steel pile tips to be driven on this project. The Division used Bridge Maintenance personnel for the delivery of all materials and the labor necessary to drive the 4 PDAs. The Geotechnical Unit helped in this endeavor by provided expert advice and a contract technician to perform the PDA testing.</p> <p>Results: After all work was completed, the total cost for the project was \$157,638.03, a saving of \$302,059.97 (when compared to the lowest responsive bid we received of \$459,698.00). As a result of this project necessary data was obtained to ensure the replacement of seven bridges along NC 12 was let in time to meet the restrictive closure period (of 75 days during the winter of 2007-08).</p>	Div 1	2008	Sterling Baker	(252)-482-7977

JOINT VESSEL SECURITY PLAN IMPLEMENTTION	<p>Problem: Due to the many U.S. Coast Guard rules and regulation the 33 CFR Navigation and Navigable Water reference manual was utilized as a guide. This was a very lengthy and extensive process to follow for compliance. Many hurdles had to be made to meet the requirements and additional communication devises needed for compliance not to mention required training, drills and exercises (still required), public access and applicability. Numerous telephone and correspondence transpired with the Commander of the U.S. Coast Guard.</p> <p>Solution: All aspects of Maritime Security for vessels and facilities were implemented for compliance and approval by the U.S. Coast Guard before acceptance of the plan. This was a tedious process set forth involving coordination and scheduling, record reporting and massive training and control measures of safety for the shore facilities and vessels. Massive man-hours were utilized to meet the compliance levels required to meet the Homeland Security guidelines set forth.</p>	Ferry Div	2008	Robert Hill	(252)-447-1055
Sampson County Rest Area Septic System	<p>Problem: The Wastewater Treatment Plant (WWTP) at the Sampson County Rest Area was costing the NCDOT in excess of \$19,000 per year due primarily to labor expense for an Operator in Responsible Charge (ORC) to operate the WWTP.</p> <p>Solution: The Roadside Environmental Unit Central Office and Division 3 Roadside Environmental Unit staff worked together to install a traditional septic system at the rest area to take the place of the WWTP. The traditional septic system does not require an ORC and so would result in dollar savings to the NCDOT.</p> <p>Results: The septic system was activated on September 6, 2007 and the WWTP was deactivated. As of December 31, 2007, the NCDOT has saved \$4,790 resultant from the conversion. The septic system installation and deactivation of the WWTP is resulting in savings of in excess of \$19,000 per year.</p>	NCDOT-Roadside Environmental Unit	2008	Stonewall Mathis	(910) 259-4919
Beam Winch	<p>We needed some way to pull the new pipe through the existing pipe without any equipment being placed in the stream. A winch would work, but where would we put it? How would we hold it? How would we charge the batteries? We determined that three H-Piles could be used to form a beam that would span the creek and provide a stable platform for the winch. The center H-Pile was offset from the two end H-Piles to help prevent twisting of the beam during the pulling process. Placement of the Beam Winch” across the concrete wing walls of the existing structure would provide ample support.</p> <p>The Equipment department had an arrow board that had been wrecked but the engine and charging system was still operational. It was stripped down to just the frame with the stabilizers used for legs.</p> <p>The liner pipe was installed in a safe process with minimum impact to the environment and traffic flow. The Department and DOT customers also benefited from the use of the recycled materials; winch, battery charging generator, and H-Piles. By using recycled materials we were able to save the Department a total of \$7263.09.</p>	Div 7	2007	Tim Powers	(336)-375-5589
Using Latex Polymers	<p>Over the years Division 11 has been concerned about the short pavement life of Asphalt Surface Treatment (tar and chip). Due to the variation in weather conditions within different parts of the state, life expectancy of pavement can be shortened due to extremes in temperature.</p> <p>Division 11 was interested in a type of binder (liquid) that will extend the life of pavement. Polymers (liquid) have greater elasticity which allow the pavement s to expand and contract without cracking, thus, extending the life of the pavement regardless of weather conditions.</p> <p>After four years of using latex polymers, the life of the pavement has been extended 48%. Division 11 also found that the need for patching has decreased by 50%. On high traffic roads the number of claims for damage to vehicles from loose stone has been reduced by over 50% due to the retention that the polymer liquid binder provides.</p>	Div 11	2007	Matthew Oliverson	(336) 903-9235
Pre-Augering H-Piles in Weathered Rock for Interior Bents	<p>Problem: Several decades ago bridges were designed to resist scour. In recent years, to improve lateral stability of interior bents that will resist the destabilizing effects of scour, NCDOT engineers have shifted from driven pile foundations and spread footings to drilled pier foundations resting within rock sockets. These drilled pier foundations are significantly more costly than previously used foundations. To save money and better utilize resources, we developed a new installation technique for piles to be installed within a rock socket.</p> <p>Solution: The Geotechnical Engineering Unit uses one of their CME 55 drill rigs with 12 inch augers to pre-auger the hole into weathered rock to a depth sufficient for lateral stability. Bridge Maintenance then drives the H-pile with their pile driving hammer into the pre-augered hole.</p>	DOH- Div 9, Div 12, BMU, & GEU	2007	John Fargher	(704) 455-8902.

Inactive Project Report	<p>Problem: Funding issues existed which needed to be addressed. There were active projects that needed additional funds for activity completion. These additional funds are limited within the constraints of the Department's annual highway budget.</p> <p>Solution: To find available funds to be better used on active projects or future priority projects created a need for an inactive project report to show those projects which have had no activity/expenditures within a specified (24 months) range.</p>	Financial Management- Project Management	2007	Majed Al-Ghandour	(919) 733-2039.
Installation of Four Test Piles & PDA on Ocracoke Island	<p>Problem: As a result of bids being received at 675% above the Engineer's estimate and an extremely compressed schedule/deadline it was evident that the Division could not contract the installation of four test piles and the associated PDA testing required. Due to the restrictive time schedule and the necessity of the data provided by the PDA testing, an out of the box solution had to be formulated and quickly implemented.</p> <p>Solution: The Division consulted with the Geotechnical Unit and decided to perform this work with Division forces. A fully operated rental agreement was used for the needed 80-ton track crane. Division personnel acquired the needed concrete piles and steel pipe tips. Bridge Maintenance personnel were use for the delivery of all materials and the labor necessary to drive the 4 PDAs. The Geotechnical Unit provided expert advice and a contract technician to perform the PDA testing.</p>	Operations- Division 1	2007	Sterling Bake	(252) 482-7977
Welcome Center Waterless Urinals	<p>Problem: Because of the severe drought in North Carolina, Governor Easley asked all state agencies to reduce water usage at all state facilities. The Northampton County Welcome Center uses 5.45 million gallons of water per year. It has 10 urinals, 44 commodes and 24 sinks. This facility provides service for over 2.2 million people a year.</p> <p>Solution: We installed 10 water free urinals at the Welcome Center at a saving of 980,460 gallons of water per year.</p>	Operations- Division 4	2007	Steve Hamill	(252) 237-6164
Eliminate Temporary Traffic Signals	<p>Problem: A bridge replacement project on Meadow Road in Eden called for installing a temporary traffic signal during a temporary detour.</p> <p>Solution: After reviewing the plans and the actual conditions in the field, it was found that the traffic could be maintained by shifting the existing traffic circle.</p>	Operations- Division 7	2007	Randy McKinney	(336) 634-5635.
Tar & Gravel Vs. Cold Patch	<p>Problem: When crews could not get asphalt from the plant they were using cold patch material to patch potholes. The cold patch material is very expensive, over double that of regular asphalt.</p> <p>Solution: To minimize the amount of cold patch material used we went back to the old method of hand patching with tar and gravel. The cold patch material is now only used if plant mix is unavailable and conditions will not allow the use of tar and gravel.</p>	Operations- Division 10	2007	David Gillette	(704) 283-5941
New Municipal Mowing Agreements	<p>Problem: Our mowing agreements were outdated and vague, resulting in NCDOT being invoiced for excessive amounts and at varying times throughout the year. Invoices were not submitted for as much as three years. This adversely affected maintenance budgets.</p> <p>Solution: We designed new agreements that brought our mowing reimbursements more in line with what our contractors are paid in those counties and limits invoicing to the number of cycles they mow. The new agreements specify invoice time frames, include project special provisions, roads to be mowed, along with mileage, and sample invoices. These agreements require the same safety, traffic control, and performance standards that contractors and state forces must comply with.</p>	Operations- Division 11	2007	Wayne Atkins	(336) 903-9122.
Contaminated Waste Minimization	<p>Problem: US Hwy 17 Bypass in Beaufort County crosses an unregulated abandoned landfill and an actively monitored US EPA Superfund Site. Material in the landfill posed an environmental risk, a constructability risk for proposed 30- inch concrete piles to support the Pamlico River Bridge. The Superfund site contained documented herbicides and pesticides in both soil and ground water, originating from a former agricultural supply facility at the site, which posed health risks to site workers, nearby residents and business patrons. The amount of material recommended for removal and disposal was estimated at 57,000 cubic yards at an estimated excavation and disposal cost of \$4 million.</p> <p>Solution: A comprehensive Contaminated Waste Minimization Plan was successfully developed by the Geotechnical Engineering Unit, in coordination with state and federal regulators and the Design Build contractor.</p>	Preconstruction- Geotechnical	2007	Cyrus Parker	(919) 250-4088.

Procurement Cost Reduction of LED Traffic Signal Modules	<p>Problem: The cost of LED signal modules is higher than the cost of incandescent bulbs. We would like to achieve a reduction in the procurement costs of these modules. LED traffic signal modules are becoming a standard commodity. Companies are now manufacturing larger quantities and more companies are manufacturing the modules. These factors may provide an opportunity to lower procurement costs.</p> <p>Solution: The solution is to create a new contract bid for LED traffic signal modules rather than to extend the present contract.</p>	Preconstruction - Traffic Engineering	2006	Milton Dean	(919) 733-5666
DMS Installations Project	<p>Problem: The previous practice of Dynamic Message Sign (DMS) installations was to install overhead sign structures with ground-mounted control cabinets. The cost of these structures averaged \$50,355. The ground-mounted control cabinets were prone to flooding and damage by mowing crews. Previously with flip disk technology, the control cabinets were placed 50 to 75 feet in advance of the DMSs. This allowed maintenance personnel to view the DMS display while working in the control cabinet. With the new LED technology, placing the control cabinet in advance of the DMS does not provide message legibility from a distance of 50 to 75 feet; therefore, placing ground mounted control cabinets in advance of the DMSs are no longer effective.</p> <p>Solution: To alleviate concerns with overhead installations, the ITS Section has changed the practice to place the DMSs on the roadway shoulder using Pedestal or Butterfly type structures. The DMS displays are mounted 25 feet above ground and the control cabinets are attached near the base of the structures.</p>	Preconstruction - Traffic Engineering	2006	Tom Parker	(919) 733-1506
Overhead Sign Design Wind Area Reduction	<p>Problem: Find a way to reduce the design wind area used to compute wind loads on overhead sign structures while maintaining flexibility to add additional wording to signs. The design wind area exceeds the actual sign area by as much as 80%. This is done to allow flexibility in making last minute changes to overhead signs during and after construction. However, it also results in design wind force effects that are larger than those produced by the actual sign "wind area. The larger force effects require larger and more costly structural members and larger foundation sizes.</p> <p>Solution: Eliminate design wind area and use a slightly larger sign panel size to accommodate additional text. Use that actual sign panel area to compute design wind forces.</p>	Preconstruction - Highway Design Branch	2006	James Gaither	(919) 250-4042
Webcast Field Inspections	<p>Problem: Roadway Design meets with field offices for most projects during the design phase. These field inspections are in the division office where the project is to be built. If a project is being built in Division 1, 2, 12, 13, or 14, members of the design team (Roadway, Hydro, Traffic, Structures, etc) drive from Raleigh to these Divisions (up to six hours away) to meet and discuss project specifics.</p> <p>Solution: Web conferencing allowed everyone in Raleigh (approximately 6 to 10 people) to meet in a conference room and discuss the project with everyone in the division without Raleigh personnel having to drive to the Division office. A license was required for \$100 (\$50 per location) which allowed viewing of the plans over the internet. The Web conferencing meeting lasted only 30 minutes.</p>	Preconstruction - Highway Design Branch	2006	Jim McMellon	(919) 250-4016
Eliminate Stream Relocation	<p>Problem: A bridge replacement project (TIP B-3630) on John Oakley Road in Caswell County called for relocating approximately 150 feet of an existing stream.</p> <p>Solution: Upon reviewing the plans and the actual conditions in the field, it was found that the project could be completed without relocating the existing stream.</p>	Operations - Division 7	2006	Randy McKinney	(336) 634-5635
Utility Savings	<p>Problem: In the past NCDOT has been charged water and sewer rates for all the water used at the Selma Rest Area, located on I-95 in Johnston County.</p> <p>Solution: Separate water meters were installed at each building at the site. These meters reflected the amounts of water used and amounts that would discharge into the sanitary sewer. An agreement was made with the Town of Selma to separate the billing rates.</p>	Operations - Division 4	2006	Robert Simpson	(252) 237-6164
Self-Contained Hydraulic System For Salt Spreader PMs	<p>Problem: Old process for performing salt spreader PMs required taking a truck, loader, and additional operator out of regular service. Salt spreader was then installed on the truck in order to perform semi-annual PMs.</p> <p>Solution: A self-contained hydraulic pumping system was developed to eliminate truck, loader, and additional operator. One transportation worker could perform the PMs alone.</p>	Operations - Division 3	2006	Jesse Hansley	(910) 347-5223

Alternate Method for Sign Illumination	<p>Rising electrical service costs and limited maintenance resources are impending problems for overhead sign lighting. The Signing Section aimed to reduce the costs of sign lighting. The section investigated alternate methods of sign illumination, finding a method that meets the federal requirements and reduces cost.</p> <p>As a result, overhead signs no longer require the traditional lighting methods and its costs. The Signing Section now endorses Type IX retro-reflective sign sheeting as an alternate method for sign illumination. This alternate method reduces signing cost while maintaining a high quality, safe, and effective transportation system.</p>	Preconstruction Traffic Engineering	2005	Ayman Alqudwah	(919) 250-4151
Development of Prestressed Concrete Box Beams	<p>Historically, NCDOT has utilized two types of precast prestressed concrete units for use in bridge decks—voided (cored) slabs and prestressed concrete girders. Each has its advantages and limitations. Girders are more durable, have greater capacity, and can span longer distances. Slabs have a much more shallow structure depth and are faster to install, leading to faster construction times. Slabs are especially viable on rural, off-system stream crossings with low traffic volumes, which accounts for a high percentage of bridge replacement projects each year.</p> <p>To provide bridge designers with more choices, Engineering Development developed standard box beams. These structural units can span up to 105 feet (up to 65 feet for top down) while maintaining a structure depth about 1.5' less than a comparable girder bridge.</p>	Preconstruction – Highway Design Branch	2005	Tom Koch	(919) 250-4046
Modified Offset Catch Basins	<p>Project involved converting offset open throat catch basins to standard grated catch basins. Work involved casting new top slabs and placing new hooded frame and grate. New grate was still offset, but by placing concrete apron in front of grate to line up with existing curb and gutter this allowed a straight line for the edge of asphalt pavement. This allowed a better joint at the gutter line, and for future resurfacing projects will allow straight line milling, eliminating the need for incidental milling in the offset areas.</p> <p>This method has been used eighteen times thus far within the Whiteville Resident Office area of Division 6.</p>	Operations Division 6	2005	W. R. Marsh	(910) 642-2489
Truck Bed	<p>The Department of Transportation is currently providing training in the form of a truck roadeo and a backhoe roadeo. The backhoe roadeo is a new event and a sandbox was needed during the training. The Sampson Maintenance department was given the task of building a metal sandbox. The materials and labor would exceed \$400. The conclusion was to use an existing pickup truck body of a wrecked pickup. The truck body is easy to maintain, very visible (DOT yellow) and very cost effective.</p>	Operations-Division 3	2005	L.E. Reynolds	(910) 592-1434.
Ink Cartridge	<p>There is a program available with a local office supply store that will give a free ream of office paper for each printer cartridge turned in. This removes the old cartridges from the waste stream and provides Division 3 with copy paper for internal use within the Division.</p> <p>This program is in use within Division 3. There are approximately 200 printers within the Division. Each has an average of two cartridges that are usually replaced twice a year. The cost of a ream of office copy paper is currently \$3.29.</p>	Operations-Division 3	2005	L.E. Reynolds	(910) 592-1434.
Polycarbonate Signal Heads	<p>Traffic signals in Dare county are located in a challenging environment that adds to the difficulties in performing maintenance activities. Challenges such as high winds and salt air degrade most materials if left unprotected or unsecured. Signal heads which house the red, yellow, and green indications suffer the most due being mounted above the roadway and within direct sight of the breaking, ocean waves. Because of the corrosive damage occurring to the signal heads, electronic technicians had to replace them once every three years. In addition the constant and sometimes high winds would cause the tunnel visors to blow off the signal heads. It was because of this continuous chore and associated costs that it was decided to try a signal head made from a different material.</p> <p>After some research, the solution was to replace the standard signal head made of painted aluminum with another made of UV stabilized polycarbonate plastic. The polycarbonate plastic material is colored yellow so there is no paint to flake off. Due to the relative lightweight nature of polycarbonate heads, the use of polycarbonate signal heads was limited to a rigid mount on a metal mast arm. Span wire applications were avoided because the wind would blow the signal heads out of position and tear them apart.</p>	Operations Division 1	2005	Madison Phillips	(252) 482-7977.
Reduced Copies of Motor Vehicle Laws	<p>Each year all Drivers License examiners and many others in different departments of state and local government receive a personal copy of the Motor Vehicle Laws of North Carolina, Annotated. If each office or work area received just one copy this would be and obvious savings in cost and materials.</p>	DMV Driver & Vehicle Services	2005	Bruce Goeden	(919) 468-0319.

Staggered Renewal	<p>NCDMV currently requires all Apportioned Motor Carriers, Commercial Vehicles, Special Mobile, For Hire, Non-Dealers transporters, Drive Away, Taxis and Unassigned National Guard to expire on December 31st of each year. During the peak renewal period from Jan 1 through Feb 15, the two state DMV agencies are required to work overtime and temporary personnel must be hired in order to assist during the peak time. Customers have to wait in long lines, which causes to be very customer unfriendly.</p> <p>Recent legislation allows for staggered renewals for the above listed vehicles. The team helped in the design and functionality of converting the customers' expiration date to spread the renewals throughout the year.</p>	DMV- Driver & Vehicle Services	2005	Don Ferrier	(919) 861-3332.
Bituminous Unit Operating Year-round	<p>Division 11 Bituminous Unit has decided to keep the Bituminous Unit intact year round rather than temporarily transferring the employees and equipment to other Units within the Division during the off season. We are now utilizing our employees year round, resulting in the Unit being more efficient and productive. In doing this, we have the teamwork and partnership of the Division Counties. Bituminous Operations has started stockpiling and snow removal, utilizing only DOT employees and equipment, rather than extensively utilizing contract Fully Operated Rental Equipment.</p> <p>Prior to this change, we were paying an average of \$3,246.72 per day with rental equipment to stockpile. Now we're paying approximately \$2,343.84 per day with DOT personnel. This is a cost savings of \$108,345.60 by Division per season just by using DOT personnel and equipment. Statewide, it could be a savings of \$1,516,838.40.</p>	Operations-Div 11	2004	Matthew Oliverson	(336) 903-9235
Substitute Vacuum Pump Oil Source	<p>M&amp;T purchased an instrument to test metal alloys in May 1996. It uses two vacuum pumps to keep the various chambers under vacuum when needed. The pumps must run continuously and require oil changes each 90 days at 1 liter per pump. An approved fluid must be used which costs \$86.50 per liter from the instrument manufacturer. This year a source was found which will furnish the fluid directly to the Department so that the instrument manufacturer's price markup is avoided. The oil from the new source costs \$8.75 per liter, creating a savings of \$77.75 per oil change.</p>	Construction-Materials and Tests	2004	Kelly Croft	(919)329-4090
Revision of DWI Restoration Hearing Process	<p>From March,1988 until May,2004, the DWI Restoration Hearing process required a panel of three (3) Driver License Hearing Officers to conduct the DWI hearings. Forty (40) hearings were scheduled one week per month per panel in established hearing locations. On average, there were six (6) DWI Panels assigned each month to conduct these hearings. The cost for one Driver License Hearing Officer to travel for one week each month was averaged to cost \$450.00 per week. This included overnight lodging and meals at or below the state allowed per diem. For one 3-person panel, the average cost was estimated at \$1,300.00 per week or \$8,100.00 per month for 6 panels which averaged \$97,200.00 per year. The average cost for 7 panels was estimated at \$9,450.00 per month or \$113,400.00 per year.</p>	Division of Motor Vehicles	2004	Wayne Hurder	
Right of Way Electronic File System	<p>The Right of Way Branch is responsible for the acquisitions of property for construction. A large amount of legal documentation is generated for each claim. Right of Way is required by State and Federal Laws to retain this documentation from 2 to 15 years, depending on the type of claim. The State Records Center is where the documentation was retained. Due to the recent State Budget Crunch, State Records was no longer able to store our documentation. Right of Way had to devise a new method of storing its documentation.</p> <p>After reviewing several alternatives, Right of Way initiated a system called ROW-EFS (Right of Way Electronic File System) where the information is processed, stored and archived electronically using existing computer technologies already in house. This system would incorporate all 20 Right of Way offices. New procedures had to be developed and taught to all of the Right of Way employees.</p>	Preconstruction-Right of Way	2004	Grady Morris	(919)733-7932
Developer Resurfacing	<p>Due to the large amount of development in Cabarrus County, and with the majority of these developments the developer must construct roadway improvements. To eliminate conflict with our resurfacing contracts, we have determined that if the development is approved, and set for construction before we receive that upcoming year resurfacing list, and the subject development is within limits of our projects, we leave out their proposed improvements from our resurfacing program. By not overlaying their improvements, we can save tenths of miles in resurfacing and add other maps to our contract.</p>	Operations-Div 10	2004	: Matt Weiss	(704) 982-0104
Aerial Mapping of Quantities	<p>This process is new so it is difficult to say if the actual quantities installed we be closely related to those that are being estimated. It has, however, decreased the time it takes to get quantities by 50%. Instead of two people spending an entire day collecting measurements, now only one person can complete the project. If the average engineer (TE1) makes \$19/hr then wages not spent on the extra personnel for one day is \$152.00. To perform the investigation requires at least one round trip of approximately 220 miles at \$.25/mile which equals \$55.00 in vehicle costs plus \$16.28 in fuel. The total savings per contract would amount to \$223.28.</p>	Operations-Div 10	2004	Tim Kirk	(704) 982-0101

Pallet Return	Inventory and supplies that the Roadside Environmental Unit receives for our daily operation comes on pallets and gets stockpiled at the local yards. As the crews clean trash and debris from the yard, the pallets were taken to the landfill at a cost to the department.	Operations- Division 7	2004	Ken Taffer	(336) 334-3192
Portable Temporary Bridge	In the past Bridge Maintenance in Div. 11 has had to place temporary detours using pipe in streams. Div. 11 designed and built a temporary bridge which can be dismantled into 4 or 5 separate pieces and is easily transported to location. Savings of \$20,000 realized per site with no impact to environment and elimination of weeks of construction.	Div 11	2003	Dennis Bennett	(336)903-9124
Cable Guardrail Mower	Previously 8 employees and 4 hours were required to cut grass around 1 mile of guardrails - plus 2 trucks to haul equipment to site. Team designed mowing system mounted on tractor to cut grass. Current process reduces manpower and equipment and allows 2.6 miles to be mowed in 1 hour. New process saves \$7,837.80 and 262.2 labor hours	Div 11	2003	Donald Stanley	(336) 903-9121
Daylily Planting	Daylilies were to be planted along US 64 and US 74 Bypasses totaling 64.74 acres or 46,162 daylilies. By providing daylilies grown by DOC to contractor, DOT was able to save \$3.07 per plant. Total savings to DOT \$141,768.18. Public response has been very positive to beauty provided by the plantings along our highways.	Div 8	2003	Arnold Lassiter	(910) 944-2344
Steel Pipe Installation	Replacement of a deteriorated 92" pipes culvert. This pipe had approximately 60' of fill. Replacement cost would be extremely high, because of fill removal, excavation size and location with other highways. Three private driveways would have been cut due to excavation, as well as expensive engineered retaining/shoring system installed, because of the depth of full and close proximity of a major highway next to the project.	OPERATIONS - DIVISION 13	2002	Ken Anderson	(828) 298-1128.
Hot Spray Thermo	Division Two were reaching the end of their life span. Theremaining roadway life was approximately 2-3 years about half the life of normal thermoplastic pavement markings. Painting of the existing surfaces was an option but would require several remarking operations before the roadway was resurfaced. Through contacts with vendors, a new product called hot spray thermo was reviewed. This product provided a life span that matched the remaining pavement life and provided a product comparable with standard long life thermoplastic. Based on our investigation we elected to utilize this product. Additionally, to enhance visibility during both daylight and night we elected to increase the existing 4 line width to 6.	OPERATIONS - DIVISION 2	2002	Steve Hamilton	(252) 695-2044
US 70 Conversion from Bahiagrass to Centipede	The Division Two Roadside Environmental crew has begun a multiyear conversion of the shoulders and median sections of US-70 in Jones and Craven counties to centipede grass from bahia. The bahia requires mowing 6-7 times a year, while the centipede will only need to be mowed about twice. Centipede will take 2-3 years to become fully established but will create savings after that. With the use of specialized herbicides, sod seeding and fertilization we re trying to expedite the process	OPERATIONS - DIVISION 2	2002	John Wells	(252) 830-3146.
Reuse of Clipped-off ABC Scheduled for Discarding	On this major interstate highway construction project, the project plans and special provisions indicated that a nominal 2 of the existing 12 aggregate base course layer was to be clipped off to establish the subgrade, and the remaining 10 layer is to be conditioned. The 2 clipped off material was to be discarded. The plans also indicated that a quantity of 60,600 tons of ABC was to be hauled to the site from the quarry to construct finished ABC shoulders, median, and rest area ramp base course.	OPERATIONS - DIVISION 13	2002	Stan Hyatt	(828) 251-6171.
Wiring an Existing Building	The building that is being used for the storage of salt, sand and signs had never been wired. This was causing a safety concern as well as delays when loading materials during the night. A local electrician submitted an estimate of \$4,904. Traffic Services in Wilmington was contacted to see if they could help. They would be able to provide lights, poles, breakers, receptacles and a panel box at no cost. These materials were salvaged from previous projects. The only expense would be for labor, equipment and wire	OPERATIONS - DIVISION 3	2002	Linwood Reynolds	(910) 592-6174.
Construction Debris Disposal Elimination	Concrete pipe and asphalt have been disposed of by hauling to the Duplin County landfill. The tipping fees for fiscal year 2000/2001 were \$29,305.20. We contacted S&W Concrete Company of Wallace and they agreed to let us haul all the concrete and asphalt to their business at no charge. S&W recently purchased a recycling machine and will recycle the material.	OPERATIONS - DIVISION 3	2002	Linwood Reynolds	(910) 592-6174.
Skilled Based Pay Testing	The Skill Based Pay-testing site in Wilmington was causing the participating Duplin County Maintenance Department employees to miss three hours each month in travel and testing time. This was causing a problem by disrupting crew activities due to a shortage of employees. Ms. Leary-Ezzell and I discussed the down time and she asked if it would be okay if the testing be performed in our office in Kenansville. I agreed and Ms Leary-Ezzell contacted Nancy McMillian (Div Three Testing Coordinator) and presented the idea. Ms McMillian obtained approval from Jackson Provost. I then discussed the idea with all employees and asked that they should take as many tests as possible and that we would cut the testing dates from 12 to 6 per year.	OPERATIONS - DIVISION 3	2002	Linwood Reynolds	(910) 592-6174.

APA Repair	The asphalt lab owns an Asphalt Pavement Analyzer manufactured by PTI, Inc. This wheel-tracking device runs a continuous load over asphalt specimens to try to predict rutting. Rut tests are becoming an integral part of our mix design process. Specialized maintenance skills are required to keep this equipment in working condition, and over the years, numerous repairs have been made to this machine. Chris Bacchi, the Assistant Asphalt Design Engineer, has made a trip to PTI in Atlanta in the past and has learned how the APA is built and how it functions. Through numerous phone calls and this training, Chris has learned how to perform all of the necessary repairs, including part replacement and calibration. The manufacturer charges for travel time as well as labor to come and make repairs.	PRECONSTRUCTION	2002	Chris Bacchi	(919) 733-3563.
Equipment Identification Numbers	Since 1994 the Equipment Unit has used adhesive vinyl lettering and numbers for marking equipment identification numbers on our over the road vehicles. This produced a much neater job than spray painting the signage as had been done in the past. As we continued to use adhesive vinyl more and more, its usefulness for special signage and equipment marking became more apparent. However, the cost of purchasing the finished vinyl product continued to rise. A team was assembled to investigate the feasibility of purchasing a vinyl plotter and the software necessary to produce our own signage in-house. Prices were obtained for materials. A demonstration of the sign making process was viewed. The cost of the signage over the past twelve months was compared to the cost of purchasing the vinyl material and estimated cost for a twelve-month period. Calculations showed that producing our signage in-house would generate significant savings.	OPERATIONS - MAINTENANCE	2002	Charles Jones	(919) 733-3572.
Wilmington Satellite Laboratory	There has been a tremendous increase in the number of projects in the Wilmington area that utilize drilled piers in the construction of structures. This trend is expected to continue over an extended time frame, resulting in a large quantity of concrete test cylinders generated for testing. The closest Material and Tests facility to these projects that can perform these tests is approximately two hours away, so a satellite laboratory was established in Wilmington that eliminated the time and use of a vehicle to transport the cylinders to Raleigh or Fayetteville.	OPERATIONS - DIVISION 3	2002	Jack Cowser	(919) 733-7088.
Electronic Utilization of Pavement Condition Survey	Every two years Division personnel conduct a pavement conditions survey of all primary and secondary roads. The Pavement Management Unit is responsible for processing and transmitting this data to Division, District and County maintenance personnel. Previously, hard copies of this data were given to all Division, District and County Maintenance Engineers. The Pavement Condition Survey data is now available on the Pavement Management Unit web site and a CD containing this data is given to each Division, District and County Maintenance Engineer. Hard copies are now processed only for the Pavement Management Unit and each Division office.	OPERATIONS - CONSTRUCTION	2002	Jerry Blackwelder	(919) 250-4094
Rest Area	The Division endeavors to provide safe and attractive rest areas at a reasonable cost to the taxpayer. At times situations arise that require job specific equipment for short periods of time. We obtained a Purchase Order Contract with a local equipment rental company for daily, weekly, and monthly rentals. Some equipment used are 1) concrete planers for uneven sidewalks, 2) stump grinder for removing dead trees, 3) small backhoe for plumbing repairs, and 4) concrete mixer. This equipment rents from \$60 to \$125 per day and \$180 to \$375 per week. Purchase of this equipment would cost from \$2500 to over \$16,000.	OPERATIONS - DIVISION 9	2002	J. M. Lineberry	(336) 896-7039
Blanket" Permanent Raised Pavement Marker Contract	Historically, the Traffic Services Supervisor waited until the spring to determine which roads had markers scraped off during the winter plowing operation. Quantities were based on state or division bid averages. The drawbacks were: 1) Having to wait until after the letting to determine exactly how many markers could be completed within the allotted budget. 2) Waiting until later in the year to let contracts, the greater chance that the contractor had already booked work. 3) Prices would generally be higher. A blanket contract for raised pavement marker was let December 5, 2001 instead of late March as in the previous year. The Traffic Services Supervisor estimated the quantity range and a percentage of roads that required raised pavement markers.	OPERATIONS - DIVISION 7	2002	Evan Andrews	(336) 256-0553
Cost Saving Operation for Drag Seal	The drag seal procedure was jeopardized due to a defective broom section. The broom bristles were not installed correctly to the wooden frames and were embedding in the seal making them a hazard to the public both pedestrians and motor vehicles. The team brainstormed to find an alternative method. A baseball infield was dragged with a chain link fence as part of the research. The uniformity within the field after this operation was observed. A ten-foot section of 9-gauge chain link fence was purchased; a 70-grade chain was attached to the fencing, and hooked to a pick up truck. The road was dragged with the fencing. The desired uniformity for 78m aggregate was obtained, the voids were filled within the aggregate, and the next application of liquid asphalt penetrated the aggregate effectively.	OPERATIONS - DIVISION 7	2002	Mark Fogleman	(336) 334-3192
Hydraulic Hose Fabrication	In the past, most hydraulic hoses, as well as fittings, were purchased from outside vendors. This process was expensive, as well as, time consuming. The Albemarle equipment shop decided it was time to change this process. A hydraulic hose crimp machine was added as well as a 10x14 room addition to the shop.	OPERATIONS - DIVISION 10	2002	Melvin Furr	(704) 982-1997

Asphalt Distributor Hose Upgrade	It was 2 months when the hose began to fail, a new one had to be special ordered. Delivery times were about two weeks, and cost was over \$900.00. In order to install the new hose, the pump had to be removed and four new gaskets installed. This took an average of 5-6 hours of labor. New gaskets were about \$10.00 each. The decision was made to modify the plumbing of the asphalt distributor to accept a common hose that was carried in inventory by the local contract supplier. The modification was performed by removing the existing coupling and welding an elbow to the pipe. Four permanently mounted hose swivel couplings were added at a cost of \$35.00 each, eliminating the need for gaskets. Total changeof hoses now takes less than one hour. The new hoses cost less than \$400.00 for the pair.	OPERATIONS - DIVISION 13	2002	Jerry Murray	(828) 298-0220
Replacement of Steel Plank Floor on a 150-ft. Span Bridge	Bridge Maintenance is responsible for a variety of structure maintenance activities. One type of maintenance performed several times a year is the replacement of steel plank flooring or rehabilitation on bridge structures. To reduce bridge closing for these repairs a new method of replacement was used. Instead of air hammers and muscle a Skid Steer Loader with an impact tool attachment is used. This allowed for a two-week reduction in the bridge closing (from 6 weeks to 4) and a reduction of required labor from 6 workers to four workers.	OPERATIONS - DIVISION 10	2002	Terry Harris	(704) 982-0101.
Lime	In the past Division Four used bagged lime for application to wildflower beds. This process was used because many of the sites were small and spread throughout the Division. Bag costs averaged \$73.20 per ton. Bulk suppliers were contacted to determine if they could apply bulk lime with a continuous sequence. The supplier was met at a central location, led to the multiple sites, informed of the application rates at each site, and allowed to move from site to site for application.	OPERATIONS - DIVISION 4	2002	Brian Glover	(252) 237-6164.
Dump Truck Canvas Stop	It is the goal of the Halifax Equipment Shop to keep the amount of unnecessary repairs to a minimum and keep the equipment on line or rented. There is currently an L-shaped bracket at the top/rear of the dump truck that is fastened to the body to receive the canvas rollback bar to cover the load. The position of the L-bracket is easily damaged while loading or unloading. There was an apparent need to improve this process and relocate the angle instead of just continuing to repair the damaged L-bracket. The action that was taken was to remove the L-bracket and attach a 3/8 angle near the fulcrum of the rollback bar, which is located just to the rear center of the truck body. This stop is less susceptible to damage.	OPERATIONS - DIVISION 4	2002	Joe Nelson	(252) 583-4221.
Granville County Rest Area Automatic Doors	In the fall of 1998 the Roadside Environmental Unit replaced the twenty-two year old manual swinging doors on the I-85 Granville County North Bound Lane Rest Area with an automatic sliding door. The cost was \$4,660.50. During the plan preparation stages of the Granville County Rest Area renovation, the REU instructed the architect to design the new building addition so that the existing automatic doors could be reused instead of a new set of doors being purchased.	OPERATIONS - ROADSIDE ENVIRONMENTAL	2002	Jennifer Pitts	(919) 733-2920.
LED Signal Head Retrofits under TIP Projects	Signal standards have changed in the past 2-3 years to include all LED signal displays. Initially only red LEDs were required, finally all LED. Traffic Services is faced with retrofitting these new signals with all LED displays using maintenance or other funding sources. All LED signals have shown as much as 50% less power consumption as old incandescent displays also LED visibility improves controlled intersection safety, and the five-year warranty on LEDs has reduced trouble calls for bulb replacement. In order to solve the problem, we proposed to get approval to let the signal contractor on the TIP project retrofit the signal heads while the project is ongoing. By letting the contractor perform the work during construction, DOT forces would not have to make a second visit to retrofit after construction is completed.	OPERATIONS - DIVISION 12	2002	Jimmy Hamrick	(704) 480-9033.
Recycled Erosion Control Stone	Riprap stone used for temporary erosion control devices on secondary roads construction has to be removed when projects are completed and permanent vegetation is established. Rather than dispose of used material, the stone is removed and stockpiled at maintenance facilities. As small amounts of riprap are needed for repairs and other maintenance activities, the recycled stone is used for these activities. This eliminates purchasing additional stone or hauling small quantities from the quarry and allows us to use the stone twice for one price	OPERATIONS - DIVISION 8	2002	Johnny Ransdell	(919) 775-3122.
School Zone Flashers	Our school zone warning flashers have always run on AC electricity and used incandescent bulbs. We decided that we would try solar for power and replace bulbs with LEDs. The installation cost for one set of solar powered flashers is \$6,221 compared with \$3,949 for conventional flashers. The payback period for the added costs over the annual energy saving of \$336.36 is seven years. Based on a two-year comparison so far both systems have performed without failure. It is expected that the conventional bulbs will begin to need to be replaced adding maintenance cost to conventional flashers. Data is not currently available.	OPERATIONS - DIVISION 11	2002	Dwayne Bauguess	(336) 667-1648.

Shoulder Machine	Due to the expense of self-propelled wideners, which cost \$120,000 per unit, we are experimenting with a shoulder machine, which attaches to the front of a rubber-tired loader at a unit cost of \$30,000. Thus far, the unit works great for shoulder work when dispensing dirt. Currently we are making modifications to achieve the same results with asphalt. With modifications in place we expect to achieve the same good results with dirt as well.	OPERATIONS - DIVISION 8	2002	Mike Garner	(910) 947-2721
Electronic Copies of Aerial Photos	The Department prints numerous amounts of aerial photos each year. Each photo costs approximately \$50 to print. Congestion Management alone spends over \$3,000 a year printing aerial photos. In addition, these photos can be very large in size and can lead to filing space concerns.  Congestion management is addressing this by having aerial photos sent electronically as jpeg files instead of printing hard copies.  Less money is spent on printing the hard copy of the photo, filing space is reduced, and manipulating the photo is much easier. Additionally the photo can be obtained within hours instead of up to three days.	PRECONSTRUCTION	2002	Stacey Silva	(919) 250-4151.
Reduced Environmental Documentation Using Abbreviated Format	The Environmental & Planning Branch of the Rail Division was interested in reducing the amount of documentation for a Final Environmental Impact Statement (FEIS) on the Southeast Highspeed Rail Project (SEHSR). The FEIS covers a large study area corridor of approximately 500 miles, across the state of Virginia and North Carolina.  After reviewing public and agency comments on the draft document, it was found that no significant changes would need to be made. The team investigated using an abbreviated format for the FEIS. The team discussed this approach with Federal Highway Administration, and it was agreed that the approach was appropriate.	TRANSIT - RAIL	2002	David Foster	(919) 508-1917
ASC Battery Replacement Program	The batteries in Econolite ASC-8000 traffic signal controllers are difficult to replace because they are soldered to a printed circuit board. Field technicians normally do not perform solder/desolder operations on printed circuit boards. In addition, the batteries are not a common type so they must be ordered through electronics parts suppliers. Therefore, the batteries were not changed on controllers in the field. While depleted batteries are replaced when controllers are repaired in our Traffic Electronic Center (TEC), only a limited number of these controllers have required repair. TEC technicians observed several controllers, in which battery decay had sent corrosive fumes onto the controller printed circuit board, rendering the controller beyond repair. When these controllers failed at an intersection, the intersection traffic signals would revert to flashing operation, and undesirable mode of operation.  A proactive battery replacement program was initiated. TEC technicians then scheduled visits to each division to replace batteries on an established schedule.	PRECONSTRUCTION	2001	John Montgomery	(919) 733-5666
Heat Shrink Tubing Method	Traffic Management Systems Section specified mechanical sealing bushings to seal riser/conduits where communication cables (fiber optic cables) enter and exits the riser/conduit at the top of a utility pole. The conduit extends from the base of a utility pole to the point where the cable enters the riser/conduit. The bushing is used to prevent water from entering the conduit and running down into a cabinet where it can damage equipment.  To install the mechanical sealing bushing requires the installer to tighten screws, which compresses two steel plates with a neoprene gasket between them to achieve a proper seal between the riser/conduit and the communications cable. Since this operation is performed at the top of a utility pole it is difficult to inspect.	PRECONSTRUCTION	2001	Greg Fuller	(919) 733-8021
Roadbind	On secondary road construction projects, one of our greatest costs is ABC stone for our base. Our normal procedure is to place 8 of ABC stone and then pave with BST. On project 6.640011, we substituted 4 of ABC stone base with an application of roadbind adhesive to the remaining 4 of ABC stone. We then scarify the stone base to mix the roadbind into the 4 of stone and regrade. Then compact and allow it to cure 1-2 weeks before paving with BST.  Roadbind is a by-product from the pulp mills. It is lignon that binds the fibers of the tree together. This lignon when mixed with the ABC creates a stronger bond between the stone aggregates and creates a stronger base. The advantages of roadbind are 1) Equal to or stronger than stone base alone. 2) Dust inhibitor. 3) Reduced time for stone setup. 4) Lower cost.	OPERATIONS DIVISION 9	2001	Kent Boyer	(336) 593-8541

Guardrail Sign Mounts for Median Guardrails	Due to the installation of the median guardrails on our multi-lane highways, additional signing is needed to safely operate the spray trucks. Mounting signs in conventional stands is dangerous to both State forces and the public due to having to carry the sign and stand across multiple lanes and then erecting it on a narrow shoulder. We looked at several commercial sign brackets for mounting signs on posts or rails but none were completely compatible with our signs or the guardrails. Using metal stock, we designed a simple bracket that will attach to different guardrail widths and can be used with our current roll-up type signs. It is less cumbersome than any commercial model we examined and therefore safer to carry across the roadway. Time saved in erecting the sign means less exposure to traffic. The cost of the commercial sign mounts varied from \$35.00 to \$45.00 per mount with additional costs added for standards and uprights to attach the signs. Utilizing our welding shop, we used raw metal stock to make the mounting bracket and salvaged square tubing from obsolete sign stands for the uprights.	OPERATIONS DIVISION 9	2001	P. H. Suggs	(336) 896-7039.
Off Road Herbicide Truck	The Division Nine-Roadside Environmental Department was faced with the challenge of continuing herbicide applications while improving safety and efficiency. In response to a series of accidents during herbicide applications in the east, it was decided to explore a safer method of applying herbicides.  A study was completed by the Division equipment personnel and those from Roadside Environmental for the construction of an off-road herbicide application truck.  A truck was fabricated from an existing flat bed truck and modified for off-road use.	OPERATIONS DIVISION 9	2001	Speedy Floyd	(336) 631-1340
The Beast	Due to the vast amount of clearing required for secondary construction, a way to dispose of vegetation and stumps efficiently and cost effectively was needed. The costs of equipment rental, labor, and landfill fees created the need to find a better method of disposal. Initially, a Waste Wood Recycler called The Beast was rented to effectively and efficiently grind up all debris. There was a dramatic increase in the rental rate of this piece of equipment prompting Division 8 to pursue the purchase of its own recycler.  The uniqueness of this project lies in the fact that there was not an equipment class code for this particular piece of equipment. This team had to pave the way for such a purchase from scratch.  By purchasing this piece of equipment and renting from us, we not only save \$9300 per month in rental charges, but also contribute back into the system funds for future equipment purchases.	OPERATIONS DIVISION 8	2001	Richard Hancock	(910) 944-2344.
NHS Retroreflectance Reading	The need to collect data for Pavement Marking Inspection Reports manually exposes both DOT employees and the employees of private contractors to high volumes and vehicle speeds of the motoring public. It also decreases travel efficiency through lane closures to obtain measurements. This team investigated the idea of having the collection of retroreflectivity data collected by a mobile unit.  A mobile unit would collect readings every 10-15 feet where as manually, readings are done 6 times per line per mile. The mobile unit summarizes data every 1/10 of a mile creating a gain of 4 readings per mile using a mobile unit. The biggest advantage in using a mobile retroreflectometer is the cost savings generated. The cost for DOT employees to collect data for 150 miles would be approximately \$20,000.00. Depending on the number of mobilization charges, a contractor could provide a mobile unit for as little as \$6,300.00. If additional mobilization charges are necessary, the total savings will be between \$7,000 and \$13,000. That is a cost saving based on this project alone. A per mile savings statewide could range from \$47 to \$87.	OPERATIONS DIVISION 8	2001	Will Garner	(910) 944-2344
Confront vs. Transline/Garlon 3A	Transline and Garlon 3A are two herbicides that can be combined together to form a highly effective broad-spectrum herbicide. A mixture of these two herbicides is available in a product called Confront. For several years NCDOT mixed Transline and Garlon 3A together, in effect making their own Confront. This had been the most cost-effective utilization of these products due to the high cost of Confront when first introduced. NCDOT has been able to negotiate the price of Confront downward to the point that it is now cheaper to buy Confront than it is to mix Garlon 3A and Transline.	OPERATIONS ROADSIDE ENVIRONMENTAL	2001	Derek Smith	(919) 733-2920

Aerial Device Boom Inspection Intervals	<p>Due to the time frame set up by National Crane Mfg. Company, it was necessary for DOT to perform a major tear down inspection once every three years regardless of utilization. Due to the suggestion of our Crane Committee, the end result was that the interval was changed from once every three years to once every 3,000 hrs. of utilization. The only modifications to the aerial device necessary to accomplish this was to install an hour meter that worked only when the Aerial equipment was in use, which was a cost of about \$75 per unit. By doing this, it extended the crane inspection interval to about once every ten years. By changing the interval from a time interval to utilization interval was a great savings on labor, material, and cost of downtime (departments having to do without their equipment during tear down period).</p> <p>Crane tear down inspections typically cost from \$8,000 to \$12,000 each. These factors multiplied by about 80 units in the DOT fleet adds up to substantial savings.</p>	OPERATIONS MAINTENANCE	2001	H. R. Hoyle	(919) 733-3572
Litter Pick-Up Sticks	<p>Adopt-A-Highway and other volunteers, maintenance work crews, inmates and community service workers collected more than 10 million pounds of litter from North Carolina's roadsides during 2000. Cleanup supplies are provided to volunteers and workers to make cleaning our roadsides more efficient and economical. The litter pickup stick was a tool provided to increase labor efficiency in picking up litter. While the pickup stick did increase efficiency, it was costly at \$5.50 each and the stick point that pierced the litter was easily breakable, resulting in sticks having to be replaced frequently.</p> <p>A department employee submitted a suggestion and blueprint showing how DOT could make its own more efficient and lower cost pickup stick with PVC tubing, caps and glue, flat head screws and red colored duct tape. The material and labor cost of the new stick is \$2.50 each, a saving for DOT of \$3.00 per stick. The point on the new stick is more durable than the point on the old stick and, therefore, will result in fewer replacement sticks requisitioned from inventory control, resulting in an even lower annual cost for pickup sticks as we work to keep our roadsides litter free. The new stick has a sturdy point that can pierce aluminum cans and heavier objects, which the previous stick could not do. The new stick is also lighter in weight, and easier to manipulate than the previous stick.</p>	OPERATIONS ROADSIDE ENVIRONMENTAL	2001	Anne Walker	(919) 715-2550
Equipment/Personnel Complement	<p>After budget review meetings with Division &amp; District Engineers, we were instructed to review personnel &amp; equipment complements &amp; determine areas that could be cut to allow for budget savings. After reviewing information regarding the equipment usage based on fuel consumption for the past year, we were able to reduce our complement by 7 pieces of equipment for a cost saving of \$3308.50/pp or \$86,021.00/yr budget savings. All equipment had reached its maximum depreciation except for a Thermolay Patch Truck that was transferred to another unit that was in need of this.</p> <p>The complement of crew cab trucks was reduced from 9 to 7 allowing 1 spare. Crews are required to be multifunctional throughout the day and the Thermolay was not cost effective. The grader was the oldest and used basically as a spare. Due to the infrequency of snow and the reduction of dirt road miles in the county, the cost savings far exceeded the need for the spare grader. The other pieces of equipment were removed due to their condition or lack of use. No equipment was turned in that would have a negative impact on our operations.</p>	OPERATIONS DIVISION 10	2001	Janice Bobo	(704) 982-0104
Bridge Timber Disposal	<p>When demolishing structures in the past, several miles had to be driven to a demolition dumpsite and pay for disposal. In the past months, a different approach to disposing of materials that are not salvageable began. The old timbers and non-useable materials are now being offered to local property owners free of charge if they sign an agreement to allow DOT Bridge Maintenance to dump the materials on their property. DOT is saving money due to the following factors: 1) Material is only handled one time in loading saving in labor and time. 2) Saving on the average of \$26 - \$40 per ton on disposal fees. 3) Dumping locally saving on labor and mileage. 4) Speeding up the project by having a quick turnaround on the trucks and are using less trucks for hauling.</p>	OPERATIONS DIVISION 10	2001	Garland Haywood	(704) 982-3720
Portable Traffic Lights	<p>For several Bridge Maintenance projects, it is required for the lane to be impassable 24 hours a day and these projects may take weeks or months. With a 5-man minimum crew size and a workload requiring several projects at a time, flagging is sometimes not an option. Portable traffic lights have helped with this problem and have become almost a necessity in day-to-day operations. One set of traffic lights is currently owned and another set of traffic lights is on rent. These lights work well in high volume, limited sight distances, and work 24 hours a day without a break. With this versatility, both sets of traffic lights stay busy all of the time. These traffic lights cut costs on extensive projects, but they also increase safety in our work zones and cut down on man-hours as well.</p>	OPERATIONS DIVISION 2	2001	T. A. Edgerton	(252) 830-3490

Portable Depth Finder	<p>At times in Bridge Maintenance work, stream depths have to be determined or check for scour in fast moving, deep water. In the past, we have had two methods of doing this. The first method is to use a level rod, and there are two problems with using this method. The 1st problem is that you are limited to 25', and from the top of the bridge, you may not be able to reach the bottom. The 2nd problem with this method is that if you can reach the bottom, the fast moving water may break your level rod. The 2nd method of checking stream depth is to tie a heavy weight to a tape measure and lower it to the bottom for a depth. The problem with this method is that the weighted tape measure often moves down stream loosing accuracy in a high flow situation.</p> <p>As a solution to this problem, I constructed the Portable Depth Finder to aid in determining a profile of the bed. The device was assembled in less than 30 minutes, and for about \$130, will instantly determine the water depth. Level rods are at least \$130 each and do not last long in high flow conditions, and can only determine limited depths.</p>	OPERATIONS DIVISION 2	2001	T. A. Edgerton	(252) 830-3490
Carbide Tipped Snow Plow Blade Results in Rockingham County	<p>In our snow removal operation in Rockingham County, we had to change worn out plow blades frequently. Truck operators were losing an average of about two hours each time a blade was replaced, traveling from his route to headquarters, replacing the blade, and back to his push route. These delays caused safety concerns and unsatisfactory customer relations, along with additional labor and equipment hours required completing our snow removal operation. In 1998 Carbide Tipped blades were placed on two of our snowplows to be evaluated for cost and time savings. The results showed Carbide Tipped blades lasted ten times longer than regular steel blades, thus decreasing our cost and increasing employee efficiency with improved customer service</p>	OPERATIONS DIVISION 7	2001	Henry Adkins	(336) 634-5642
Pile Jetting Spoil Cleanup	<p>The Manteo Resident Engineer's Office was faced with a challenge to develop a method of cleanup for spoils generated during the installation of piling in sensitive wetlands for the new Croatan Sound Bridge Project. Rather than relying on the contractor to solve this problem, a NCDOT team was developed to take ownership of research innovative methods, and select the course of action.</p> <p>A method of conveying the material approximately 1900 foot to high land was identified during a search of methods utilized by other industries. The shipbuilding and roofing industry utilize industrial vacuums to convey materials. The team made a visit to a shipyard in Virginia where the technology was working. An onsite demonstration was performed to insure conveyance of similar material over the required distance. The test was successful. Department personnel presented a video of the cleanup method to the Environmental Agencies. They approved this method of cleanup as their preferred method.</p>	OPERATIONS DIVISION 1	2001	Randy Midgett	(252) 473-3637
Improvements to Special Markings Truck	<p>The special markings truck had three 60-gallon tanks and one 4-gallon tank. The most that the special markings crew can use in a day is approximately ten gallons of paint. The 60-gallon tanks took up most of the room in the bed of the truck. An additional pickup was often needed to carry construction signs. To clean these tanks someone had to lean inside the tanks, which the employee could have injured his/her back or became sick from the paint fumes.</p> <p>With the assistance of the Equipment Department, the 60-gallon tanks and the 4-gallon tank were replaced with three 10-gallon tanks. Also the Equipment Department purchased plastic liners for the new tanks. Roll-up construction signs were also purchased</p>	OPERATIONS DIVISION 11	2001	Dwayne Bauguess	(336) 903-9160
Patch Crew Improvements	<p>Maintenance is responsible each year for patching in order to better the roads. This could be resurfacing, patching, or just patching because the road just simply needs patching. Each patch crew has to fill up water tanks each morning located on their squad trucks in order to fill the tanks on the roller. This consisted of having to climb up in the bed of the truck, which could be a safety factor, and it took about 40-45 minutes to fill the tanks.</p> <p>The old water line was ¾ diameter. We replaced the old line with a 1-1/2 water line. Not only was the water line replaced but also a bottom fill system was installed. In doing so, it saved the patch crew approximately 35 minutes in the filling of the water tanks. Currently there are 20 patch crew employees that would be waiting on the squad truck to arrive at the job site.</p>	OPERATIONS DIVISION 11	2001	T. J. Spicer	(336) 835-4241

<p>Wasted Stone on Secondary Road Construction Projects</p>	<p>For Secondary Road Construction Projects (SRCP), the roads that are prepared for paving end up with a considerable amount of segregated stone that is typically kicked to the shoulder of the road. Not only is the stone wasted, but also in locations where people live the stone presents a problem for people trying to maintain their yard and shoulders of the road in their yard with stone scatted on the shoulder.</p> <p>This innovation is not time consuming or difficult to perform. A rubber tire loader or a force-feed loader and trucks are the only additional equipment needed. The finished road is a much cleaner job without the stone cast on the shoulder of the road.</p> <p>Instead of kicking the stone on the shoulder, the rubber tire or force-feed loader can pick up the windrow of segregated stone. This stone can either be used on driveways on the job to prevent haul cost on can be stockpiled in the yard for later use on driveways</p>	<p>OPERATIONS DIVISION 4</p>	<p>2001</p>	<p>Danny Rackley</p>	<p>(252) 459-2762.</p>
<p>Central Inventory Improvement</p>	<p>A warehouse of about 4900 square feet has been established in Newton, NC with a primary objective of providing a satellite warehouse location for certain assets managed by Central Inventory. The goal of this satellite warehouse was to make these assets more readily available to western divisions. The location was managed by a Storeroom Manager (GR 59), who utilized a pickup truck and two forklifts in the performance of his duties.</p> <p>The location did not have delivery capability except to the local community, thus assets had to be picked up by the divisions or arrangements were made for Central Inventory delivery trucks to stop and pickup the assets for delivery to the western divisions. Additionally, the movement of assets through the warehouse indicated the activity might not justify the costs. A thumbnail analysis of the system indicated the assets could be distributed through Central Inventory nearly as effectively with a negligible difference in costs. As a result, the warehouse was closed effective April 27, 2001 with personnel transferred to Division 12</p>	<p>OPERATIONS EQUIPMENT</p>	<p>2001</p>	<p>Dave Vanpelt</p>	<p>(919) 733-2220</p>