

Transportation Asset Management Case Studies

Presented by



U.S. Department
of Transportation
**Federal Highway
Administration**

COMPREHENSIVE TRANSPORTATION ASSET MANAGEMENT **The North Carolina Experience, Part One**





Cape Hatteras Lighthouse.

FRONT COVER PHOTO:
The Reedy Creek Bridge at night.

Note From the Associate Administrator

With factors such as an aging national infrastructure, increasing congestion and limited funds weighing heavily on transportation agencies, State departments of transportation (DOTs) are looking for innovative ways to manage their transportation dollars.

One tool that is providing great benefits is Transportation Asset Management (TAM), a strategic approach that strives to provide the best return for each dollar invested by maximizing system performance, improving customer satisfaction and minimizing life-cycle costs.

TAM endeavors vary from State to State and include efforts in the areas of data integration, economics in asset management, the utilization of Highway Economic Requirements System – State Version (HERS-ST), life-cycle cost analysis (LCCA), preservation, and pavement and bridge management, among others.

Because each State's experience is unique – and because FHWA believes that transportation agencies work more efficiently when information on one another's successes is shared – the Office of Asset Management is continuing its series of TAM case study reports begun in 2002.

On behalf of the Office of Asset Management, I am pleased to add this case study on a comprehensive TAM effort to the series. I believe that each of the five case studies generated this year (one on LCCA, two on HERS-ST and two on comprehensive TAM efforts) will help transportation agencies meet the increasingly complex challenges facing them today.



King W. Gee
Associate Administrator for Infrastructure
February 2007

Note to the Reader

The TAM case study series is the result of partnering between State departments of transportation and the Federal Highway Administration's (FHWA's) Office of Asset Management. FHWA provides the forum, and the States furnish the details of their experiences with asset management.

For each case study, FHWA representatives interview State transportation staff and compile the information, and the State approves the resulting material. Thus, the case study reports rely on the agencies' own assessment of their experience. Readers should note that the reported results may not be reproducible in other organizations. ■



An HOV lane on I-77.

Executive Summary

Once considered a rural State, North Carolina now boasts an estimated population of 8,683,242 individuals, with 7 million licensed drivers and more than 7.5 million registered vehicles.

Managing complex transportation demands in the areas of highways, aviation, ferry, public transit and rail requires out-of-the-box thinking, especially in light of the State's burgeoning population, increasing maintenance needs and limited transportation dollars.

North Carolina has addressed these concerns by becoming a leader in the transportation field. In 1998, the North Carolina Department of Transportation (NCDOT) stepped up its asset management efforts by developing a maintenance quality assurance program to report its maintenance needs to the North Carolina General Assembly. The department also began a pavement preservation initiative in 2001 that develops system preservation strategies based on the maintenance condition report.

In 2000, the DOT embarked upon an effort to develop a visionary document that would identify the State's long term transportation needs. A multimodal steering committee spearheaded the endeavor, which included 1) an 18-month scoping process to determine potential funding and needs for all modes of transportation, and 2) a 30-month public education, solicitation and dialogue process regarding transportation priorities. The result? NCDOT's Board of Transportation unanimously adopted the Long Range Statewide Transportation Plan, the agency's first real blueprint for the next 25 years, in September 2004.

During the development of the long range plan, NCDOT's Division of Highways recognized the need to establish a clear direction for the department and set up workgroups tasked with developing performance based measures for each core business area of the DOT. Each workgroup was assigned the task of developing a plan for their respective area based on the department's asset management philosophies and the long range plan. The DOT is in the process of rolling out those measures, and it continues to develop management systems in pavement and traffic signal maintenance that will be used in concert with its overall maintenance, bridge and geographic information systems. NCDOT's next steps include an update of the Long Range Statewide Transportation Plan and the development of an implementation strategy that addresses the needs and findings of the plan. ■

AGENCY FACTS

Established as the State Highway Commission in 1915, NCDOT has undergone several reorganizations over the years.

Via legislative statute, the DOT assumed maintenance of the county road system in 1932. The next major change came in 1941, when the General Assembly consolidated services previously provided by the Secretary of State and the Department of Revenue, creating the Department of Motor Vehicles. The Executive Organization Act of 1971 combined the State Highway Commission and the Department of Motor Vehicles to form the North Carolina Department of Transportation and Highway Safety. In 1979, “Highway Safety” was dropped from the department’s name when the Highway Patrol Division was transferred to the newly created Department of Crime Control and Public Safety, and NCDOT as we know it today was formed.

NCDOT has the second largest State-maintained highway system in the Nation, with jurisdiction over 79,009 of the State’s 103,104 centerline roadway miles. In addition, NCDOT maintains 17,848 of the State’s 18,540 structures. Of these, 14,030 are bridges and 4,510 are culverts.

The State keeps travelers abreast of current conditions via a statewide 511 traveler information system and an intelligent transportation system (ITS) that includes over 140 dynamic message signs, 200 traffic cameras, three transportation management centers, 500 centerline miles of Interstate Motorist Assistance Patrol (IMAP) and 8,800 traffic signals, as well as a web-based Traveler Information Management System (TIMS) that provides the user with real-time incident and congestion information.

The department’s planning, project development and design activities are centralized in DOT headquarters in Raleigh; operations, construction and maintenance activities are housed within 14 division offices, 41 district offices and 100 county maintenance facilities across the State. The 13,991-employee department operates under the Secretary of Transportation and a 19-member Board of Transportation. The State’s 17 metropolitan planning organizations (MPOs) and 20 regional planning organizations (RPOs) play a key role in transportation planning efforts.

NCDOT’s mission is to “provide and support a safe and integrated transportation system that enhances the State.” It has demonstrated its commitment to this mission by 1) working to eliminate the highway maintenance backlog and reduce congestion while protecting and improv-

ing the State's natural resources, and 2) working to develop and improve the State's infrastructure through maximization of existing resources and continual process improvement. TAM has played a vital role in this effort.



An NCDOT crew crack-sealing a road.

SETTING THE STAGE

What Did North Carolina Have?

Throughout much of its history, NCDOT has committed a large portion of its transportation dollars (as much as 50 percent) to new construction and capacity expansion projects, an approach that served the State well as its population burgeoned and it evolved from a rural to an urban State.

That focus began to change with the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, which required each State to prepare a long range transportation plan (LRP), along with a short-term statewide transportation improvement program (STIP) consistent with the State's long range goals. North Carolina began developing its long range plan as a result of the ISTEA provision, but the focus was still primarily on new construction.

In response to concern over the Nation's aging transportation infrastructure, FHWA, the American Association of State Highway and Transportation Officials (AASHTO) and several industry associations implemented National Cooperative Highway Research Program (NCHRP) Project 14-12 on Maintenance Quality Assurance. The focus of the program was on measuring maintenance performance by level of service (LOS) for randomly selected roadway features on a given highway network. NCDOT became aware of Project 14-12 and developed the Maintenance Condition Assessment Program (MCAP) to survey and evaluate the condition of the State's highway assets in order to estimate the needs for routine maintenance and resurfacing.

A short time later, the North Carolina State Legislature passed General Statute 136-44.3 (Maintenance Program), which requires NCDOT to survey the condition of the State highway system in even-numbered years and report the findings to the State legislature. The MCAP satisfied the requirements of the General Statute, and NCDOT Operations made the commitment to conduct a statewide assessment every two years for the Interstate, primary, secondary and urban systems. (The agency's goal is 95 percent accuracy, plus or minus three percent, in the data collected.) Construction and expansion projects were still prevalent in the DOT's plan, but the focus began to turn more toward conditions and maintenance – and ultimately, with assistance from AASHTO and FHWA, to system preservation and asset management.

What Did North Carolina Want?

North Carolina wished to serve its citizens while simultaneously preparing to meet long-term transportation needs. In addition, the department wanted a comprehensive transportation/asset management plan that would 1) provide an investment strategy based on the department's guiding principles, and 2) serve as a policy guideline to support future investment decision-making. Documents such as the MCAP report had proven invaluable in educating the legislature, public and other stakeholders on the maintenance needs of the department and in increasing awareness of the importance of infrastructure preservation, but the department knew it needed a more comprehensive asset management approach. Estimates of both infrastructure needs and available revenue would be key to making informed, realistic decisions and maximizing North Carolina's financial resources.

For this to happen, NCDOT needed to 1) obtain the best system data possible, and 2) develop a comprehensive asset management/long range plan that was performance driven. NCDOT staff knew that this would require a departure from past practice, where documents were developed in-house and remained with the planning division. Creating a comprehensive long range plan document would require involvement from all divisions as well as a concerted public involvement effort.



Resurfacing a country road.

HOW DID NORTH CAROLINA GET THERE?

In 2000 NCDOT established a multimodal steering committee consisting of 13 members from all modes/functions, plus two ex-officio FHWA members, to guide the development of the Long Range Statewide Transportation Plan. This committee spent 18 months conducting a scoping process to determine available funding (\$55 billion) and needs (\$84 billion).

DOT planners started reviewing the State's infrastructure needs and developed two distinct methodologies for categorizing infrastructure concerns. The first method classified transportation facility and service needs into one of three tiers – statewide, regional or sub-regional – by interest and use. The statewide tier, for example, focuses on the needs of the infrastructure receiving the most use, i.e., Interstate, US routes, etc., and enabled NCDOT to identify a backbone network of 55 highway facilities (referred to as Strategic Highway Corridors) that represent 7 percent of NCDOT's highway miles but carry almost 50 percent of the State's traffic.

The second method categorized needs by programmatic improvement categories – maintenance, system preservation, modernization and expansion. Examining future needs in this manner helped enhance public policy dialogue concerning how NCDOT should prioritize use of limited financial resources. This method also provided a basis for comparison to past expenditures and investment patterns.

System Definition

Long Range Plan Tiers



- **Statewide Tier** - Facilities such as Interstates and major primary highways which serve long-distance trips, connect major population centers, have the highest usage and primarily provide a mobility function.
- **Regional Tier** - Minor US and NC designated highways which connect regional centers and typically serve high levels of demand for short distances, e.g., commuter travel.
- **Subregional Tier** - Minor NC routes and secondary roads which serve localized, short distance movements, have low demand, and provide land access to homes and businesses.

Then NCDOT did something it had not undertaken before; the agency began a 30-month public involvement process where it asked constituents to provide input on the general direction of the department. The question to the public, stakeholders and elected officials was simple: with limited resources, how could NCDOT best allocate its transportation dollars against a backdrop of growing needs?

Utilizing what NCDOT planners term an organic process breathed new life into the planning process. “The process took on a life of its own in 2003,” says Assistant Programming Manager Al Avant. “People started calling and asking how the DOT was going to spend its \$55 billion.” Public comments were incorporated into the report, and the board approved the Long Range Statewide Plan in September 2004. Then the work of implementing the plan – the agency’s blueprint for the next 25 years – began.

WHERE IS NORTH CAROLINA TODAY?

In 2003 NCDOT recognized the importance of asset management to the department as a whole and, as part of a reorganization effort, established an Asset Management Office under the Chief Engineer – Operations. This bureau is made up of centrally based units that support the division offices in asset management evaluations and activities.

NCDOT also recognized the need for a performance based management plan. The development of such a plan was led by a steering committee made up of staff from the Chief Engineer's Office – Operations and Division Engineers. The steering committee is responsible for providing general oversight for seven functional workgroups (maintenance, pavement, bridges, traffic/ITS, roadside, construction, and funding and allocations), with representation from FHWA and the appropriate units. These workgroups were charged with developing a series of performance based measures (based on LOS) that support the long range plan and asset management philosophies. The department has identified several tasks for developing and implementing these measures. (See Performance Based Measures/Asset Management Tasks.)

Performance Based Measures/Asset Management Tasks

Develop Operations Strategic Plan

- Develop and implement performance measures and targets.
- Determine resources needed to achieve targets.
- Develop related funding methodology.
- Obtain support of senior management.

Fully Implement Long Range Statewide Plan and Operations Strategic Plan

- Have asset management assessment and evaluation process in place.
- Meet performance/LOS targets and adjust as needed.

NCDOT's focus on transportation asset management has brought about numerous other changes, including the addition of a system preservation line item in the legislative budget; the changing of secondary roads legislation in 2005 to transition from a program focused solely on paving dirt roads to one that includes paved road improvement projects; and the development of management systems in pavement (PMS), maintenance (MMS), traffic signal maintenance, bridge (BMS) and geographic information systems (GIS). NCDOT's goal is for all of these systems to one day communicate with a common data system.

In addition, as part of the department's effort to keep the 2004 Long Range Statewide Transportation Plan a living document, NCDOT has committed itself to updating the needs and revenue analysis every two years and conducting a full plan update (including citizen input and an investment direction) every four years. In light of this, the department undertook a mid-cycle update in 2006. NCDOT will release its findings in the spring of 2007.

WHAT HAS NORTH CAROLINA LEARNED?

The Asset Management Office has garnered several lessons from NCDOT's development of a comprehensive transportation asset management program.

First and foremost, says Asset Management Director Lacy Love, a DOT should start with something it is already doing, e.g., pavement preservation, and expand over time. NCDOT has been working on its TAM program for eight years, and the program is still evolving.

Second, TAM must have buy-in at all levels – from the chief executive to the front line manager; implementing a comprehensive TAM program requires a team approach and a willingness to change from what Love terms a “firefighting” approach to a planning mode. Involving the public is also a vital component of a successful TAM effort.

Third, a DOT needs to give field personnel the tools they need in order to make intelligent decisions regarding system conditions and maintenance priorities. By establishing performance measures, a measurement methodology and robust management systems, the department is poised to provide the motorists of North Carolina with the highest possible return on their investment dollar. Love cites the example of using personal digital assistants (PDAs) for maintenance managers so that they can accurately capture what's being done on DOT roadways. For NCDOT, this type of commitment is essential to improving LOS from the ground up.



Hamlet Rail Station.

WHAT'S NEXT?

NCDOT is in the process of rolling out its highway performance based measures. The agency has begun an update of the Long Range Statewide Transportation Plan and is continuing the development of its management systems. The next major undertaking will be seeking stakeholder support on the State's commitment to performance based measures and LOS. The bottom line, says Love, is providing the biggest return for each dollar spent on transportation assets, a goal that is becoming reality as NCDOT expands its TAM program.



MLK Parkway.

Additional information is available from the following:

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FHWA-IF-07-010