NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

HURRICANE FLOYD

LESSONS LEARNED

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

HURRICANE FLOYD LESSONS LEARNED

This report was commissioned by the State Highway Administrator for Secretary David T. McCoy of the North Carolina Department of Transportation. For information concerning any aspect of this report, please contact:

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April 5, 2000

This document was designed and produced by the IMPACT Public Information Program.

DEDICATION

"*Hurricane Floyd Lessons Learned*" is dedicated to North Carolina Department of Transportation employees, James Alphonso Wilder and Larry Clyde Summerlin, who lost their lives while in service to the Department.

JAMES ALPHONSO WILDER

On September 16, 1999, 60 year-old North Carolina Department of Transportation employee, James Alphonso Wilder, was swept away by floodwater near Trenton. Shortly prior to his death, Mr. Wilder assisted emergency personnel in the rescue of a private citizen stranded due to flooding caused by Hurricane Floyd. After the rescue, the truck in which he was a passenger was overcome by floodwater. Upon exiting the vehicle, Mr. Wilder lost his footing and was swept away.

LARRY CLYDE SUMMERLIN

On September 17, 1999, 63 year-old North Carolina Department of Transportation employee, Larry Clyde Summerlin, was killed when his truck was swept away by rising floodwater in Duplin County. At the time of the incident, Mr. Summerlin was attempting to report to work assisting with Hurricane Floyd recovery efforts. Like many others stranded by the storm, strong currents and dangerous conditions prevented his rescue.

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Executive Summary

Hurricane Floyd, a Category IV storm with wind gusts cresting to Category V levels, reached the North Carolina coast the morning of September 15, 1999. Downgraded to a Category II storm upon landfall, Floyd brought as much as 22 inches of rain. Combined with rains from Hurricane Dennis just weeks earlier, Hurricane Floyd caused record flooding in Central and Eastern North Carolina. North Carolina had never experienced a natural disaster of this magnitude. Strong winds from past hurricanes had brought major destruction; however, Floyd caused extreme flooding that worsened as waters continued to rise several days after the storm passed. A full week went by before the last river crested and storm waters receded.

Central and Eastern North Carolina suffered catastrophic flood-related losses. More homes were flooded due to Hurricane Floyd than any other event in the state's history, and the depth of the floodwater was unparalleled. Numerous communities were isolated, individuals were stranded in trees and on rooftops, and hundreds of water systems were contaminated. At the storm's peak, 235 shelters housed approximately 62,000 hurricane victims. More than one million individuals were left without electricity. Floodwaters tainted with raw sewage, pesticides, agricultural waste and dead farm animals resulted in the condemnation of thousands of homes. Regrettably, 51 people, including two North Carolina Department of Transportation (NCDOT) employees, lost their lives. Governor Hunt ultimately declared 66 of North Carolina's 100 counties "disaster areas."

Flooding caused massive damage to Eastern North Carolina's highway infrastructure, closing numerous local routes, as well as such major highways as Interstate 40, Interstate 95, and U.S. 70, 64 and 264. These U.S. highways are vital evacuation routes and also serve as alternate routes to Interstate 40. Many communities became inaccessible by land. Airports closed temporarily, and all 23 airports east of Interstate 95 sustained damage. NCDOT recorded over 2,100 damage sites to its 78,000-mile highway infrastructure. Flooding made recovery efforts difficult and dangerous.

Hurricanes, rock slides, tornadoes, snow, ice and other weather events happen routinely. NCDOT stands strong and ready to respond to these types of events as well as day-to-day traffic incidents and their impacts to transportation. However, nothing could have prepared the Department for the challenges it faced in responding to Hurricane Floyd. The Department delivered a planned, timely and customer-focused response to the massive flooding caused by this devastating storm. NCDOT employees, who in some cases were dealing with the loss of their own homes and belongings, worked long hours and braved adverse conditions to serve the traveling public.

NCDOT's response and recovery efforts were coordinated and effective, yet opportunities exist to improve readiness. This report was commissioned to evaluate

NCDOT's response to Hurricane Floyd, identify strengths and weaknesses, and develop recommendations. Interviews were conducted with employees throughout the department. Those interviewed included both the field staff, who performed response and recovery activities, and central office personnel, who focused on public information, coordination, policies, and procedures. A full list of interviewees can be found in Appendix A of this report.

The Findings section of this report is categorized into four major areas: Readiness, Operations, Logistics, and Administration. It describes the many topics raised by the interviewees. The Action Items section contains a comprehensive list of specific tasks to improve operations in many of the topic areas noted in the Findings section. These Action Items can be summarized into the following recommendations.

- Create a Statewide Operations Center
- Develop Provisions for Emergency Food and Lodging
- Complete the Emergency Operations and Procedures Manual and Provide Training
- Improve Emergency Traveler Information
- Optimize Emergency Procurement and Deployment of Materials, Equipment, and Personnel
- Improve Emergency Communications Resources
- Complete Evacuation Planning and Develop Operations Procedures
- Continually Update Policies and Procedures for Emergency Road Repair and Debris Removal
- Optimize Federal Emergency Reimbursement Documentation Procedures Including Automation
- Improve Inter-and Intra-Agency Emergency Coordination

Making these operational changes will improve NCDOT's response to natural disasters (hurricanes, tornadoes, rock slides, etc.) as well as day-to-day incidents (crashes, hazardous material spills, etc.) that affect North Carolina's transportation system. By continually improving its ability to respond to emergencies, the Department better serves its customers.

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ACTION ITEMS

Action Items

I. Readiness

A. *Roles and Responsibilities*

1. Complete development of the NCDOT Emergency Operations and Procedures Manual, review and update periodically, and provide training annually.
2. Clarify chain of command for all levels of NCDOT emergency operations.
3. Conduct post-event evaluations of NCDOT emergency response and recovery as part of Continuous Process Improvement.
4. Optimize staging to maximize preparedness and minimize inefficiency.
5. Label equipment deployed for emergency use with home Division, county and department for easy identification.
6. Consider pre-pairing Divisions to maximize mutual assistance.
7. Improve coordination between Division bridge maintenance and Bridge Maintenance Unit personnel.
8. Improve coordination between the Safety and Loss Control Unit and Division safety personnel.
9. Explore developing standardized oversize/overweight vehicle permit requirements and policies for use during emergencies.
10. Create plans for around-the-clock staffing at the Emergency Operations Center and operations at essential NCDOT facilities, such as the Division of Highways-Division Offices, the Public Information Office, the Customer Service Office, and the statewide operations center.

B. *Travel Demand Management*

11. Create a NCDOT statewide operations center for transportation management.
12. Install back-up power supplies at key intersections along evacuation routes.
13. Expand evacuation route signing to reach Interstate 95.
14. Clarify and document decision criteria, process and logistics between NCDOT, State Highway Patrol, and Federal Highway Administration for road closures and restrictions.
15. Complete Interstate 40 reversal plan including decision criteria and public education.
16. Develop procedures to obtain real-time information from the Ferry Division.
17. Working with local decision-makers through Emergency Management, improve evacuation practices to minimize traffic impacts of concurrent evacuation of multiple communities.
18. Consider emergency needs of evacuees in queued traffic.
19. Consider deploying Division of Motor Vehicles enforcement staff to Welcome Centers.
20. Provide traveler information at Welcome Centers and Rest Areas during emergencies.
21. Continue participation in the development of the Southeastern States Evacuation Traffic Management Plan.
22. Consider adding an Incident Management Engineer to Divisions with interstate routes.
23. Develop detour routes for all interstate and major primary routes.

II. Operations

A. Communications

24. Improve logistics of briefings and conference calls.
25. Insure local officials are updated on NCDOT operations during emergency operations.
26. Through Emergency Management, conduct debriefings to improve transportation aspects of emergency event operations.

B. Information Dissemination

27. Develop and deploy real-time road condition web site Transportation Information and Management System.
28. Improve public education and awareness of transportation safety hazards during and after emergency events.
29. Deploy strategically located intelligent transportation system devices.

III. Logistics

A. Facilities

30. Consider procurement of mobile emergency command facility for Division of Highways.
31. Establish emergency back-up meeting location for all facilities.
32. Explore best method for sustainable power for key NCDOT facilities.
33. Insure emergency access to NCDOT facilities for essential staff.

B. Food and Lodging

34. Create NCDOT emergency subsistence policy and procedures.
35. Establish process for providing food (snacks and meals) and drinking water to NCDOT employees working on emergency response, that minimizes the need for cash on hand.
36. Explore pre-planning for housing NCDOT employees during emergency response and recovery.
37. Consider simplified and automated reimbursement process for food and lodging expenses when NCDOT employees are deployed for emergency response and recovery.

C. Resources

38. Optimize equipment and material emergency procurement and sharing between Divisions, Equipment and Inventory Control Unit, and Purchasing Section.
39. Consider stocking equipment and supplies for emergency readiness (i.e., drums, barricades, signs).
40. Consider wider deployment of digital cameras to Divisions.
41. Consider standardizing and providing training for the operation of variable message signs and highway advisory radios.
42. Address inoperable portable and permanent highway advisory radios during statewide upgrade.
43. Optimize fuel procurement and distribution by Divisions, Equipment and Inventory Control Unit, and Purchasing Section.
44. Assess statewide emergency and everyday mobile communication needs and implement improved system.

45. Provide secure phone line to NCDOT offices where necessary and address use of these lines in emergency operating procedures.
46. Create standing list (including home phone numbers) of available sources of manpower for disaster recovery and Customer Service Office functions.

IV. Administration

A. Human Resources

47. Update Workplace Safety Manual to include safety issues identified in Hurricane Floyd.
48. Develop a database to maintain vaccinations given to employees, such as tetanus shots administered during Hurricane Floyd.
49. Strengthen enforcement of requirement for commercial facilities to identify locations of hazardous materials.
50. Continue Critical Incident Stress Management at a reduced scale through the Employee Assistance Program.
51. Coordinate volunteer efforts by NCDOT employees.
52. Continue recognizing outstanding employee response to emergency events.
53. Establish procedures for payment of salaries for employees not using direct deposit.
54. Document procedures to allow employees deployed for emergency response to receive cash advances from hosting Divisions.
55. Establish definition of essential employee status and communicate to staff.
56. Improve consistency internally, and between state agencies, for implementing personnel and leave policies during emergencies.

B. Recovery Procedures

57. Discuss federal emergency reimbursement procedures with Federal Emergency Management Administration and Federal Highway Administration prior to hurricane season, and update Emergency Operations and Procedures Manual.
58. Consider adding an Environmental Engineer to Divisions without the position.
59. Provide historical pricing information in the Emergency Operations and Procedures Manual and update annually.
60. Continue contracting without bidding during emergency events and explore additional innovative contracting procedures that increase flexibility.
61. Consider allowing overruns in emergency contracts up to 10% and authorizing Division Engineers to approve these overruns.
62. Refine procedures with Emergency Management for payment and coordination of non-system debris removal and non-system road repairs by NCDOT.
63. Establish NCDOT responsibility for non-system road repair.
64. Working with local officials, pre-designate debris disposal sites and develop logistics for disposal for use during emergency response and recovery.
65. Automate and improve efficiency of emergency event record keeping utilizing the future NCDOT accounting system, Business Systems Improvement Project.
66. Determine best budgeting mechanism for non-reimbursed emergency event costs.

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INTRODUCTION

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North Carolina is no stranger to natural disasters. Hurricanes, rock slides, tornadoes, snow, ice and countless other weather events happen routinely. North Carolina Department of Transportation (NCDOT) stands strong and ready to respond to these types of events, as well as day-to-day traffic incidents, and the impacts to transportation they cause. However, nothing could have prepared the Department for the challenges it faced in responding to Hurricane Floyd in September of 1999.

NCDOT forces worked as a true team to deliver a planned, timely and customer-focused response to the massive flooding caused by this devastating storm. NCDOT employees, who in some cases were dealing with the loss of their own homes and belongings, worked long hours and braved adverse conditions to serve the citizens of North Carolina and the traveling public. In two tragic cases, NCDOT employees lost their lives due to Hurricane Floyd.

Amidst the tragedy and destruction caused by Hurricane Floyd, the Department had a plan, pre-staged forces, materials and equipment, maintained open lines of communication with customers, and worked diligently to open over 1,500 flood affected roads. These efforts earned great praise for NCDOT from the public, the media and emergency response agencies.

"Hurricane Floyd was the worst natural disaster in our state's history."
James B. Hunt, Governor
State of North Carolina

While proud of its response and recovery efforts, the Department believes in Continuous Process Improvement (CPI) and recognizes that Hurricane Floyd presented a unique opportunity to improve readiness for future events. This report focuses on four critical areas: Readiness, Operations, Administration and Logistics.

The Action Items section identifies specific activities, that are summarized as recommendations in the Executive Summary. Two recommendations already underway, "Create a Statewide Operations Center" and "Complete the Emergency Operations and Procedures Manual," will allow the Department to make great strides in improving its ability to respond to emergencies. Other recommendations include targeted improvements to emergency food and lodging for employees, traveler information, evacuation planning and implementation, internal and external communications, non-system road repairs and debris removal, and reimbursement procedures.

The Findings section is a summary of interviews conducted with nearly 100 NCDOT personnel, ranging from field forces to central office staff. The section describes the many challenges encountered and identifies strengths and weaknesses in the Department's recovery and response. The commentaries found in this section provide the background for the many tasks listed in the Action Items section.

Impacts to North Carolina's transportation system are sure to continue. Winter weather will bring snow and ice. Hurricane activity is projected to increase. The prospering economy brings increased traffic volumes. With every event and incident, the public expects, and NCDOT provides, a better response. Hurricane Floyd has provided an opportunity for the Department to both celebrate its successes and focus on opportunities for improvement by exploring and implementing the findings of this report.

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FINDINGS

FINDINGS

This section contains a synopsis of the interviews conducted, background material, and considerations. It is divided into four general categories:

- Readiness
- Operations
- Logistics
- Administration

These findings can be cross-referenced with the corresponding action items by section title.

READINESS:

ROLES AND RESPONSIBILITIES

In the summer of 1999, NCDOT prepared for what was forecasted to be an active hurricane season. Plans were put in place to address deployment of NCDOT personnel from unaffected to affected areas of the state, procurement of emergency supplies, and documentation of various emergency policies and procedures. Implementation of these plans led to the initiation of the Emergency Operations and Procedures Manual for the Division of Highways (DOH). Development of the manual is underway.

An NCDOT Emergency Operations and Procedures Manual is currently in development.

The completed manual will include detailed information on various emergency response issues. Emergency conditions rarely allow for a standard response. Therefore, this manual is intended to be a guide, not a rigid instruction book. The manual will serve as a common reference statewide when discussing emergency issues. Division Engineers and their staff should be given an opportunity to participate in the manual's development and offer suggestions for the Department's emergency response efforts. Once completed, procedures and contact information included in the manual should be reviewed and updated periodically.

Interviewees frequently commented that the Federal Highway Administration (FHWA) and Federal Emergency Management Agency (FEMA) procedures for obtaining recovery reimbursement seemed to be constantly changing (see Administration section). Consequently, the information requested from the field staff changed throughout the recovery work and created confusion in an already difficult situation. A recommendation was made to include these procedures in the manual. Also, meetings should be held with FHWA and FEMA representatives prior to hurricane season to determine if regulations and reporting requirements have changed. The manual should be updated accordingly.

Completion of the manual and future updates should be followed by training. In addition to field forces, NCDOT personnel from central offices and representatives from emergency response agencies could attend. Training would focus on items included in the manual. Using drills and other hands-on activities would provide realistic training and identify any weaknesses in emergency readiness.

Placing the manual on the NCDOT intranet will allow easy access to pertinent forms. However, each office should have a hard copy available in the event computer access is affected by the emergency. The draft

table of contents for the manual can be found in Appendix B.

Clearly defining the decision-making hierarchy will minimize uncertainty and duplicated efforts. Top level administrators should address issues having statewide impacts, thereby improving efficiency. In turn, local managers should make decisions affecting their specific operations. The distribution of decision-making power should be covered in the manual.

Keeping in mind the Department's CPI goal, NCDOT has evaluated past experiences in an effort to improve future operations. An excellent way to document such efforts is by preparing a "Lessons Learned" report. It would be helpful to designate responsibility for this activity before emergency events occur. A team of knowledgeable personnel could be assembled for each debriefing, but the designee would be responsible for leading the efforts. Updates of the manual could include these lessons learned.

The Department's readiness activities were not limited to internal operations. NCDOT is a member of the State Emergency Response Team (SERT). The Secretary of the Department of Crime Control and Public Safety, Emergency Management's (EM) parent agency, is given the authority to direct any state agency in an emergency situation. SERT is called into action when emergency situations are imminent or strike unexpectedly. SERT is centrally located at the Emergency Operations Center (EOC) in Raleigh, allowing on-site coordination between EM and other state agencies. Staff from the Public Information Office and the Road Maintenance Unit are the designated SERT representatives from NCDOT. The Department has worked well with SERT in the past. Their 1999 pre-season planning activities, combined with Hurricane Floyd response efforts, further enhanced NCDOT's excellent working relationship with EM. EM and other SERT agencies also should be invited to participate in NCDOT's annual emergency operations training.

North Carolina's Emergency Management structure also includes local government Emergency Management staff. DOH offices often work with these local EM offices on routine highway incidents, and these relationships were helpful in coordinating responses to Hurricane Floyd.

With Hurricane Floyd approaching, NCDOT began implementing some of the readiness plans that had been created. Recovery crews were dispatched from western Divisions and housed in hotels in Raleigh and Greensboro the night before Hurricane Floyd hit in an effort to expedite reopening roads. Unable to anticipate the storm's path, these locations were chosen because they provide easy access to many areas of the state via Interstate 40 and Interstate 85.

"You need a plan in place for these type events."

David T. McCoy, Secretary
NC Department of Transportation

Standard make-up for these recovery crews was determined during the planning stages. Crews were equipped with extra chain saws and dump trucks without tailgates in preparation for clearing and hauling debris. While staging resources improved response time, recovery efforts were hampered because some equipment was less effective in responding to the water impacts of Floyd. Also, some teams were frustrated by being sent to one location to assist only to be relocated. Teams deployed after damage assessment were better prepared and equipped to handle the massive flooding and the damage to roads and bridges.

In all instances, Divisions that received assistance were very appreciative and complimentary of the hard work performed by assisting Division personnel. Of special note, some assisting Divisions added a clerk to handle the large quantity of paperwork required in the recovery process. This practice was quite useful and should be continued.

"Being prepared (pre-staging) made all the difference in responding to this event."

Len Sanderson, PE
NCDOT State Highway Administrator

Many believed pre-staging was essential and reflected well upon the Department. However, others believed that it was an inefficient use of resources and a more directed reaction was needed. Being charged with the safety of the motoring public, it is important that NCDOT maintain constant preparedness. The challenge is to have general guidelines for preparedness.

Due to flooded roads, it was difficult for NCDOT crews to determine where repairs were needed. Once the overwhelming magnitude of the damage was discovered, Divisions were paired and unaffected regions sent additional crews to assist in the hardest hit areas. The Chief Engineer's Office facilitated these pairings. As the recovery progressed, the paired Divisions were able to work independently and required less assistance from the Chief Engineer's Office.

A suggestion was made to have pre-existing Division pairings that would be able to help each other during a similar event. This arrangement would allow the assisting Division to familiarize itself with the important issues in its partner Division. The suggestion was also made that paired Divisions work together to determine needs as future situations unfold, allowing deployment of better prepared teams to the most critical areas.

Forms for crew and equipment transfer were created during the summer pre-planning efforts and will be included in the Emergency Operations and Procedures Manual. With the large transfer of equipment between Divisions, it was often difficult to determine which piece of equipment belonged to whom. Suggestions were made that transferred equipment be labeled such that home Division, county and department could be easily identified. The operator of each piece of equipment would also be identified on the form for crew and equipment transfer.

To best handle the event from a central perspective, each member of the Chief Engineer's staff was assigned a responsibility area. These areas included public information, EOC staffing, signs and signals, division coordination and debris removal. While the majority of personnel in the Chief Engineer's Office felt these roles were clearly defined, the field forces did not. Improved internal communications could assist with this deficiency. Divisions also defined post storm responsibilities, and felt this ensured an efficient response.

Some field forces were also concerned that the central office was not sensitive to the demands of the emergency response in the field and the level of effort it required. This situation impacted the Division's day-to-day operations for recovery months following the storm. It became difficult for them to do storm

recovery, routine tasks, and special reporting requested by the Chief Engineer's Office.

In the summer of 1999, NCDOT's Bridge Maintenance Unit and Safety and Loss Control Unit were decentralized. As a result, a Bridge Maintenance Engineer and a Safety Engineer were assigned to each of the 14 DOH offices. Hurricane Floyd revealed opportunities to improve coordination between these central office managers and field forces. During response and recovery efforts, Safety and Loss Control managers were unable to determine if the information sent to Division Safety Engineers was relevant or helpful. Also, structural repair needs were unknown, therefore the Bridge Maintenance Unit could not begin the repair designs. In conjunction with the Chief Engineer's Office, improvements for communication and work flow between the Bridge Maintenance Unit, Safety and Loss Control Unit and DOH offices are underway for both emergency and routine situations.

"Motorist safety during the evacuation was very important to the department."

Don Goins, PE
NCDOT Chief Engineer

Travel Demand Management

NCDOT is a key player in planning for and managing evacuations, with the Ferry Division, Division of Motor Vehicles (DMV) and DOH playing important roles. DOH's responsibilities include assisting in the development of evacuation routes, erecting signing along designated routes, managing traffic flow once an evacuation has been ordered, and installing condition responsive signals--including evacuation signal timing plans at key locations. To address a shortcoming identified during Hurricane Floyd evacuation, NCDOT is adding signing to extend evacuation routes to Interstate 95.

Managing traffic flow during the Hurricane Floyd evacuation was one of NCDOT's greatest challenges. Major congestion resulted when a myriad of residents began evacuating Wilmington at the same time. As the storm approached and traffic increased, DMV, DOH, EM and State Highway Patrol (SHP) officials began debating the need to reverse the eastbound lanes of I-40 between Raleigh and Wilmington. The reversal would have significantly increased capacity for westbound traffic; however, it also would have required extensive traffic management resources. Public safety was the priority for all parties involved in the decision-making process. As discussions continued, traffic subsided in Wilmington, as well as on Interstate 40, and the reversal was never implemented.

This event as well as similar occurrences in other southern states has led NCDOT to begin work on a lane reversal plan for Interstate 40. In order for the plan to be successful, NCDOT must develop criteria to determine when lanes will be reversed. Additionally, the Department must designate who will make the decision to reverse lanes. SHP, DMV and DOH, with help from EM and local law enforcement, are working together to create this plan. If possible a "dry-run" may be undertaken to test the plan. Once developed, the public should be educated about the benefits of the reversal and provided with safety tips.

Should evacuees be unavoidably detained in traffic queues for long periods of time, availability of water, restrooms and telephones should be considered, as well as

emergency medical assistance. EM, shelter providers and enforcement personnel could assist in developing these plans.

Once local governments issue evacuation orders, a major function of the Ferry Division is to assist in evacuating North Carolina's Outer Banks. In response to Hurricane Floyd, ferries ran continuously once the evacuation orders were issued. Working with local governments and law enforcement, the Ferry Division was able to give ample notice of the last ferry's departure time to local residents and the evacuation went smoothly.

"The Ferry Division's participation was critical to the evacuation of North Carolina's Outer Banks."

David D. King, NCDOT Deputy Secretary

However, a concern arose at the EOC during the evacuation as to when NCDOT Ferries would stop running. This vital information should be well communicated during future events. Increased participation by the Ferry Division in coastal emergency operations with the EOC may address this need. Also, providing real-time emergency information on the Ferry Division web site may be helpful if communication and power sources are available.

Evacuation issues are particularly pressing on North Carolina's Outer Banks. Access to the mainland is limited to a few bridges, and some locations are only served by ferries. Emergency events that could impact these already limited-access areas must be given special attention. Earlier in 1999, a draft report was produced describing the logistics of evacuation needs for the Outer Banks if life-threatening events are expected and roadways are breached. Recommendations in this report should be reviewed as evacuation issues are addressed.

EM and others mentioned the need for a more coordinated look at evacuation decision procedures. These decisions are statutorily made at the local government level with assistance from EM. Many state agencies and support organizations, such as the American Red Cross and the Salvation Army, play a key role in evacuations. The local EM office is the designated Incident Commander in an evacuation incident, although this authority is rarely enacted. EM is responsible for evaluating the effects of widespread evacuations. In 1987, EM conducted a Hurricane Evacuation Study, which looked at highway capacity during massive evacuations. Typically, local evacuation decisions are made without much consideration given to the compounding effect of multiple community evacuations and the concentrated traffic impact. More regional evacuation pre-planning and education may help to minimize the intensity of evacuation traffic in the future. Also, FEMA is currently conducting a Hurricane Floyd evacuation after-action study which should be helpful in improving future evacuations.

Travelers who stopped at North Carolina's Interstate 95 northbound Welcome Center were often frustrated and angry due to the delays they encountered and the lack of real-time information. Many believe that a stronger DMV presence and the availability of real-time road condition information would have been beneficial (See Operations section).

Traffic impacts were not limited to those evacuating Eastern North Carolina. Hurricane Floyd's projected path caused the evacuation of Florida, Georgia, and South Carolina, adding to significant traffic delays in North Carolina, especially along northbound Interstate 95. Unfortunately,

traffic information shared between NCDOT and the surrounding states was not communicated to the affected Divisions. For example, lane closures for work zones along Interstate 95 were scheduled to be removed if evacuation orders were issued for North Carolina. Instead, lanes were reopened once evacuating traffic had begun to queue. Advanced coordination would have prevented some of this congestion. Current FHWA and FEMA efforts to coordinate a Southeastern States Evacuation Traffic Management Plan will improve this situation.

At the height of the crisis, over 1,500 roads were washed away or closed.

It was suggested that a NCDOT statewide operations center be established to handle emergency traffic operations management. While each Division office is qualified to manage traffic locally, this center would be useful in managing regional traffic problems and providing coordination between states. It could also be used as NCDOT's command center and should be equipped with back-up power and communications resources, eating and sleeping facilities, and videoconferencing capabilities. Additionally, the center could provide traffic management support during non-emergencies.

Four Division offices have Incident Management Engineers who handle both day-to-day freeway incidents and coordinate with adjacent Divisions on regional incidents. The Division Operations Engineer handles this task when an Incident Management Engineer is not part of the DOH staff. Traffic management issues during Hurricane Floyd and the increasing number of day-to-day freeway incidents have shown the need for Incident Management Engineer positions in Divisions with major interstate corridors. These positions would focus on other incident management issues, including pre-designated detour routes, corresponding trailblazing signs, and the development of local relationships and procedures.

With over 1,500 roads closed at the height of the flooding, information about roadway conditions at any given time was vital. The information would have been more accurate if one agency had been responsible for its dissemination. During Hurricane Floyd, NCDOT and SHP were responsible for determining the status of the state's affected roadways. Sometimes conflicting information came from each source. An agreement between these agencies on how to determine road status would be helpful in the future.

Also, EOC staff questioned whether road closure status applied to emergency vehicles. A reporting distinction, known only to emergency personnel, will be used for future events. This information will be available on the NCDOT Road Conditions web site (See Operations section).

The issue of road closures must be addressed for both incidents and declared emergencies. This issue is one of both public safety and tort liability for NCDOT. A defensible policy on road closures would clarify the issue for Department staff, enforcement personnel, and the public. NCDOT staff spent many hours replacing vandalized and stolen road closure devices. Policies should be created clearly defining the decision-making criteria, liability for clearing vehicles from the roadway, and the procedures and logistics of implementing restrictions.

OPERATIONS:

COMMUNICATIONS

Communication was essential in coordinating the restoration of transportation facilities and operations after the storm. Employees at all levels of NCDOT worked together and did their part to assist. Some additional pre-planning and minor improvements may have made communication and coordination more efficient.

Briefings and conference calls were held at the cabinet level of state government, throughout the Department, and with EM. These discussions were helpful in communicating needs, status reports and other valuable information, thereby improving coordination. Conference calls were instrumental in helping the Divisions and the Chief Engineer's Office work together.

Thinking through logistical aspects of these conference calls during pre-event planning, such as the use of the mute button to keep out extraneous office noises, would have made the calls more efficient. Scheduling a regular time for these calls may have made them easier for staff to plan around, resulting in less time spent waiting for all participants to assemble.

Participation by the Ferry Division could have improved availability of real-time information, and the Geographic Information Systems Unit (GIS) could have made their services available sooner. The Chief Engineer's participation in the Secretary of Transportation's emergency event briefings gave him a better understanding of system-wide transportation issues, which proved beneficial as he directed the efforts of the DOH. The Chief Engineer should continue to attend these briefings in future events.

As recovery work progressed, some participants believed the need for conference calls and briefings diminished as the information became less critical. Perhaps participants who were not as integrally involved in on-going operations could have been excused as the emergency began to subside. A suggestion was made to place meeting summaries on the NCDOT web site immediately following the conference calls and briefings, allowing field personnel to access information directly. This would further improve coordination between the central offices and field forces.

E-mail was also an excellent method of getting information to multiple users. However, the comment was made that the notify function on e-mail is not used universally, making it difficult to know when new messages have arrived. A suggestion was made to expand NCDOT's communication capabilities to include videoconferencing. This suggestion is consistent with the recommendation to create a statewide operations center, where videoconferencing would allow participation by key staff, while minimizing travel.

The ability to effectively communicate became crucial during Hurricane Floyd recovery efforts.

Field staff believed face-to-face meetings between the Chief Engineer and his staff were helpful in improving coordination and communication. A discussion covering general contracting issues for emergency repairs insured that a consistent message was communicated throughout the affected areas.

During a declared emergency, requests for NCDOT assistance from local governments and other state agencies are made through SERT (See the Readiness section). These requests are made using the

computer program EM-2000. Once NCDOT's SERT team members receive a request via EM-2000, it is screened by the SERT team and then the Chief Engineers Office. The appropriate NCDOT Unit or Division is then contacted for assistance. This process allows for clear tasking and tracking of work within the Department. A suggestion was made that these requests be verified before being forwarded to a Division or Unit. For example, one Division worked overnight to fill sandbags, only to be told in the morning they were not needed. NCDOT should also evaluate past SERT requests and consider advance packaging of resources to allow for quicker deployment.

Coordination between NCDOT and utility companies is essential to reopen roads as quickly as possible. NCDOT will not perform tree removal or any other road clearance operation in the vicinity of downed power lines until their status is known. Preplanning with utility companies to improve coordination during emergency response and recovery would be helpful. It was noted that utility company representatives are members of SERT, and as such, could provide an avenue for coordination during emergency events.

NCDOT Customer Service volunteers answered over 175,000 hurricane related phone calls.

Improved sharing of information would have been valuable to local emergency response personnel. For example, when Interstate 95 was closed, NCDOT implemented a detour using U.S. 1 north of Raleigh. Unfortunately, local emergency service providers were not informed of the detour and did not expect the added traffic volumes on this route.

This report was limited to an internal assessment of NCDOT operations. The next logical step would be to conduct a "Lessons Learned" exercise, with a broader audience, through EM. This exercise would allow NCDOT to have a better understanding of transportation issues beyond the department. Also, implementation of the resulting recommendations would improve interagency coordination.

Information Dissemination

Getting information to motorists was a high priority for NCDOT after Hurricane Floyd, due to the storm's impact on travel conditions in Eastern North Carolina. Citizens needed to know where and when they could travel. Emergency service providers needed to know which routes they could use to aid in disaster recovery. NCDOT's response to these needs raised the level of service provided to these customers.

NCDOT's Customer Service hotline (1-877-DOT-4YOU) typically handles 700 calls per week. The morning after Hurricane Floyd hit, calls began pouring into the Customer Service hotline. The existing eight phone lines were expanded to 50, and NCDOT volunteers manned the Customer Service hotline up to 18 hours a day. On the busiest day over 50,000 phone calls were answered. A total of more than 175,000 calls were answered during the crisis.

The field staff in affected areas made commendable efforts to assess damages and provide road condition information to those who needed it. A system was developed for gathering information from the field and

consolidating it in the Chief Engineer's Office for dissemination. However, field forces found it difficult to repair roads and report road conditions simultaneously. Reporting closures took time away from the work of opening roads.

Once the road condition data collection process was in place, the challenge became finding a better way of getting the information to customers. Working together, the Information Systems Technology and GIS units created a better system almost overnight. Road condition information was added to NCDOT's web site for use by the public, emergency service providers and customer service operators. Users were able to locate closures, either by using text or the GIS maps. On average, NCDOT's web site receives approximately 15,000 to 17,000 daily hits. During the Hurricane Floyd crisis, the web site recorded over 250,000 hits on its busiest day, and almost two million total hits. NCDOT's web site was praised for being an excellent source of information.

"Due to Hurricane Floyd, NCDOT has a better understanding of the internet's extensive capabilities."

Paul Roberts, Director
NCDOT Information Systems Technology Unit

EM used the NCDOT web page extensively to route emergency responders. The EOC received a significant number of calls concerning road conditions and praised NCDOT's web page as a valuable resource. EM's call volume declined after NCDOT's web site and Customer Service hotline were publicized. Unfortunately, all EM personnel were not aware of the web site. In Onslow County, a county EM official reported that over 80% of post-event phone calls concerned road conditions. Having no knowledge of the web site, the county EM representatives repeatedly called the local NCDOT maintenance office for information. Effectively communicating the availability of these resources is essential.

NCDOT's Public Information Office was vital in providing information to statewide media outlets during the Hurricane Floyd crisis. The media informed the public about the hotline and the web site, and praised the Department for its public information efforts.

NCDOT had previously considered developing a real-time traveler information web site, similar to those of other state DOTs. The volume of requests received following Hurricane Floyd verified the need for this project. NCDOT is currently developing the Transportation Information and Management System (TIMS) to provide traveler information. This web-based system will address both the information collection and dissemination problems encountered in Hurricane Floyd. It will also allow NCDOT field forces to directly input adverse road conditions into the system as they occur. The eventual use of GIS mapping to display the locations of travel impediments will improve user-friendliness.

The department intends to use this system for day-to-day events that affect local travel as well as for major events, like Hurricane Floyd. Hopefully, an automated companion phone-in system can be developed to provide information as well. Once in place, NCDOT will publicize the system extensively to increase awareness of the information's availability to as many customers as possible. The use of kiosks to display the TIMS system at Welcome Centers and Rest Areas across the state is also being pursued.

Traveler safety was a major concern during the crisis. Interviewees reported citizens driving around or destroying

barricades that NCDOT placed to close roads. Several citizens lost their lives by attempting to drive through fast moving water. The public must be better informed about the dangers of driving through water. It should be stressed that there is no way to know how deep water may be, how fast it may be moving, or if the road below has been washed away. Staying off the roads allows NCDOT and other emergency responders to do their jobs. Some Division staff suggested pursuing stiff penalties for those who remove or ignore road closure signage in future emergencies.

Intelligent Transportation Systems (ITS) technology was vital to providing road condition information.

Intelligent Transportation Systems (ITS) is the term for the use of technology to operate transportation facilities more efficiently. NCDOT's existing ITS infrastructure, consisting of Closed Circuit Television (CCTV) cameras, Highway Advisory Radios (HAR), and Variable Message Signs (VMS), allows improved detection and reporting of roadway incidents. These devices proved to be vital tools in providing road condition information to the traveling public following Hurricane Floyd. The Chief Engineer's Office was able to coordinate the use of this equipment to serve local residents as well as through travelers.

Using cameras and automated traffic speed and volume sensors to detect traffic flow disruptions would provide NCDOT with better information to make travel demand management decisions, especially concerning evacuation traffic flow. Portable CCTV cameras would be especially helpful in reacting to evacuation traffic demands and are being considered in the plans to reverse Interstate 40 traffic (See Readiness section). These CCTV images could be included on the Department's Smartlink™ traveler information web site that shows CCTV traffic images from locations across the state. The ability to see road conditions during a weather emergency improves travel decisions.

The use of permanent and portable VMS and HAR to convey travel information allows NCDOT to better communicate with the traveling public. Using portable devices allows the Department to place equipment where it can be most effective. Not only would these devices improve our ability to manage the transportation system during catastrophic events, they would be beneficial for day-to-day traffic management as well. Procurement of additional portable and permanent VMS, HAR and CCTV should be considered, as well as identification of strategic locations for use.

LOGISTICS:

FACILITIES

The Department's General Services Division ensures that new NCDOT facilities are not located in the 100-year flood plain. They also assess the potential of flood effects to existing NCDOT facilities including flood-proofed buildings, such as those on Cape Hatteras. The General Services Division staff is available to assist with NCDOT facility repairs during emergencies. Although Hurricane Floyd did not cause structural damage to most NCDOT facilities, the storm impacted the Department's ability to conduct business as usual. Floodwaters affected some DMV

and DOH facilities, as well as airports in Eastern North Carolina, rendering them temporarily unusable or unreachable.

The Public Transportation Division deployed its training bus to serve as a mobile command center in Greenville, after the Division Two office flooded. The bus provided adequate office space to make

The Public Transportation Division's training bus served as a mobile command center during the crisis.

phone calls and complete paperwork. There was a consensus that having a mobile command center ready to deploy at a moment's notice would be advantageous during future emergencies. Also, each NCDOT facility should have a back up plan indicating where staff would assemble if the primary facility becomes unusable. If a need for leased space arises, the General Services Division can assist with these arrangements.

As many eastern areas of the state were without electricity for several days, the need for sustainable power was a concern. Currently, generators are installed when new maintenance facilities are built. Older maintenance facilities have limited back-up power sources, with small back-up generators used to run essential equipment. The Department is developing plans to provide back-up generators capable of powering essential components of maintenance yards and equipment shops. However, a standard generator may be insufficient to power sensitive computer equipment needed in emergency communication. Also, any supplemental power supply would need to be tested and maintained regularly to insure operability during an emergency event. This evaluation should be included in the pre-event checklist.

Access to NCDOT facilities by all essential emergency staff was an issue. For example, many employee access badges only allow access during limited hours. In the future, all essential emergency staff should have security badges providing 24-hour access. Also, provisions should be made for back-up emergency access to County maintenance yards, in the event those with keys are unable to respond quickly.

Food and Lodging

Difficulty in providing food and lodging to NCDOT employees working on relief efforts was a widely stated concern. This dilemma applied to employees from assisting Divisions, as well as those working in their own Divisions. Food and lodging were often unavailable for a variety of reasons. Some Division personnel were unable to return home due to flooded conditions, and food and lodging compensation is normally not provided for these employees. Since many restaurants were closed, employees had difficulty purchasing meals. When restaurants were open, some NCDOT employees had insufficient cash on hand to pay for meals.

The Department's attempt to obtain food from the National Guard Division (NG), for crews deployed in the Wilmington area, was unsuccessful. NG's policy specifies that it can provide food for groups of 250 or more; however, the Department did not meet this requirement. In some instances, the Salvation Army,

American Red Cross and other relief groups provided meals to NCDOT employees. A few days into the event, the Secretary of Transportation requested the State Budget Officer waive restrictions relating to food and lodging. As a result, NCDOT was better able to provide meals, snacks, and water to employees working on relief efforts. This topic received more positive comments than any other, in terms of improving employee morale.

Lodging arrangements were made by Division, Chief Engineer Office, and EOC personnel with varying degrees of success. In some locations, local residents housed Department employees in fire stations, churches and their own homes. After the storm, NCDOT attempted to move staged personnel further east, but were unable to find available rooms as evacuees and other emergency responders also needed accommodations. Further, some hotels were unavailable due to damage or lack of utilities. It was noted that Carolina Power & Light (CP&L), as well as other relief agencies, have pre-arranged agreements with hotel chains statewide to give lodging priority to their employees. Interviewees suggested the Department explore such an arrangement. Suggestions also included storing cots at NCDOT facilities and setting up emergency shelters with priority given to emergency responders. Suggestions for feeding NCDOT employees included mobile kitchens and catering contracts. Lack of power and water could affect emergency response. Therefore, back-up plans should be created in case primary emergency food and lodging is not available.

"Food and lodging were often unavailable ... people just started taking care of each other."
Janice Faulkner, Commissioner
Division of Motor Vehicles

Although basic employee needs were ultimately met, the process was inefficient and caused frustration among both employees and managers. NCDOT should develop procedures for providing emergency provisions in large-scale as well as localized emergencies. These procedures, including sample request letters for the State Budget Officer's action, could be included in the Emergency Operations and Procedures Manual. This planning would allow staff to focus on other response and recovery issues during future emergencies. Also, soliciting assistance from EM and SERT to address emergency food and lodging needs would benefit the state by reducing duplication of efforts and economies of scale.

Some NCDOT employees believed the paperwork involved with preparing individual expense vouchers was a burden. Any procedure that could simplify or minimize this paperwork would be helpful.

RESOURCES

Equipment and material used during the crisis primarily came from affected Divisions, assisting Divisions, outside suppliers, and the Equipment and Inventory Control Unit. Fall 1999 NCDOT Y2K readiness efforts proved to be a great resource for providing emergency supplies to handle the demands of Hurricane Floyd. These supplies included extra fuel, back-up generators and other

critical items.

Other requests were coordinated through NCDOT's Purchasing Section or the Equipment and Inventory Control Unit. These offices, and the Chief Engineer's Office, used NCDOT's statewide mainframe inventory program to locate resources. They also attempted to consolidate statewide emergency supply orders to benefit from economies of scale. The pre-planned emergency procurement process was successful in obtaining items that were in short supply. Although field and central office personnel worked well together, opportunities to fine-tune the distribution process were identified. When Divisions ordered supplies, some were delivered to the Equipment and Inventory Control Unit. Often, the Equipment and Inventory Control Unit was not told who had ordered these supplies, which impeded distribution. Also, poor coordination resulted in unneeded materials being sent from one Division to another.

Better pre-planning and coordination would improve assistance efforts within the Department. Division staff are knowledgeable about local topographic and geographic needs. However, support units are knowledgeable about the different types of equipment and materials. They also recognize the need for the use of non-standard procurement methods during emergencies. The large volume of supplies ordered, and the working relationships between units and suppliers should benefit NCDOT in getting fair prices and faster service in emergency situations.

The use of e-mail was suggested to assist in coordinating communication between the Divisions about needed resources and their availability. The Chief Engineer's staff could use the mainframe inventory system to assist in prioritizing these needs statewide.

Vandalism, relocation and theft of traffic control equipment further depleted supplies. Affected Divisions requested additional devices from other Divisions, as well as from the North Carolina Department of Corrections (DOC). However, the barricades provided by DOC only included horizontal panels, not the actual vertical supports necessary to create a Type III barricade. Department employees in Division Three designed a support system to meet this urgent need. NCDOT has continued using the improved design, and is considering bundling these barricades into kits that can be transported for quick and easy emergency usage.

Use of VMS and HAR was not maximized due to inoperable equipment or lack of training. Field employees suggested that standardizing equipment likely to be relocated statewide, such as VMS and HAR, would help to insure the equipment's use. This also would allow a single employee to operate and service all the equipment deployed regardless of the source. The Purchasing Section felt standardization would help minimize maintenance costs. Training in the use of the VMS and HAR would be beneficial. Also, many of the HAR were inoperable at the time of the storm and should be repaired.

The department's emergency procurement process helped to obtain equipment that was in short supply.

Specific equipment was noted to be particularly helpful when recovering from the hurricane. Digital cameras were repeatedly cited as being helpful in documenting damage and repairs. There are now digital cameras in each eastern Division, and NCDOT is in the process of providing them statewide. These cameras

also are especially helpful in documenting FHWA and FEMA recovery reimbursement paperwork. Portable lighting was cited as useful equipment, although it was not needed very often. Consideration should be given to pre-arranging emergency equipment rental. Equipping maintenance vehicles with fabric ROAD CLOSED signs was also suggested.

Delivering badly needed fuel was difficult because many roads were impassable.

The availability of fuel during recovery efforts was a concern to department field staff. NCDOT facilities typically keep one month's worth of operating fuel on hand. Field personnel topped off existing fuel storage tanks and equipment fuel tanks before the hurricane hit. However, NCDOT fuel supplies in affected areas were greatly reduced when equipment from assisting Divisions, SHP and NG was refueled.

Delivery of additional fuel from regular suppliers was difficult, as many roads were impassible and there were other critical demands for fuel, such as hospitals and shelters. Also, there was a perception in the field that only full loads of fuel could be ordered, and that there was no procedure for paying for less than full loads. However, the Equipment and Inventory Control Unit stated that loads of any quantity could be ordered and may be appropriate in emergency situations. It should be noted that no Division ran out of fuel.

The emergency fuel procurement process should be jointly evaluated by Division, Equipment and Inventory Control Unit, and Purchasing Section staff to address these issues. Working with EM, the team should identify other agency fuel needs and develop practices that insure NCDOT's resources can adequately meet all needs. Items to consider include allowing other agencies to get fuel directly from NCDOT's fuel suppliers; determining if increased storage capacity at field offices is warranted; considering the need to purchase a NCDOT fuel tanker; and exploring the issue of ordering fuel refills centrally during emergency conditions.

Cellular phones, pagers and radios were vital pieces of NCDOT's mobile communication system during the hurricane recovery efforts. Upon arrival, assisting Division staff reprogrammed their radios to communicate with local forces. However, not all NCDOT vehicles have radios, so truck-to-truck communication was not always possible. DMV staff noted that efficiency would have been improved if they had been able to communicate with DOH staff via radio.

The Department should investigate the possibilities of emergency radio communication between DOH, DMV and SHP. The Equipment and Inventory Control Unit has portable radio towers that could be used for future localized events. Emergency communication preparedness should consider the pre-setting of needed frequencies. If Divisions were pre-paired before events, these frequencies could be pre-set on assisting Division radios as well.

To aid in Hurricane Floyd recovery, cellular service providers supplied NCDOT with additional phones, in some cases at no charge. Department employees also used their personal cellular phones for NCDOT business. A recommendation was made to evaluate the assignment of cellular phones, and also to consider providing them as part of the mobile command vehicle. A concern was raised that cellular phone networks could become overloaded in future emergencies, and key NCDOT emergency communication would be impacted. Interviewees suggested investigating the possibility of having priority access to cellular communications in emergencies (i.e., emergency communication

calls would have priority over non-emergency calls). Also, the ability to pre-purchase large blocks of cell phone time may prove economical and should be investigated.

Providing reliable and cost-effective emergency communication devices was repeatedly suggested. EM noted a need for NCDOT to have sustainable communications with the Divisions, especially the Ferry Division. A NCDOT satellite phone was deployed as part of the mobile command unit and was used with mixed success.

Consideration should be given to how the Department will integrate these emergency communication needs into day-to-day operations. Field communication needs between DOH, DMV, SHP, and EM should be evaluated.

At the height of the emergency, the public called eastern Division offices requesting information. When these incoming calls tied up all phone lines, it was difficult for NCDOT staff to make emergency calls. A recommendation was made to provide designated secure phone lines to various NCDOT units, which would be activated only in emergencies. These phone numbers would only be given to Department employees to ensure urgent incoming and outgoing calls could be made without disruption.

NCDOT employees volunteered to serve in capacities ranging from assisting affected Divisions, to answering calls at the Customer Service Office, to staffing the EOC. Creating standing lists of available personnel is recommended. This would expedite getting the additional resources in place efficiently.

Hazardous material, such as household chemicals and animal waste, were concerns during recovery efforts.

ADMINISTRATION:

HUMAN RESOURCES

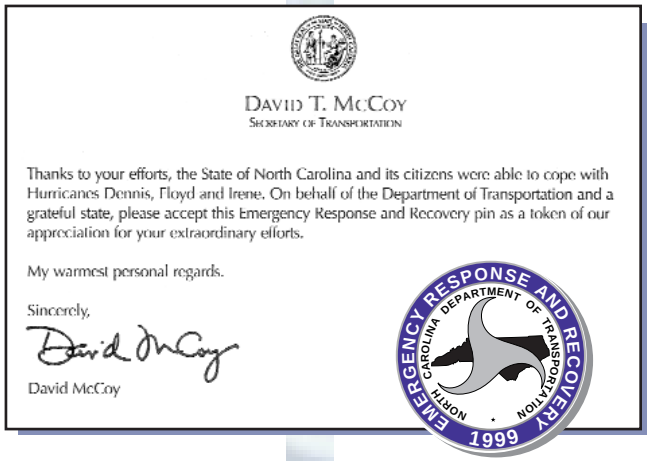
NCDOT employees have the experience and training to respond to hurricanes and the resulting destruction. However, they were unprepared for the intense rains and flooding associated with Hurricane Floyd. NCDOT personnel faced such hazards as fast-moving water, lack of proper safety equipment, and health concerns resulting from contaminated floodwaters. Safe Operating Procedures for hazards identified during Hurricane Floyd are being developed and will be incorporated in the NCDOT Workplace Safety Manual. They also should be regular topics at safety tailgate meetings prior to and during such an event. Evaluation of safety equipment for similar events is also underway.

Due to the danger resulting from sewage and household chemicals seeping into the water, NCDOT employees working in the recovery efforts were given tetanus shots. Maintaining a database of those that received the shots should be considered for future natural disasters. The database should also track other health concerns for reference in future emergency events.

Another health issue concerned locating hazardous materials. Commercial entities are required to report such locations to EM. When the Department requested the locations of hazardous materials within the proximity of NCDOT workers, the information was unavailable or out of date. Such information needs to be accurate and accessible for timely retrieval during an emergency.

NCDOT employees faced rising water levels, life and death situations, exhaustion, and urgent family situations. Division Engineers provided time for employees to be with their families and shifted hours to avoid

exhaustion. As additional post-event assistance, the Safety and Loss Control Office provided Critical Incident Stress Management (CISM), through trained counselors. This service was provided for the first time to NCDOT personnel. It became a valuable asset to employees dealing with personal property damage, the loss of a co-worker, or time away from family. It has been suggested that CISM remain available for Department employees, through the Employee Assistance Program (EAP), and that employees are informed of its availability.



DAVID T. McCOY
SECRETARY OF TRANSPORTATION

Thanks to your efforts, the State of North Carolina and its citizens were able to cope with Hurricanes Dennis, Floyd and Irene. On behalf of the Department of Transportation and a grateful state, please accept this Emergency Response and Recovery pin as a token of our appreciation for your extraordinary efforts.

My warmest personal regards.

Sincerely,

David McCoy

EMERGENCY RESPONSE AND RECOVERY
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
1999

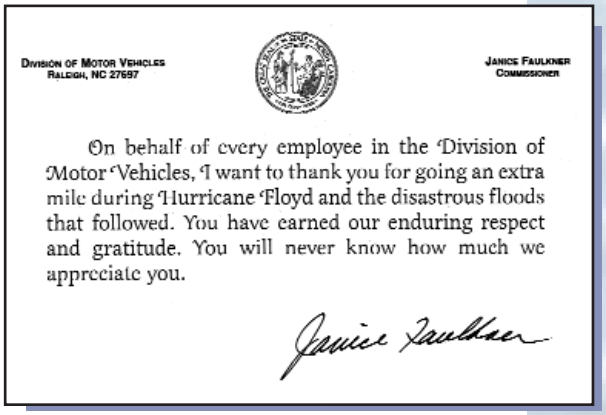
Many NCDOT employees went above and beyond the call of duty, in some cases leaving their families and property unattended, during the recovery efforts. In addition, some had to place their families in shelters because of devastating personal property damage. Other employees who reported to work could not return home due to rising waters. Many slept at the office or in their vehicles and had no food due to the lack of open restaurants. These men and woman sacrificed their personal needs to help others. Morale became a critical issue.

Secretary of Transportation David T. McCoy acknowledged the efforts and sacrifices made by NCDOT employees with a pin and a thank you card from the state of North Carolina. This recognition was given to all employees who worked on relief and recovery efforts. DMV Commissioner Janice Faulkner also recognized her employees with personally signed thank you cards. Recognition of work in relief and recovery efforts should be continued.

NCDOT employees were eager to help their fellow North Carolinians and assist in cleanup efforts. However, poor coordination limited assistance opportunities. It is suggested that such activities be actively coordinated with the Governor's office to provide ample volunteer opportunities in future events.

One way to maintain morale is by timely distribution of paychecks. The majority of NCDOT's employees are on direct deposit, which made payment of funds simple during the emergency. However, some employees still receive checks. These individuals did not receive their money on time due to flooded roads and suspended courier service. A protocol should be established for delivery of checks in emergency events.

Most personnel who traveled east for recovery efforts received cash advances. Financial hardship became an issue when these workers had to stay longer than anticipated because of the lingering effects of



DIVISION OF MOTOR VEHICLES
RALEIGH, NC 27697

JANICE FAULKNER
COMMISSIONER

On behalf of every employee in the Division of Motor Vehicles, I want to thank you for going an extra mile during Hurricane Floyd and the disastrous floods that followed. You have earned our enduring respect and gratitude. You will never know how much we appreciate you.

Janice Faulkner

Floyd and the amount of work to be done. Eastern Divisions provided cash advances to the western Division volunteers. These procedures should be formalized for future emergencies.

Interviewees expressed concern about inconsistencies in administering leave policies and directives. Managers and supervisors

were responsible for determining essential and non-essential employee status, a major element of the leave policy. Interviewees believed determining this status prior to future events will alleviate confusion. Also, administration of leave varied within the department, as well as between state agencies, causing complaints. Others believed the adverse weather policy conflicted with the Governor's executive order. These examples indicate a need for clear and well communicated information between upper management and field personnel.

Recovery Procedures

Approximately 2,100 sites on the state's highway infrastructure were damaged. Of those, 1,600 were on non-federal roads and 500 were on federal highways. Therefore, the Department had to meet both FEMA and FHWA requirements. There were times when the Department re-established vital transportation links to provide relief to those stranded. Later, the Department was questioned about the environmental impacts of these efforts.

Investigating and addressing environmental impacts is standard practice as part of NCDOT projects. However, environmental permitting requirements and support documentation for road and bridge repairs resulting from Hurricane Floyd were new. Unfortunately, some repairs were already complete before these requirements were known.

Guidelines for meeting environmental commitments while responding to emergencies are needed. State and Federal environmental regulatory agencies, as well as EM representatives, should participate in the development of these guidelines. Environmental review process requirements should be fully discussed and documented. Updates will also be required. This documentation could be included in the Emergency Operations and Procedures Manual.

Divisions with Environmental Officers found them to be invaluable staff members. These employees were especially helpful in reviewing damage sites, assessing the permit types needed, contacting the correct regulatory agencies, completing the environmental checklist and conducting biological investigations. Consideration should be given to providing every Division with an Environmental Officer to assist with emergency and day-to-day environmental issues.

Environmental concerns are always at the fore-front of NCDOT projects, however Floyd brought new challenges.

Immediately following the hurricane, state workers began clearing roads, but soon turned to contractors for help. Normally, Divisions have the authority to let contracts up to $100,000. Following the Governor's declaration of a state of emergency, the Division contract limit was raised to $2 million, and standard bidding and contracting procedures were waived as provided by General Statute 136-28.1(e). Sample contracts and historical pricing information were supplied to the Divisions so they could evaluate submitted costs and minimize price gouging, a typical concern following emergency events. Historical pricing information should be included and updated annually in the Emergency Response and Procedures Manual. Also, a recommendation was made to allow contract overruns up to 10% and to authorize Division Engineers to approve these overruns.

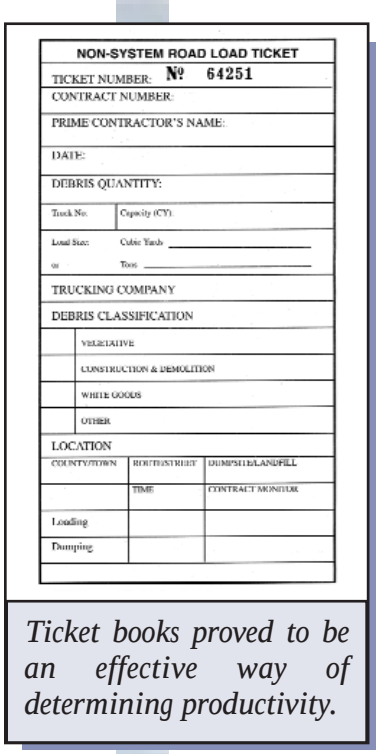
Contractors removed debris from non-system roads, while contractor and NCDOT forces cleared system-roads. The Chief Engineer's Office and EM recommended that local contractors be used

before out of state contractors in recovery efforts. Theoretically, local contractors will cost less, know the Department's procedures, and continue to do work with the state. Additionally, hiring local contractors revitalized the local economy at a time when businesses were heavily damaged and people were unable to work.

EM requested NCDOT's assistance with debris removal and road repairs on non-system roads. These tasks would otherwise be the responsibility of municipalities or private citizens. Historically, the Department has absorbed the non-federally reimbursed costs on these non-system roads from its maintenance budget. An interagency agreement was executed between the Department and EM to document this request and provide reimbursement for these costs. This agreement allowed the Department to respond to local needs while protecting its maintenance budget.

However, some interviewees felt a clear definition of NCDOT responsibilities in private road repair did not exist. The confusion occurred when the Department worked on roads that had been in poor condition prior to the storm. The Department's procedure for defining emergency road repair should be refined.

Early in the cleanup efforts, method of payment was a point of contention. NCDOT preferred payment based on hours, while FEMA preferred cubic yards. Based on their favorable impression of the Department's past actions, FEMA provided a waiver to the Department to use hourly based contracts. Ticket books proved to be effective in determining contractor productivity compared to time worked. They also were used to maintain a record of waste transferred to disposal sites for both system and non-system roads. This distinction is necessary for reimbursement. These processes worked well for NCDOT crews and contractors who traveled between debris pickup sites and filled dump trucks. This method should be continued since complete and accurate documentation is essential for reimbursement of costs.



NON-SYSTEM ROAD LOAD TICKET

TICKET NUMBER: № 64251
CONTRACT NUMBER:
PRIME CONTRACTOR'S NAME:
DATE:
DEBRIS QUANTITY:
Truck No. | Capacity (CY)
Load Size: Cubic Yards
or Tons
TRUCKING COMPANY
DEBRIS CLASSIFICATION
VEGETATIVE
CONSTRUCTION & DEMOLITION
WHITE GOODS
OTHER
LOCATION
COUNTY/TOWN | ROUTE/STREET | DUMPSITE/LANDFILL
TIME | CONTRACT MONITOR
Loading
Dumping

Ticket books proved to be an effective way of determining productivity.

Location of disposal sites and hours of operations became key issues. Although a municipality may have requested debris removal, county landfill hours of operation limited dumping activities. Pre-designating debris disposal sites with city and county governmental representatives, as well as identifying city and non-system roads, is recommended.

In the past, it has taken up to 10 years to complete compilation of records for major events and request federal reimbursement. A position was added in the Chief Engineer's Office to assemble documentation and request reimbursement in a timely manner. However, there are still limitations that delay reimbursement of emergency monies. Currently, there is no easy way to track what portion of an employee's day is spent performing work that is reimbursable without manually sorting through an FR 11 (Job Report Form). It is also difficult to identify and track emergency contracts, which are reimbursable. The Department's new financial system currently under development, Business Systems Improvement Project is anticipated to improve disaster recovery accounting. Interviewees also suggested the Department research the use of laptops and palm pilots for automated processing of reimbursement documentation.

The Department's current method of obtaining federal funds for disaster reimbursement impacts regular maintenance activities. Maintenance work has been limited in the years following a natural disaster because of spending during the event. With the increase of state-maintained roadways in North Carolina, the funding for routine maintenance already is lacking. The idea of a rainy day fund was raised in discussions with interviewees. Allocation of monies to this fund would reduce maintenance spending. This idea should be further investigated as a way to minimize the impact to maintenance funds.

Some bridges were so severly damaged that they had to be replaced.

Repair costs depleted routine maintance funds.

CONCLUSION

CONCLUSION

Hurricane Floyd challenged North Carolina like no other event in the history of the state. Working as a team, NCDOT employees rose to the call, serving the needs of citizens and the traveling public. Operating around the clock, Department employees managed evacuation traffic, answered 175,000 hotline calls, created a web site that received nearly two million hits and reopened 1,500 flood affected roads.

The Department has taken the opportunity to reflect upon its response and recovery efforts. Interviews were conducted with nearly 100 NCDOT employees who performed the wide array of response and recovery tasks. Discussed in the Findings section, this information was categorized into four critical areas: Readiness, Operations, Logistics and Administration. The Action Items section lists specific actions and tasks discussed in the Findings section. A careful process, including prioritization and risk management, must be undertaken to determine an approach for implementation. These Action Items can be summarized into the following recommendations:

- Create a Statewide Operations Center
- Develop Provisions for Emergency Food and Lodging
- Complete the Emergency Operations and Procedures Manual and Provide Training
- Improve Emergency Traveler Information
- Optimize Emergency Procurement and Deployment of Materials, Equipment, and Personnel
- Improve Emergency Communications Resources
- Complete Evacuation Planning and Develop Operations Procedures
- Continually Update Policies and Procedures for Emergency Road Repair and Debris Removal
- Optimize Federal Emergency Reimbursement Documentation Procedures Including Automation
- Improve Inter-and Intra-Agency Emergency Coordination

As NCDOT strives to improve internal operations, opportunities exist to enhance working relationships with other state agencies. A recommendation of this report stresses the expansion of lessons learned to include discussions with other agencies that interact with NCDOT in an emergency event (i.e., SHP, NG, FHWA, FEMA, and EM). Evaluating actions both internally and as a member of a larger team will improve the Department's readiness for future events. By taking these steps, the Department can maintain its focus on customer service excellence.

HURRICANE FLOYD
LESSONS LEARNED

APPENDICES

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

A: List of Interviewees

Troy Absher	Division 11
Dwayne Alligood, PE	Division 2
David Allsbrook, PE	Operations
Keith Anderson	Division 6
Wayne Atkins, PE	Division 11
Greg Basinger	Division 3
Joe Blair, PE	Division 3
Doug Bowers, PE	Division 3
Wally Bowman, PE	Division 5
Pat Boykin	Division 3
Jennifer Brandenburg, PE	Road Maintenance
Lt. Col. Bill Brinson	Enforcement
Michael Bryant	Driver License
John Burns	Equipment & Inventory Control Unit
Greg Burns, PE	Division 6
Gary Burton	Division 6
Roberto Canales, PE	Operations
Scott Capps, PE	Division 5
Roger Cates, PE	Division 3
Don Conner, PE	Division 1
Rodney Cooper	Division 5
Robert Crumpler, PE	Division 6
Ronald Davenport, PE	Division 2
Troy Dover, PE	Division 5
Don Dupree	Division 4
Jimmy Eatmon, PE	Division 4
Jim Edwards	Enforcement
John Emerson, PE	Bridge Maintenance
Aaron Everett	Division 2
Janice Faulkner	Commissioner-DMV
Frankie Floyd	Division 2
Richard Ford	Operations
Jerry Gaskill	Ferry Division
Terry Gibson, PE	Division 6
Don Goins, PE	Operations
Tom Gould	Division 5
Ricky Green, PE	Division 5
Debbie Greene	Division 2
Drew Harbinson	Purchasing Section
Roger Hawkins	Division 3
Doug Hoell	Emergency Management
Joey Hopkins, PE	Division 5

Carol Howard	Vehicle Registration
Julie Hunkins, PE	Highways
Preston Hunter, PE	Division 2
Joan Jernigan	Division 6
Sherri Creech-Johnson	Public Information
Daniel Keel, PE	Division 2
Becky Keith	Personnel
Ann Keith-Faison	Oversize/Overweight Permits
David King	Deputy Secretary-DOT
Neil Lassiter, PE	Division 2
Cameron Lee, PE	Facilities
Allen Lewis	Division 2
Jerry Linder	Division 5
Lacy Love, PE	Road Maintenance
Clarence Lucas	Division 2
Wes Lyall	Division 2
Duane MacEntee	Safety & Loss Control
Ken Mason	Division 2
Carl McCann, PE	Division 11
David McCoy	Secretary-DOT
James Merricks	Information Systems Technology
Mark Munden	Emergency Management
Ken Murphy, PE	Division 6
Jon Nance, PE	Division 5
Bob Nelson, PE	Division 6
Wendi Oglesby, PE	Division 4
Tracey Pittman, PE	Division 6
Allen Pope, PE	Division 3
Terri-Lynne Poppe, PE	Division 5
Col. David Richards	Enforcement
Jerry Rivenbark	Division 3
Paul Roberts	Information Systems Technology
Forrest Robson, PE	Geographic Information Systems
Ellis Ross, PE	Operations
Len Sanderson, PE	State Highway Administrator
Jim Snakenberg, PE	Facilities
Jamie Snow	Division 5
Wayne Stallings	Chief Financial Officer
Danny Taylor, PE	Division 2
Eric Tolbert	Emergency Management
Jim Trogdon, PE	Division 4
Steve Varnedoe, PE	Operations
Doug Waters	Division 9
Lin Wiggins, PE	Bridge Maintenance
Cary Woody	Division 5
Jarvis Woody	Division 2

B: Emergency Operations and Procedures Manual

Examples of Debris Removal Crews Make-up
FEMA Funding Requirements & Process
FHWA ER Funding Requirements & Process
Emergency Phone List
State EOC
Chief Engineerís Office Personnel
SRMU Personnel
Division Office Staff Personnel (statewide)
Division Emergency Phone Numbers
Personnel
List of Debris Removal Contractors
List of Available Equipment
Generators, chainsaws, tandems, track excavators, rubber-tired excavators, front-end loaders, backhoe, bulldozers, chippers, pumps

C: List of Acronyms

Organizations

(CP&L)	Carolina Power & Light
(DOC)	Department of Corrections
(EM)	Division of Emergency Management
(DOH)	Division of Highways
(DMV)	Division of Motor Vehicles
(FEMA)	Federal Emergency Management Agency
(FHWA)	Federal Highway Administration
(GIS)	Geographic Information Services
(NCDOT)	North Carolina Department of Transportation
(NG)	National Guard Division
(SHP)	State Highway Patrol

Terminology

(CCTV)	Closed Circuit Television
(CPI)	Continuous Process Improvement
(CISM)	Critical Incident Stress Management
(EOC)	Emergency Operations Center
(EAP)	Employee Assistance Program
(HAR)	Highway Advisory Radios
(ITS)	Intelligent Transportation Systems
(SERT)	State Emergency Response Team
(TIMS)	Transportation Information and Management System
(VMS)	Variable Message Signs