DRAFT

STATE OF NORTH CAROLINA

TRAFFIC RECORDS ASSESSMENT

January 08 – 13, 2012

National Highway Traffic
Safety Administration
Technical Assessment Team

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EXECUTIVE SUMMARY

The National Highway Traffic Safety Administration (NHTSA), in response to a request by the Governor's Highway Safety Program of North Carolina, assembled a team to conduct a traffic records assessment. The Governor's Highway Safety Program carried out the logistical and administrative steps necessary for an onsite assessment. A team of professionals with backgrounds and expertise in the various traffic records data systems (crash, driver, vehicle, roadway, citation and adjudication, and EMS/injury surveillance) conducted the assessment January 8th through 13th, 2012.

The scope of this assessment included all of the components of a traffic records system. The purpose was to determine whether the traffic records system in North Carolina is capable of supporting management's needs to identify the State's highway safety problems, to manage the counter-measures applied in attempts to reduce or eliminate those problems, and to evaluate those efforts for their effectiveness.

Background

North Carolina underwent a traffic records assessment in 2007, during which deficiencies were identified that were the basis for recommendations enumerated in that report. During this assessment, the State has demonstrated notable progress in its traffic records system that has resulted from implementation of some of the recommendations for improvement and the State's own initiative in identifying and seeking solutions.

At the time of the 2007 assessment, the State reported that most of the nearly 300,000 crash reports it received annually were paper reports, though a small percentage of reports were being received electronically. Five years later, the timeliness of the data has improved substantially as the percentage of electronic crash submissions has grown. Data entry of paper reports is timely. Fifty-five percent of crash reports are now received electronically by the Division of Motor Vehicles. Another 30 percent of the total volume of reports is completed using field data collection software, but they are not yet transmitted to the Crash Records Section at DMV in the electronic format. They are, instead, data entered by DMV personnel. Once the interface is complete for these remaining electronic reports, 85 percent of crashes will be automatically uploaded into the State crash file.

Driver licensing has taken a number of steps toward compliance with the Real ID Act. Using facial recognition and document authentication technology, they are working to ensure that each applicant for a driver license or state ID card is well-vetted and properly enrolled into the driver license database. Their future plans involve re-configuration of the office process flow to include taking the applicant's photograph at the beginning of the process, in order to aid in fraud investigations should an applicant leave after having given counterfeit identity documents or fraudulent information, but before completion of the application and issuance process.

Though electronic citations have been used in North Carolina for over a decade, the Highway Patrol estimates that 80 percent of its citations are now electronically generated. Because of the drop-down menus for roadway names, automated fine calculations, and the ability to cut and

paste information on the mobile data computers from the DMV databases into the citation form, accuracy of the citation data has been improved. The fact that data re-entry of handwritten citations is not required, introduction of errors into the system is lessened as well.

Injury Surveillance data is strengthened by the fact that North Carolina has enacted legislation to mandate emergency medical system data and trauma data transmission to the State.

At this time, however, some issues and deficiencies remain and continue to impact the ability of the present traffic records system to optimally support North Carolina's management of its highway safety programs. These are discussed in the summary below and the full report that follows.

Crash Records

The North Carolina Department of Transportation (NCDOT), Division of Motor Vehicles (DMV) is the official custodian of the State's crash file. The current crash file was implemented in 1999 and there has not been a major re-write of the database since its inception. The crash report is documented in North Carolina in two formats. The paper form DMV-349 is still in use and accounts for approximately 45 percent of the annual volume of crash reports submitted. Electronic crash reports account for the balance and are generated from two sources; an e-crash field reporting module from third-party vendors and North Carolina TraCS which was developed by the NCDOT Information Technology (IT) staff and is provided free of charge to local, tribal, and state law enforcement. Both electronic versions follow the approved NCDOT format and contain over 300 data fields and perform validation edit routines of State mandated business rules for accuracy and completeness.

Because electronic reports generated by third-party vendor systems must first be printed and submitted in hard copy to the DMV, NCDOT IT staff recently completed a pilot with three local agencies who use the same Records Management System (RMS) vendor to enable their system to submit completed and successfully validated e-crash reports electronically using XML exchange. This pilot was successful and the NCDOT is poised to address the other vendors who supply RMS software. NCDOT estimated that 30 percent of the total crash volume annually is submitted by printed reports from RMS vendors' systems that capture crash reports electronically. Addressing these additional vendor systems as quickly as possible will improve the timeliness of the crash database and eliminate the redundant data entry currently imposed on the data capture staff.

North Carolina has an impressive business process that results in a high degree of confidence and accuracy in its crash file. The system is governed by an excellent Quality Control process. Broader data quality metrics should be developed to provide a more comprehensive view of the entire data collection process.

Roadway Component Records

The State has made significant improvements in the highway safety information environment since the last traffic records assessment. Two issues noted in that report were location referencing and status of the Geographic Information System. Because the electronic collection of traffic crashes has increased appreciably the ability to locate the crash occurrence on the public road system has also increased appreciably. This was due to a software routine built into the automated system that aids in the location process. The North Carolina Department of Transportation has also made great progress in the development and implementation of the Arc

Geographic Information System (GIS) used to house and display roadway characteristics data on the State road system. The information systems used in roadway safety programming are fundamentally sound and are meeting the needs of the roadway safety community.

Driver and Vehicle Records

The DMV was not able to implement a total rewrite of the State Automated Driver License System (SADLS) and the State Title and Registration System (STARS) that was anticipated for 2008. Nonetheless, the over-the-counter driver license process was changed to central issuance with improved control over the validation of personal identification of applicants. Use of the Systematic Alien Verification for Entitlements (SAVE) file was initiated in 2007. Also, registration of vehicles and processing of title applications has been extended to qualified auto dealerships.

The DMV is poised to complete the rewrite of their driver and vehicle systems and has the changes defined for tightening the control in order to counter attempts to obtain a driver license under fraudulent conditions. No recommendations were needed to enable North Carolina to satisfy the requirements of the traffic records system *Advisory*.

Statewide Injury Surveillance System (SWISS) Records

North Carolina's injury surveillance data are captured in two disparate systems. One system resides within the Office of Emergency Medical Services. This system is reported to include all data components recommended by the *Advisory*.

A second injury surveillance system resides within the Injury Epidemiology Unit of the Division of Public Health, Injury and Violence Prevention Branch. This injury surveillance system is comprised of emergency department, hospital discharge, and vital statistics (death) data.

EMS agencies transmit data to the State either via commercial software (90 percent) or using an on-line state-supplied application at no cost (10 percent). EMS data are linked to emergency department data on a daily basis. Aggregate information is available about the number of agencies and personnel in the State and agency level reports address response time, call volume and disposition.

Hospital discharge and emergency department data processing is contracted to an outside vendor that compiles reports and responds to requests for data. Ninety-seven percent of emergency departments in the State post to the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) with the remaining three percent due to begin reporting within the year. De-identified discharge sets are shared with the State Center for Health Statistics.

Twelve designated trauma centers and two non-designated hospitals submit data to the National Trauma Data Bank. Trauma records are linked to EMS reports.

Mortality data is reported to the local registrar within five days of death. The registrar prepares death certificates and forwards them to Vital Records and on to the National Center for Health Statistics. This process would benefit from the development of an electronic registration system in terms of timeliness of the records.

The existence and use of two different injury surveillance systems introduces the opportunity for conflicting reports and statistics. Efforts should be made to develop a single comprehensive injury surveillance system for the State.

Citation and Adjudication Records

North Carolina led the nation in its efforts to develop the electronic citation, which it began in 1999 with a pilot program with the Highway Patrol. That program has grown and is embraced by law enforcement agencies throughout the State to the point that 82.3 percent of the traffic citations issued annually are completed and transmitted electronically. The Administrative Office of the Courts has taken an active role in this process, working to purchase printers for law enforcement officers, to enable agencies to implement electronic citations.

Because of the volume of electronic citations and the fact that paper citations are added to the electronic database through data entry by court staff, there is virtually a complete database of enforcement actions within the State. One missing element that should be considered for inclusion into the dataset is warning citations. This information is vital to law enforcement in terms of learning about subsequent behavior of a warned versus a cited violator. Such data should be made a part of the citation database.

Although this rich enforcement data source exists, it is unclear whether it is being used to its fullest capacity. The Traffic Records Coordinating Committee should market the available traffic safety data within the state, such as citation and adjudication data. Once the locations on citations and crash reports are harmonized, it will be possible to review the effect of various enforcement countermeasures on crash incidence and severity in North Carolina.

Traffic Records Coordinating Committee (TRCC)

North Carolina has a long-standing Traffic Records Coordinating Committee which has been meeting regularly for the last decade. The State's size has tended to limit attendance for some local level members due to the time commitment required to travel to meetings.

The Executive Committee for Highway Safety acts as the TRCCs executive level committee members. The heads of the State Departments that are responsible for the record systems that comprise the North Carolina traffic records system comprise the executive level. The Injury Surveillance System has not had consistent recent involvement and the Director of the Administrative Office of the Courts is not a member. Efforts should be made to secure full involvement of the AOC and Public Health executives.

Strategic Planning

The 2007 strategic plan was based on the recommendations of the 2007 Traffic Records Assessment. The TRCC helped in developing the original strategic plan, and is instrumental in its continuation and revisions. They were supported in this effort by the Executive Committee for Highway Safety (ECHS) which is comprised of executive members of the major State safety stakeholder agencies and operates as the de-facto TRCC executive committee. The TRCC members provide project input to the TRCC and these projects are incorporated into the Plan. Stakeholder agencies are actively involved with the implementation of the Plan's strategies and projects.

A workshop should be scheduled for members of the TRCC to develop a new strategic plan under the guidance of a facilitator. The facilitator would lead the strategic planning process,

especially encouraging TRCC members to define problems and develop solutions. The TRCC should secure the commitment of personnel and resources to address multiyear data systems planning across different state agencies. The TRCC-driven planning process should result in a statewide data improvement program that assures coordination of efforts and sharing of data between the various safety data systems. The stated intent of the TRCC to contract the services of the Highway Safety Research Center should satisfy this purpose.

The following are the major recommendations for improvements to the State's traffic records system. The references indicate the sections of the report from which the recommendations are drawn.

MAJOR RECOMMENDATIONS

Crash Records System

- ❑ Expand the capability as soon as possible to allow the remaining third-party vendors to electronically submit e-crash reports generated from their software. **(Section 2-A)**

- ❑ Study the case for accepting non-reportable crash data into the crash file and work with the Traffic Records Coordinating Committee to develop a short form crash report to address crashes that can easily be handled without a full DMV-349 report. If developed, carefully implement and market the short form crash report to ensure there is no intentional degradation in the reportable crash experience. **(Section 2-A)**

- ❑ Provide for a specific structured field to document citation numbers on all versions of the crash report and include this field in both the data entry process and the Oracle database crash file. **(Section 2-A)**

- ❑ Develop and implement a broader and more specific data quality metric report that can leverage the validation error logs and share them regularly with the law enforcement community. Such an effort will more clearly indicate the level of training required to use and understand the crash report. **(Section 2-A)**

Citation and Adjudication Records

- ❑ Develop a centralized database for warning tickets that is available to law enforcement officers and others in the traffic records community. **(Section 2-E)**

- ❑ Create electronic citation audit procedures to ensure citations are tracked from time of issuance to disposition of citations. **(Section 2-E)**

- ❑ Develop an effective way of sharing data across multiple systems within the data collection process, such as crash and citation, for consistency and accuracy of data. **(Section 2-E)**

Traffic Records Coordinating Committee (TRCC)

- ❑ Add representation to the Traffic Records Coordinating Committee including local law enforcement and local engineers. **(Section 1-A)**

- ❑ Add representation to the Executive Committee for Highway Safety from the Division of Public Health to represent EMS, Trauma and Injury and Violence Prevention sections. **(Section 1-A)**

- ❑ Develop meaningful data quality metrics and measures following the guidelines in NHTSA's *Model Performance Measures for State Traffic Records Systems*. **(Section 1-A)**

Statewide Injury Surveillance System (SWISS)

- ❑ Develop one comprehensive, inclusive of all components, injury surveillance system. **(Section 2-F)**

    - o Employ the services of the North Carolina Institute of Medicine whose mission, according to their website, is "To seek constructive solutions to statewide problems that impede the improvement of health and efficient and effective delivery of healthcare for all North Carolina citizens."

    Or

    - o Form a subcommittee of the Traffic Records Coordinating Committee, including representation from all components of the injury surveillance system. The subcommittee would be charged with:

        - Developing policies and procedures to govern the integrated data.
        - Identifying obstacles to data linkage for each component and solutions to overcome said obstacles.
        - Identifying gaps in the components' data and solutions to close those gaps.
        - Determining the best agency or entity to perform the linkage, house, and maintain the data. The agency or entity would be responsible for analyzing and/or releasing the linked data only. Data owners and/or custodians would remain responsible for any requests for their respective component. The best type of agency or entity would be one that is HIPAA compliant whether as a covered entity or business associate.
        - Other tasks as necessary to realize an injury surveillance system.

Roadway Information

- ❑ Perform a benefit/cost analysis of collecting the subset of fundamental data elements of MIRE for use in enhanced safety analyses. **(Section 2-B)**

Strategic Planning

- ❑ Charge the TRCC with the development of a new Traffic Safety Information Systems Strategic Plan addressing the recommendations in this traffic records assessment.

Identify deficiencies apart from those noted in the traffic records assessment by canvassing each TRCC member and especially each traffic records system component custodian for their input. **(Section 1-B)**

- ❑ Assure that all TRCC members participate in the development of the Traffic Safety Information Systems Strategic Plan and the selection and priority setting of the projects in the Plan. It is advisable to acquire the skills of a facilitator to conduct workshops for the Plan development. **(Section 1-B)**

ACKNOWLEDGMENTS

The Traffic Records Assessment Team would like to acknowledge Frank Hackney, State Traffic Records Coordinator, Governor's Highway Safety Program and Teresa Hinton, Receptionist, NCGHSP for their support and able assistance in making this assessment possible.

The team would like to thank Joan Vecchi, team facilitator, for giving a national perspective to the assessment process and its goals. We would also like to thank our Administrative Assistant, Kathy Zogby.

The team would also like to thank the principal participants in the assessment for the time invested, the information they presented, and their candor in answering the many questions put forth by the team.

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INTRODUCTION

A complete traffic records system is necessary for planning (problem identification), operational management or control, and evaluation of a State's highway safety activities. Each State, in cooperation with its political subdivisions, should establish and implement a complete traffic records system. The statewide program should include, or provide for, information for the entire State. This type of program is basic to the implementation of all highway safety countermeasures and is the key ingredient to their effective and efficient management.

As stated in the *National Agenda for the Improvement of Highway Safety Information Systems*, a product of the National Safety Council's Association of Transportation Safety Information Professionals (formerly the Traffic Records Committee):

> "Highway safety information systems provide the information which is critical to the development of policies and programs that maintain the safety and the operation of the nation's roadway transportation network."

A traffic records system is generally defined as a virtual system of independent real systems which collectively form the information base for the management of the highway and traffic safety activities of a State and its local subdivisions.

Assessment Background

The Traffic Records Assessment is a technical assistance tool that the National Highway Traffic Safety Administration (NHTSA), the Federal Motor Carrier Safety Administration (FMCSA) and the Federal Highway Administration (FHWA) offer to State offices of highway safety to allow management to review the State's traffic records program. NHTSA has published a *Traffic Records Program Assessment Advisory* which establishes criteria to guide State development and use of its highway safety information resources. The Traffic Records Assessment is a process for giving the State a snapshot of its status relative to that *Advisory*.

This assessment report documents the State's traffic records activities as compared to the provisions in the *Advisory*, notes a State's traffic records strengths and accomplishments, and offers suggestions where improvements can be made.

Report Contents

In this report, the text following the "*Advisory*" excerpt heading was drawn from the *Traffic Records Program Assessment Advisory*. The "*Advisory*" excerpt portion is in italics to distinguish it from the "Status and Recommendations" related to that section which immediately follows. The status and recommendations represent the assessment team's understanding of the State's traffic records system and their suggestions for improvement. The findings are based entirely on the documents provided prior to and during the assessment, together with the information gathered through the face-to-face discussions with the listed State officials. Recommendations for improvements in the State's records program are based on the assessment team's judgment.

SECTION 1: TRAFFIC RECORDS SYSTEM MANAGEMENT

Advisory Excerpt: *Management of a State TRS requires coordination and cooperation. The data that make up a TRS reside in a variety of operational systems that are created and maintained to meet primary needs in areas other than highway safety. Ownership of these databases usually resides with multiple agencies, and the collectors and users of the data span the entire State and beyond.*

The development and management of traffic safety programs should be a systematic process with the goal of reducing the number and severity of traffic crashes. This data-driven process should ensure that all opportunities to improve highway safety are identified and considered for implementation. Furthermore, the effectiveness of highway safety programs should be evaluated. These evaluation results should be used to facilitate the implementation of the most effective highway safety strategies and programs. This process should be achieved through the following initiatives.

1-A: Traffic Records Coordinating Committee

Advisory Excerpt: *The National Highway Traffic Safety Administration's (NHTSA) 2004 Initiatives to Address Improving Traffic Safety Data Integrated Project Team report (hereafter referred to as the Data IPT Report) includes guidance on establishing a successful Traffic Records Coordinating Committee (TRCC). The following include recommendations from the Data IPT Report and additional items of an advisory nature:*

- *Establish a two-tiered TRCC.*
  There should be an executive and a working-level TRCC. The executive-level TRCC should be composed of agency directors who set the vision and mission for the working-level TRCC. The Executive TRCC should review and approve actions proposed by the Working TRCC. The Working TRCC should be composed of representatives for all stakeholders and have responsibilities, defined by the Executive TRCC, for oversight and coordination of the TRS. Together, the two tiers of the TRCC should be responsible for developing, maintaining, and tracking accomplishments related to the State's Strategic Plan for Traffic Records Improvement.

- *Ensure Membership is Representative.*
  TRCCs should be representative of all stakeholders, and each stakeholder representative must have support from their top management. When departments are considering changes to their systems, all TRCC members should be notified and departments should consider how to accommodate the needs of all the TRCC agencies.

- *Authorize Members.*
  The Working TRCC should have formal standing, recognition, and support of the administrators of participating agencies. This support will help the TRCC succeed in overcoming the institutional barriers, lack of focus, and lack of resources that prevent collaboration and progress in integrating highway safety data. The exact role and powers of the TRCC should be made explicit in its charter. Legislators, the governor, and top management of participating agencies should give authority to the TRCC members to make policy decisions and commit their agencies' resources to solve problems and approve the State's strategic plan for traffic records. The most important responsibility of the TRCC should be to provide the leadership necessary to ensure that available funds are sufficient to match stated needs. Despite challenges stemming from collective decision making by members from different agencies with competing priorities, TRCC members should speak with "one voice." The TRCC should have guidelines to determine who speaks for the TRCC and how its recommendations should be communicated.

- *Appoint an Administrator/Manager.*
  A single point of contact for managing a data improvement project is necessary to ensure leadership. The TRCC should designate a traffic records administrator or manager and provide sufficient time and resources to do the job. This person should be responsible for coordinating and scheduling the TRCC, in addition to tracking the progress of implementing the State's traffic records strategic plan. Uniform criteria should be established for monitoring progress. NHTSA can facilitate training for the TRCC administrator/manager regarding traffic record systems, program management, and data analysis.

- *Schedule Regular Meetings.*
  The TRCC should establish a schedule of regular meetings, not only to discuss data coordination issues and make progress on the strategic plan, but also to share success stories to aid in overcoming fears of implementation. The meetings should take place as required to deal with the State's traffic records issues and to provide meaningful coordination among the stakeholders. The TRCC should gain broader support by marketing the benefits of improved highway safety data. An example to provide data and analytical expertise to local government officials, legislators, decision makers, community groups, and all other stakeholders. TRCC meetings should include strategy sessions for such marketing plans.

- *Oversee Quality Control/Improvement.*
  The TRCC should have oversight responsibility for quality control and quality improvement programs affecting all traffic records data. Regularly scheduled presentations of quality control metrics should be part of the TRCC meeting agenda and the TRCC should promote projects to address the data quality problems that are presented.

- *Oversee Training for TRS Data Improvement.*
  The TRCC should have oversight responsibility for encouraging and monitoring the success of training programs implemented specifically to improve TRS data quality. Regularly scheduled presentations of training needs and training participation should be part of the TRCC meeting agenda, and the TRCC should promote projects to conduct training needs assessments and address the identified training needs.

1-A: Traffic Records Coordinating Committee Status

Establish a two-tiered TRCC

North Carolina has had a two-tiered Traffic Records Coordinating Committee (TRCC) in existence since December 2002. The executive and working groups can be key contributors to the development and success of the strategic plan for North Carolina's traffic records. The strategic plan should be followed and supported by the members of both groups, working collaboratively.

The executive group in North Carolina is called the Executive Committee for Highway Safety (ECHS) and consists of the secretary level personnel from all the traffic safety systems with the exception of Public Health and the Administrative Office of the Courts (AOC). This group has been meeting approximately three times a year.

The working group membership includes representation from most stakeholder agencies. These members should be the collectors, managers, and users of traffic records data from State and local organizations. Representation at the local level does not exist.

Authorize Members

The TRCC has a mission statement which details the direction for the TRCC. The mission encases every aspect of traffic safety records. The working group TRCC is not guided by a charter, but by informal Memoranda of Understanding which outline its purpose and responsibilities. There is no formal process to include certain positions within various agencies who should be involved. Most individuals are asked to be part of the TRCC because of previous contact and willingness to participate. A charter will allow the TRCC to authorize and prioritize projects for the traffic records system. This charter should be supported by the key stakeholders' organizations and grant the TRCC authority to make policy decisions and use resources available within their agencies to develop a strategic plan for traffic records systems. The executive level of the TRCC is chartered and has membership from many traffic safety system agencies. It has been noted, representatives of the Division of Public Health and AOC are not part of the executive level.

There has not been a specific charge for the TRCC since approximately 2006. Many cooperative projects listed began in 2006 and have been implemented throughout the state. Throughout this traffic records assessment, issues about data capture and use have been addressed where the TRCC can help coordinate the agencies involved to improve the systems. Various recommendations in this document call for TRCC involvement.

Ensure Membership is Representative

The TRCC incorporates personnel and administrators from each of the principal agencies which own, collect or use traffic records data. With shrinking budgets and personnel downsizing, it is essential to have agencies that are part of the TRCC realize what data are available to the traffic safety community. All agencies within the TRCC should be made aware when a major change to any system is being considered. This ensures all agencies that may be affected by the decision are included. This will allow for better planning for interoperability and data sharing. When the TRCC is not included, it may take more time and effort to redevelop components to share data.

The TRCC roster is not an exhaustive list of agencies that should be participating. The membership does not have local law enforcement or engineering representation. The Governor's Highway Safety Program (GHSP) has 11 law enforcement liaisons (LEL) that represent local law enforcement agencies across the State. This is a group, who are already representing the local law enforcement agencies, to participate on the working level TRCC. Even if certain agencies cannot participate in person, the TRCC should not exclude any agency based on geographic displacement; they are still contributors and users. The roster from November 2011 lists members who may not be in the capacity they were in a few years ago. An update of the roster with new contacts for agencies involved in TRCC is recommended.

Oversee Quality Improvement

Standard metrics should be used to measure each component of the traffic records system in order to give a clear picture of improvement (or degradation) of the components over time and the impact various projects or changes have on the overall health and integrity of the data itself. However, there are no metrics in place to encompass the broader concerns beyond the project level. The TRCC should continue to revisit and expand the metrics used for the traffic data. This will ensure the accuracy, completeness, consistency, timeliness and integration or linkage of data from future enhancements are improved.

Appoint an Administrator

The newly appointed Traffic Records Coordinator resides in the GHSP. This administrator is not the TRCC Chair, but does support the TRCC with scheduling and creating the agenda for meetings. The traffic records coordinator position was vacant for two years before the role was filled about three months ago.

The role of the coordinator is to be a point of contact for any traffic safety system and point individuals in the direction needed to find and use available data. This position will be helping with the lines of communication between partners at local, State and federal levels. Communication with the people who know the data or have a need for the data is the key to success in the collection and use of traffic safety data.

Schedule Regular Meetings

The TRCC should plan regularly scheduled meetings for both the executive and working groups. This will help with the buy-in from agencies to become part of the TRCC and empower the TRCC to make decisions on the direction of the traffic records system. The executive group needs to meet regularly to review recommendations brought forth by the working group. They have scheduled meetings about three times a year in the past. Regular meetings for the working group will also enable agencies to be involved more even if they cannot make all the meetings. Although meetings are not set regularly, the meeting dates are set far in advance for members to plan accordingly. Without this coordination, there will be systems developed or modified without the vision or input from others who collect, manage, or use the data. With financial constraints tightening, the regular meetings may help lessen the burden some agencies may be experiencing by understanding what else is being used throughout the State for data collection and dissemination.

Oversee Training for Traffic Records System Data Improvement
Training should be coordinated under the auspices of the TRCC. This does not stop at the individual collecting the data. Individuals with the responsibility of ensuring quality and accuracy of the data are an integral part of the process to allow all users to have the quality data needed to make informed decisions.

There should be discussions and opportunities for training to be offered. As technologies and systems change, the TRCC needs to be able to help and continue to support the personnel needed to keep up with the changes. The TRCC should allow time in each meeting to address and discuss training needs.

Recommendations:

- ❑ Assure that end and affected users are involved in the earliest planning for system modifications.
- ❑ Add representation to the Traffic Records Coordinating Committee including local law enforcement and local engineers.
- ❑ Develop meaningful data quality metrics and measures following the guidelines in NHTSA's *Model Performance Measures for State Traffic Records Systems*.
- ❑ Set and distribute an agenda prior to the meeting to allow the members to be present, either physically or by phone.
- ❑ Develop a project list that reflects current status and priority of each project (completed, active, and projected) and review and update at each meeting.
- ❑ Distribute the agenda in advance of each meeting.
- ❑ Add representation to the Executive Committee for Highway Safety from the Division of Public Health to represent EMS, Trauma and Injury and Violence Prevention sections.

1-B: Strategic Planning

Advisory Excerpt: *The TRS should operate in a fashion that supports the traffic safety planning process. The planning process should be driven by a strategic plan that helps State and local data owners identify and support their overall traffic safety program needs and addresses the changing needs for information over time. Detailed guidance for strategic planning is included in the NHTSA Strategic Planning Guide and the FHWA Strategic Highway Safety Plan documents. The strategic plan should address activities such as*

- ❑ *Assign Responsibility for the Strategic Plan.*
  The strategic plan should be created and approved under the direction of the TRCC. The TRCC should continuously monitor and update the plan, to address any deficiencies in its highway traffic records system.

- ❑ *Ensure Continuous Planning.*
  The application of new technology in all data operational phases (i.e., data collection, linkage, processing, retrieval, and analysis) should be continuously reviewed and assessed. The strategic plan should address the adoption and integration of new technology as this facilitates improving TRS components.

- ❑ *Move to Sustainable Systems.*

  The strategic plan should include consideration of the budget for lifecycle maintenance and self-sufficiency to ensure that the TRS continues to function even in the absence of grant funds.

- ❑ *Meet Local Needs.*
  The strategic plan should encourage the development of local and statewide data systems that are responsive to the needs of all stakeholders.

- ❑ *Promote Data Sharing.*
  The strategic plan should promote identification of data sharing opportunities and the integration among federal, State, and local data systems. This will help to eliminate duplication of data and data entry, assuring timely, accurate, and complete traffic safety information.

- ❑ *Promote Data Linkage.*
  Data should be integrated to provide linkage between components of the TRS. Examples of valuable linkages for highway and traffic safety decision making include crash data with roadway characteristics, location, and traffic counts; crash data with driver and vehicle data; and crash data with adjudication data, healthcare treatment and outcome data (e.g., Crash Outcome Data Evaluation System [CODES]).

- ❑ *Coordinate with Federal Partners.*
  The strategic plan's budget-related items should include coordination between the State and the various federal programs available to fund system improvements. The data collection, management, and analysis items in the strategic plan should include coordination of the State's systems with various federal systems (e.g., the Fatality Analysis Reporting System [FARS], the Problem Driver Pointer System [PDPS] of the National Driver Registry [NDR], the Motor Carrier Management Information System [MCMIS], and the Commercial Driver License Information System [CDLIS]).

- ❑ *Incorporate Uniform Data Standards.*
  The strategic plan should include elements that recognize and schedule incorporation of uniform data elements, definitions, and design standards in accordance with national standards and guidelines. Current examples of these standards and guidelines include:

  - *Model Minimum Uniform Crash Criteria (MMUCC)*
  - *American National Standards Institute (ANSI) -D20.1 and ANSI-D16.1*
  - *National Governors Association (NGA)*
  - *Global Justice XML Data Model (GJXDM)*

- *National Center for State Courts, Technology Services, Traffic Court Case Management Systems Functional Requirement Standards*
- *Guidelines for Impaired Driving Records Information Systems*
- *National Emergency Medical Service Information System (NEMSIS) Data Dictionary.*

❑ *Plan to Meet Changing Requirements.*
To help the State meet future highway safety challenges, the strategic plan should include a periodic review of data needs at the local, State, and federal levels. It should be updated to include tasks to meet those needs as they are identified.

❑ *Support Strategic Highway Safety Planning and Program Management.*
The strategic plan should include elements designed to ensure that the State captures program baseline, performance, and evaluation data in response to changing traffic safety program initiatives. Additional elements should be present for establishing and updating countermeasure activities (e.g., crash reduction factors used in project selection and evaluation).

❑ *Strategic Planning of Training and Quality Control.*
The strategic plan should incorporate activities for identifying and addressing data quality problems, especially as these relate to training needs assessments and training implementation.

1-B: Strategic Planning Status

The most recent Strategic Plan for Traffic Records (Plan) was developed in 2007 and revised in 2009. The strategic plan document is titled *North Carolina's Traffic Records Coordinating Committee.* The Traffic Records Coordinating Committee (TRCC) is a working group of highway safety professionals whose stated goal is "To provide accurate and complete traffic records data in a timely manner that protects the privacy of citizens; to provide the environment where collaboration, data and resource sharing occurs naturally; and to identify success by measuring results, ultimately leading to a reduction in traffic fatalities, injuries, and crashes."

The Plan is reviewed annually in preparation for a Section 408 grant application for traffic records project funding. Section 408 provides grant funds for traffic records system improvements under the federal SAFETEA-LU legislation.

The 2007 Plan was based on the recommendations in the February 2007 *Traffic Records Assessment*. The TRCC helped in developing the original Plan and is instrumental in its continuation and revisions. They were supported in this effort by the Executive Committee for Highway Safety (ECHS) which is comprised of executive members of the major State safety stakeholder agencies and operates as the de-facto TRCC executive committee. The TRCC members provide project input to the TRCC and these projects are incorporated into the Plan. Stakeholder agencies are actively involved with the implementation of the Plan's strategies and projects. The 2009 Plan included nine projects at a cost of almost $8 million of which $1.1 million was funded through the Section 408 program. The Administrative Office of the Courts projects were State funded at $6.8 million.

Many of these projects are in progress and some have been protracted in their progress due to reduced budgets.

A requirement of the SAFETEA-LU legislation is for each state to develop a Strategic Highway Safety Plan (SHSP). An SHSP is a major component and requirement of the Highway Safety Improvement Program (HSIP) which was established by SAFETEA-LU, 23 U.S.C. § 148 as a core federal program. Along with their highway safety partners, the North Carolina Department of Transportation (NCDOT) developed an SHSP in order to address the frequency, rate and factors contributing to fatal and disabling injury crashes. The SHSP is the guiding document for safety emphasis areas and strategies of other safety plans and is to be consistent with other State safety plans and programs.

A vital factor for any successful SHSP is access to quality crash data and other traffic records. North Carolina is fortunate to again be a national leader in these areas. With nearly 100,000 miles of State and local maintained roads, having an accurate, up-to-date traffic records system is deemed imperative to the identification and remediation of highway safety issues. The ECHS adopted the TRCC as the working group for the SHSP. The TRCC works through the highway safety agencies that are represented on the ECHS. Consequently, the TRCC has the full support of the ECHS and is a vital component of the SHSP.

The TRCC needs to undertake the development of a fresh multi-year Traffic Safety Information Systems Strategic Plan in harmony with the SHSP and especially because of the lapse of time since the development of the last formal Plan.

Offered in the following paragraphs are suggested activities to be undertaken by the TRCC in the development of a new strategic plan. The italicized headings and narrative are taken from NHTSA's *State Traffic Safety Information Systems Strategic Planning: A Guide for the States.* Presenting the NHTSA Guide is not intended to be a prescriptive planning process but an illustration on how to address issues pertaining to the current and future strategic plan development. Only a selected number of the Guide's statements are offered since the TRCC has addressed many of the issues in the Guide. These issues are considered the most critical by the assessment team.

Traffic Records Coordinating Committee
The vital first element in the planning process is to define the group that will be responsible for approving, developing, and implementing the plan. Each State should have a policy-level group that oversees the State's highway safety data systems. The TRCC function may be vested in an existing information systems planning group within the State, but there should be a group within the State that can commit personnel and resources to address multiyear data systems planning across different State agencies. The TRCC-driven planning process should result in a statewide data improvement program that assures coordination of efforts and sharing of data between the various State safety data systems.

North Carolina has in place a TRCC that has membership representing all components of the traffic records system including managers, collectors and users of traffic records data. The current Co-Chairs appear to possess the understanding and enthusiasm to conduct and implement Traffic Safety Information Systems Strategic Plan successfully.

Traffic Records Assessment
The second key element of a good State traffic safety data system planning process is the performance of a Traffic Records Assessment in a State.

The Governor's Highway Safety Program (GHSP) in the NCDOT commissioned this assessment in preparation for developing a new strategic plan and Section 408 application.

Potential Projects and Programs
The TRCC should identify potential projects and data system improvement programs that will move the State's traffic safety information system in the direction defined by its goals and objectives.

A workshop should be scheduled for members of the TRCC to develop a new strategic plan under the guidance of a facilitator. The facilitator would lead the strategic planning process, especially encouraging TRCC members to define problems and develop solutions. The TRCC should secure the commitment of personnel and resources to address multiyear data systems planning across different state agencies. The TRCC-driven planning process should result in a

statewide data improvement program that assures coordination of efforts and sharing of data between the various safety data systems.

The stated intent of the TRCC to contract the services of the Highway Safety Research Center should satisfy this purpose.

Project Descriptions
Each candidate improvement project should be concisely defined in terms of project plans which provide a basic overview of each project as identified within the strategic plan. Each project plan should contain information such as: responsible project director, agency, goal/purpose of the project, anticipated results of the project (how will its success or failure be measured), any inter-relationships or dependencies on other projects, estimated timelines, and resource requirements. The Plan must identify the cost of each potential project and timelines along with the funding source for each project and how those funds will be used.

The revised 2009 Plan appears to meet the essence of the above guideline.

Assign Accountability and Set Deadlines
For each project there should be a clear definition of the agency or project director who is responsible for the project. Each project description should provide a clear set of milestones and expected completion dates for each milestone. This accountability and timeline component of the strategic plan will serve to assist in the State's annual progress evaluation report.

The custodian (or designee) of each of the traffic records system components should be an active member of the TRCC and provide information about any new initiatives or modifications to the existing system so that impending new initiatives or changes are reviewed for their impact on existing systems. The TRCC should have the authority and charge of overseeing the planning and improvement of the key safety data systems within the State. A collaborative approach to developing the plan will be necessary to jointly identify the gaps in existing resources, negotiate with the various authorities to perform each task, and assign who should be responsible, in terms of people and agencies, for completing each task.

Evaluations
Each project plan should include specific criteria that will be used to measure the success or failure of the project in terms of the project's impact on achieving the safety data improvement goals and objectives. By defining in the beginning the expected impact upon measures such as timeliness, accuracy, completeness, integration, uniformity, and accessibility, the success or failure of each project can be determined. Each State will be expected to provide annual evaluations of their various projects and their success toward achieving the goals and objectives as defined in their strategic plan.

Component custodians should provide annual evaluations of their various projects and their success toward achieving the goals and objectives as defined in the Plan. The evaluations should include measures (relating to timeliness, accuracy, completeness, integration, uniformity, and accessibility) for the system component as a whole and to indicate the success or failure of each

project in terms of the project's impact on achieving the safety data improvement goals and objectives.

Support Strategic Highway Safety Planning and Program Management
The TRCC under the leadership of the ECHS developed the State's Strategic Highway Safety Plan (SHSP) and is responsible for the Traffic Safety Information Systems Strategic Plan. A core group of safety officials is involved in both efforts. The collaboration between the State agencies involved in both planning efforts should enable planning and coordination of strategies in each.

The SAFETEA-LU legislation requires a comprehensive SHSP that relies on accurate, timely, and consistent data which must be made available to the State and local safety planners. In order to assure that the required data are available, Congress established a funding program. The Section 408 program calls for funding of state safety data improvement projects. Congress specified that every state shall develop a data-driven, comprehensive, strategic highway safety plan as a precursor to receiving federal safety program funds.

The highway safety community will be well served by the development of a Traffic Safety Information Systems Strategic Plan that is based on a TRCC consensus-built vision and mission and is related to the safety strategies listed in the SHSP, the Highway Safety Improvement Program, the Motor Carrier Safety Plan, and the Highway Safety Performance Plan. It would also enable the TRCC to establish a foundation to address unanticipated changes brought about by demographic shifts, economic downturns, budget shortfalls, and requirements necessitated by new technology and/or new legislation. The Co-Chairs of the TRCC as well as each member should seek support for the initiatives advanced by the TRCC that were determined by the strategic planning process.

Strategic Planning of Training and Quality Control
As mentioned above, component custodians should provide annual evaluations of their various projects and their success toward achieving the goals and objectives as defined in the Plan. The evaluations should include measures (relating to timeliness, accuracy, completeness, integration, uniformity, and accessibility) for the system component as a whole and to indicate the success or failure of each project in terms of the project's impact on achieving the safety data improvement goals and objectives.

A *Model Performance Measures for State Traffic Records Systems* has been published by the NHTSA. The Model recommends quality metrics for each component of a traffic records system. The Model does not state that each of the quality metrics suggested for each component should be applied but does suggest that these measures or others developed by the states should be considered to measure the quality of each component system and to be able to determine the effect of projects on the quality of the system component in general.

Many of the system components do have quality control mechanisms in place through system and logic edits and manual quality assurance procedures. These mechanisms, in many instances, are not enough. The Model provides definitions of the performance measures and examples of how the measures can be applied. It is recommended that these measures be reviewed in the

strategic planning and the project selection processes and applied where appropriate. Consideration of quality control or quality metrics at the planning and implementation stages of a project has more potential for success in measuring quality for a particular system and evaluating the effectiveness of the projects selected.

The results of the quality assurance and control mechanisms should be a primary source of information for ongoing and new training efforts relating to data collection, data entry, and data use for each system component.

Recommendations:

- ❑ Charge the TRCC with the development of a new Traffic Safety Information Systems Strategic Plan addressing the recommendations in this traffic records assessment. Identify deficiencies apart from those noted in the traffic records assessment by canvassing each TRCC member and especially each traffic records system component custodian for their input.

- ❑ Assure that all TRCC members participate in the development of the Traffic Safety Information Systems Strategic Plan and the selection and priority setting of the projects in the Plan. It is advisable to acquire the skills of a facilitator to conduct workshops for the Plan development.

- ❑ Assure that the information needs suggested by strategies developed for the SHSP are addressed in the strategic planning process.

- ❑ Include items in each TRCC meeting agenda that address progress reports on each system and project, as well as the status of the quality metrics developed by the TRCC following the guidelines in NHTSA's *Model Performance Measures for State Traffic Records Systems.*

1-C: Data Integration

Advisory Excerpt: *The Data IPT Report recommends that States integrate data and expand their linkage opportunities to track traffic safety events among data files. Integrated data should enable driver license and vehicle registration files to be updated with current violations, prevent the wrong driver from being licensed, or keep an unsafe vehicle from being registered. Integration should ensure that all administrative actions are available at the time of the driver's sentencing. Data linkage is an efficient strategy for expanding the data available, while avoiding the expense and delay of new data collection.*

State TRCCs should develop working relationships with the health care community to ensure that the causation, crash, emergency medical services, hospital, and other injury-related data linked during the event can be merged statewide. They should also link to other data such as vehicle insurance, death certificates, medical examiner reports, etc., to support analysis of State-specific public health needs.

Linkage with location-based information such as roadway inventory databases and traffic volume databases at the State level can help identify the kinds of roadway features that experience problems, allowing States to better address these needs through their various maintenance and capital improvement programs. Data integration should be addressed through the following:

- *Create and Maintain a Traffic Records System Inventory.*
  The TRS documentation should show the data elements and their definitions and locations within the various component systems. Ancillary documentation should be available that gives details of the data collection methods, edit/error checking related to each data element, and any known problems or limitations with use of a particular data element. The system inventory should be maintained centrally, ideally in a data clearinghouse, and kept up-to-date through periodic reviews with the custodial agencies. Funding for system development and improvement should include a review of existing systems' contents and capabilities.

- *Support Centralized Access to Linked Data.*
  The traffic records user community should be able to access the major component data files of the TRS through a single portal. To support this access, the State should promote an enterprise architecture and database, and develop a traffic records clearinghouse to serve as the gateway for users. The databases in the clearinghouse should be linked in ways that support highway safety analysis. At a minimum, this would include linkage by location, involved persons, and events.

- *Meet Federal Reporting Requirements.*
  The TRS, where possible, should link to or provide electronic upload files to federal data systems such as FARS, MCMIS/SafetyNet, Highway Performance Monitoring System (HPMS), and others.

- *Support Electronic Data Sharing.*
  The TRS should support standard methods for transporting data between systems. At a minimum, these should include a documented file structure and data definitions for information to be transferred to statewide databases. Standard information transfer formats and protocols, such as XML format and FTP, should be supported.

- *Adhere to State and Federal Privacy and Security Standards.*
  The TRS should make linked data as accessible as possible while safeguarding private information in accordance with State and federal laws. This includes security of information transferred via the Internet or other means.

1-C: Data Integration Status

Create and Maintain a Traffic Records System Inventory

The *North Carolina Traffic Records Guidebook, 2008 edition*, documents the State's Traffic Records System (TRS) inventory. This work in documenting the inventory was outsourced under contract to a local engineering firm and the North Carolina State University engineering department. This comprehensive document details each traffic records component system generally and provides the key characteristics of each file. While the product of this effort is a valuable resource the inventory does not include each system's data elements, or their definitions and locations within the various component systems. There is no centralized detailed inventory as outlined in the *Advisory.*

Support Centralized Access to Linked Data

There is no centralized access to the various component files of the TRS from a single portal, nor were any plans identified to provide for such access. Each component system is controlled and maintained separately by its assigned custodial agency. This decentralized architecture without a single centralized access point is actually more typical in the states.

The North Carolina Department of Transportation's Traffic Engineering Accident Analysis System (TEAAS) is a partially centralized system. This engineering/crash analysis system offers NCDOT traffic engineers access to a merged crash and roadway dataset to analyze crashes that occur on the State's roads in an effort to make the roads safer.

Meet Federal Requirements

North Carolina makes data pertaining to Commercial Motor Vehicle-involved crashes available to the Motor Carrier Management Information System SafetyNet via electronic data transfers from the crash file. North Carolina participates in the Fatality Analysis Reporting System (FARS) and utilizes FAST FARS as well to assist in its compliance obligation to NHTSA. North Carolina is meeting its federal reporting requirements to both systems. More information on these two systems can be found in Section 2-A of the report.

Support Electronic Data Sharing

The crash file appears to have a well-documented file structure that supports electronic data transfer capable of using standard formats and eXtensible Markup Language (XML). This was particularly apparent for the submission of third party vendor Records Management Software (RMS) electronic crash reporting software in use by local law enforcement that are capable of electronic transfer to the statewide crash data file.

Adhere to State and Federal Privacy Security Standards

North Carolina protects personal information from disclosure in compliance with the federal Driver's Privacy Protection Act (DPPA) and the State's statute §20-43-1 governing the disclosure of personal information in motor vehicle records. Equal care appears to be taken to prevent disclosure when similar data is electronically transferred or released.

Recommendations:

- ❑ Task the Traffic Records Coordinating Committee with pursuing stakeholder agency interest in supporting single portal access to linked, centralized traffic record system files to permit a comprehensive view of highway safety analysis considering all components of the traffic records system.

- ❑ Create a centralized detailed inventory of the traffic records system as outlined in the *Advisory*.

1-D: Data Uses and Program Management

Advisory Excerpt: *Data availability and quality directly affect the effectiveness of informed decision making about sound research, programs, and policies. Accurate, comprehensive, and standardized data should be provided in a timely manner to allow the agency or decision-making entities at the State or local levels to:*

- ❑ *Conduct Problem Identification.*
  Problem identification is the process of determining the locations and causes of crashes and their outcomes and of selecting those sites and issues that represent the best opportunity for highway safety improvements. States should be able to conduct problem identification activities with their traffic records system.

- ❑ *Develop Countermeasure Programs and Program Management Procedures.*
  States select and evaluate strategies for preventing crashes and improving crash outcomes. This requires that decision makers can select cost-effective countermeasures and that safety improvement programs and funds should be managed based on data-driven decision making.

- ❑ *Perform Program Evaluation.*
  States should be capable of measuring progress in reducing crash frequency and severity. Ideally, the effectiveness of individual programs and countermeasures should be evaluated and the results used to refine development and management processes.

- ❑ *Support Safety-Related Policies and Planning.*
  The States are responsible for developing SHSPs. These data should be available to support this and other policy and planning efforts such as development of agency-specific traffic safety policies, traffic records strategic planning, safety conscious planning, and others.

- ❑ *Access Analytic Resources.*
  Data users, and decision makers in particular, should have access to resources including skilled analytic personnel and easy to use software tools to support their needs. These tools should be specifically designed to meet needs such as addressing legislative issues (barriers as well as new initiatives), program and countermeasure development, management, and evaluation, as well as meeting all reporting requirements.

- ❑ *Provide Public Access to Data.*
  The TRS should be designed to give the public or general non-government user reasonable access to data files, analytic results, and resources, but still meet State and federal privacy and security standards.

- ❑ *Promote Data Use and Improvement.*
  The TRS should be viewed as more than just a collection of data repositories, and rather as a set of processes, methods, and component systems. Knowledge of how these data should be collected and managed, along with where the bottlenecks and quality problems arise, is critical to users understanding proper ways to apply the data. This knowledge should also aid in identifying areas where improvement is possible.

1-D: Data Uses and Program Management Status

Conduct Problem Identification

The Governor's Highway Safety Program (GHSP) in the North Carolina Department of Transportation (NCDOT) has a staff of ten persons who are responsible for the planning and management of the highway safety programs. In addition to the administrative responsibilities, the GHSP administers the highway safety grant programs and monitors the operations and achievement of them. The highway safety program specialists direct the programs in defined geographical portions of the State (addressing all of the programs operating in an area) and may also serve as the guiding managers for specific topical areas. Thus, the Program has a cadre of cross-trained expert specialists to offer assistance to the localities and the entire State.

The safety program specialists have varying degrees of analytic capability, and they maintain awareness of the progress of projects for which they are responsible. However, the analytic force for the GHSP comes from "outside" support. The Traffic Safety Unit (TSU) also in NCDOT is a first-line major support for problem identification analyses. TSU also provides timely responses to GHSP and all of the requirements within NCDOT and has exclusive access to the most current versions of the crash file. Equally important, TSU has the most comprehensive understanding of the characteristics of the crash file and the caveats that need to be borne in mind when using the latest data content.

The other "outside" support comes from the longstanding relationships with the Highway Safety Research Center (HSRC) at the University of North Carolina and the Institute for Transportation Research and Education (ITRE) at North Carolina State University.

The capabilities and experience of these two universities are among the most longstanding analytic resources available to a highway safety office, and the scope of their work for North Carolina and the nation is legendary. A listing of current specific projects is not included in this report because the snapshot of activity at any single point would be inadequate to illustrate the capabilities of those resources and their contributions to highway safety programs and analyses.

Develop Countermeasure Programs and Program Management Procedures

Countermeasure programs also have been and are being defined by NHTSA. However, the grant program applications have the option of proposing new and innovative countermeasure options. GHSP is now concentrating on the concerns that have been identified by examination of the available data in accordance with NHTSA's current foci.

Perform Program Evaluation

GHSP program managers and grant project directors are responsible for monitoring and evaluation. Programs are evaluated mainly by the measures defined when the projects are established.

Five years of data are normally used in the evaluations, and the 2011 crash data are now almost complete and available to the TSU for analysis. Performance measures are defined at the outset. The critical performance measures are reductions in crashes, injuries and fatalities.

Support Safety-Related Policies and Planning
The Traffic Records Coordinating Committee (TRCC) under the auspices of the Executive Committee for Highway Safety (ECHS) is responsible for developing the Strategic Highway Safety Plan and the Statewide Traffic Records System Strategic Plan. These multi-agency strategic plans are designed to provide all traffic safety agency stakeholders in North Carolina with a planning and coordination tool to allow better collaboration between the stakeholder agencies.

The Governor's Highway Safety Program (GHSP) is viewed as a leader to provide direction for highway safety in North Carolina and, as such, provides safety analysis for problem identification, and countermeasure development. In conjunction with the TSU and HSRC and ITRE the GHSP is well positioned to provide the policy and safety planning direction for the State.

Access Analytic Resources
North Carolina Traffic Records System (TRS) users and decision makers have access to a variety of skilled analytical personnel as well as basic and sophisticated analytical software. Most stakeholder agencies have access to some level of in-house analytical expertise, but if none, they do have access to other outside resources to assist them. One such resource is the University of North Carolina's Highway Safety Research Center (HSRC). Established by the North Carolina General Assembly in 1965, the HSRC has been a leading research institute in support of transportation safety. Utilizing SAS as an analytical software tool, the HSRC provides summary data as well as specific responses to crash and roadway queries to assist North Carolina State and local governments in their mission to provide for public safety. Another resource is the North Carolina Department of Transportation (NCDOT) Traffic Engineering Accident Analysis System (TEAAS) that links roadway and crash data together in a merged dataset and is capable of identifying, for example, specific issues with problem intersections. TEAAS is fed from the Oracle crash file every two hours and is a mirror image of the Oracle crash file. Although not publicly available, there is interest in trying to make TEAAS accessible to other governmental agency TRS users and researchers. Other systems that offer analytical capabilities reside within the systems themselves. For example, the North Carolina Highway Patrol utilizes a mainframe database crash file that contains key data fields from their crash reports. This mainframe system has menu-driven options for mining their data and presenting it in a summary statistical format for analysis, problem identification and resource allocation. Additionally, local law enforcement Records Management System (RMS) software inherently offers some degree of analytical capability to the contracting user agency.

Provide Public Access to Data
Certified and non-certified copies of crash reports can be requested in person at any of the DMV offices or through mailing a request to the North Carolina DMV Traffic Records Section. There is a $5 charge for each certified copy of a crash report; non-certified copies are available at no charge. Crash reports are not accessible online.

Crash Facts are accessible through the Traffic Records section of the DMV website (http://www.ncdot.org/dmv/forms/default.html?s=REC). The comprehensive reports contain an abundance of information about motor vehicle crashes as they relate to involvement (pedestrian,

pedalcyclist, motorcyclist), restraint use, alcohol involvement, and demographics (teen drivers) among other factors. Statistics are provided at the state, county, and city levels. North Carolina crash data can be queried at www.hsrc.unc.edu/crash. This query system can create tables based on the crash data at the crash, vehicle, or person level and by state, county, or city level, or even by Highway Patrol area or NC DOT Division. Additional reports can be accessed through the NC DOT website at http://www.ncdot.gov/doh/preconstruct/traffic/safety/crashdata/.

The Injury and Violence Prevention Branch of the Division of Public Health, Department of Health and Human Services publishes several reports on the leading causes of death by injury, hospitalization and emergency department visit data. The reports are further stratified by age, gender, race and county of residence. Links to the CDC for injury data by topic (motor vehicle crash, falls, traumatic brain injury, etc.) are provided as well. These reports can be accessed via http://www.injuryfreenc.ncdhhs.gov/DataSurveillance/DataSurveillanceIndex.htm.

The State Center for Health Statistics (SCHS) within the Division of Public Health, Department of Health and Human Services produces several reports and disseminates data on the health status and health care use of North Carolinians. The SCHS maintains the Health Data Query System, a web-based interactive system that enables users to produce customized health reports by select data elements such as age, race, and county of residence. The queries are based on birth data, mortality data, and population estimates.

The SCHS contracted with the UNC at Charlotte to develop the North Carolina Comprehensive Assessment for Tracking Community Health (NC-CATCH). The county profiles, found at http://www.ncpublichealthcatch.com/ provide "Indicator Fact Sheets" that supply users with public health trends in their counties and throughout the State. NC-CATCH is being phased out in favor of the HealthStat Query System. HealthStat is being modeled on the Indicator Based Information System (IBIS) employed by several states. HealthStat will be an interactive query system enabling users to query a number of health care databases collected and maintained by SCHS. It is expected that users will be able to generate reports based on diagnoses, mechanism of injury, age groups, geographic locations, and more. A prototype is expected by the end of January 2012 and full production expected the following year.

The SCHS published, in February 2011, an online document entitled *Sources of Data for Community Profiles: A Resource Guide for Community Health Assessment in North Carolina*. This booklet inventories the sources of data to which communities can refer to help determine priority health problems, programs to improve these problems, and areas that may require legislative action.

The Carolina Center for Health Informatics in the UNC Department of Emergency Medicine publishes annual reports based on the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) emergency department visit data, the most recent publication covering calendar year 2009. The *Overview and Analysis of NC DETECT* reports (current and previous years) demonstrate the capacity of the emergency department data to provide for syndromic surveillance, describe the state of injury in North Carolina, and provide for public health research. These annual reports can be accessed through the NC DETECT website (www.ncdetect.org) under *Publications & News*.

Another resource for health data is the publication *Injuries to North Carolina Children* published by North Carolina SafeKids. The reports (current and previous years) can be accessed through the SafeKids website, www.ncsafekids.org.

Promote Data Use and Improvement

The Traffic Records Coordinating Committee (TRCC) has the responsibility to ensure that data users have access to the available data to perform research, make appropriate decisions about policies, or measure success or failure of efforts to improve traffic safety. One of the most effective means by which to promote data use is to make the data readily available.

Agencies that are the custodians of records in most aspects of traffic records seem to be willing to share the data. The TRCC is ideal to lead the charge to make the agencies involved "data aware." The typical data sources are shared when needed. A full inventory of the available data and the contact information for requesting access is an effective means for making the data available.

With the advent of data sharing models, the availability of data could be improved within the State by enabling these technologies for ad hoc and commonly requested datasets. The datasets and tools are currently available for agencies to gather the data. Nationally recognized standards will allow the data to be more accessible by users of the data with less maintenance by the custodians of the data.

Recommendations:

- ❑ Develop an online query system by which an individual can query the crash records using specific identifying information; charge users who find matching crash reports a fee (e.g., $10 per crash report) to access and download.

- ❑ Create a Fatality Statistics web page that presents a near real-time daily count of fatalities, comparing the year-to-date count to 'this time last year', as well as counts for holiday periods with the same current year to previous year comparison.

- ❑ Make the traffic crash statistics and the query system easier to access on the Department of Transportation website. While the Crash Facts are easily accessed, the more specific, targeted reports are buried further into the website.

SECTION 2: TRAFFIC RECORDS SYSTEM COMPONENTS

Advisory Excerpt: *At the time of passage of the Highway Safety Act of 1966, State centralized TRS generally contained basic files on crashes, drivers, vehicles, and roadways. Some States added data on traffic safety-related education, either as a separate file or as a subset of the Driver File. As traffic safety programs matured, many States incorporated EMS and Citation/Conviction Files for use in safety programs. Additionally, some States and localities maintain a Safety Management File that consists of summary data from the central files that can be used for problem identification and safety planning.*

As the capabilities of computer hardware and software systems increased and the availability of powerful systems has expanded to the local level, many States have adopted a more distributed model of data processing. For this reason, the model of a TRS needs to incorporate a view of information and information flow, as opposed to focusing only on the files in which that information resides.

Under this more distributed model, it does not matter whether data for a given system component are housed in a single database on a single computer or spread throughout the State on multiple local systems. What matters is whether the information is available to users, in a form they can use, and that these data are of sufficient quality to support its intended uses. Thus, it is important to look at information sources. These information sources have been grouped to form the major components of a TRS:

- ❑ *Crash Information*
- ❑ *Roadway Information*
- ❑ *Driver Information*
- ❑ *Vehicle Information*
- ❑ *Citation/Adjudication Information*
- ❑ *Statewide Injury Surveillance Information*

Together, these components provide information about places, property, and people involved in crashes and about the factors that may have contributed to the crash or traffic stop. The system should also contain information that may be used to judge the relative magnitude of problems identified through analysis of data in the TRS. This includes demographic data (social statistics about the general population such as geographic area of residence, age, gender, ethnicity, etc.) to account for differences in exposure (normalization) and data for benefit/cost and cost effectiveness determinations. Performance level data should be included to support countermeasure management.

A frequently used overview of the contents of a TRS is the Haddon Matrix, named after its developer, William Haddon, the first NHTSA Administrator. It provides a valuable framework for viewing the primary effects of Human, Vehicle, and Environmental factors and their influence before, during, and after a crash event. Table 1 is based on the Haddon Matrix.

Table 1: Expanded Haddon Matrix With Example Highway Safety Categories

	Human	***Vehicle***	***Environment***
Pre-Crash	· *Age* · *Gender* · *Experience* · *Alcohol/Drugs* · *Physiological Condition* · *Psychological Condition* · *Familiarity with Road & Vehicle* · *Distraction* · *Conviction & Crash History* · *License Status* · *Speed*	· *Crash Avoidance* · *Vehicle Type* · *Size & Weight* · *Safety Condition, Defects* · *Brakes* · *Tires* · *Vehicle Age* · *Safety Features Installed* · *Registration*	· *Visibility* · *Weather/Season* · *Lighting* · *Divided Highways* · *Signalization* · *Geographic Location* · *Roadway Class, Surface, Cross-Section, Alignment, etc.* · *Structures* · *Traffic Control Devices, Signs, Delineations, and Markings* · *Roadside Appurtenances, Buildups, Driveways, etc.* · *Volume of Traffic* · *Work Zone* · *Animal Range Land & Seasonal Movements*

Crash	· *Belt Use* · *Human Tolerance* · *Size* · *Seating Position* · *Helmet Use*	· *Crash-Worthiness* · *Passenger Restraints* · *Airbags and Airbag Shutoff*	· *Guardrails* · *Median Barriers* · *Breakaway Posts* · *Rumble Strips and Other Safety Devices* · *Maintenance Status of Roadway and Devices*
Post-Crash	· *Age* · *Physical Condition* · *Insurance Status* · *Access to Health Care* · *Driver Control Actions* · *Court Actions* · *Probation*	· *Post Crash Fires* · *Fuel Leakage* · *Power Cell Securement* · *Hazardous Materials* · *Title*	· *Traffic Management* · *Bystander Care* · *EMS System* · *First Responders* · *Hospital Treatment* · *Long-Term Rehabilitation*

The Haddon Matrix has proven to be a meaningful way to examine primary effects of contributing factors on crash frequency and severity. It helps decision makers to consider countermeasures designed to address specific contributing factors. In recent years, with availability of more detailed data analyses, awareness has grown about the interactions among contributing factors. A good example of such interactions would be weather and drivers' skill or experience levels. To make the contribution of interaction effects more obvious, the matrix in Table 2 can be used to supplement the Haddon Matrix.

Table Bachand: Examples of the Interactions among Crash Characteristics

	Human	***Vehicle***	***Environment***
Human	· *Road Rage* · *Ped/Bike Behavior & Driver Behavior* · *Driver Age & Passenger Age & Number*	· *Familiarity with Vehicle & Training* · *License Class & Vehicle Type* · *Rollover Propensity & Driver Actions* · *Vehicle Ergonomics & Person Size*	· *Crash Avoidance* · *Vehicle Type* · *Familiarity with Roadway* · *Experience with Weather Conditions*
Vehicle		· *Vehicle Size Weight Mismatch* · *Under-Ride/Over-Ride* · *Shared Roads, No-Zone* · *Tire Inflation & Rollover Propensity*	· *Rollover Propensity & Road Configuration* · *Roadway Debris & Vehicle Size Weight* · *Vehicle Type & Weather Conditions* · *Vehicle Condition & Weather Conditions*
Environment			· *Congestion Interaction with Road Type* · *Congestion & Vehicle Mix & Lane Width* · *Animal Management Policies & Roadway Access & Seasons*

Taken together, these views of traffic safety factors offer a way of thinking about highway safety issues that is both conceptually robust and practical. For the purposes of this Advisory, the most important aspect of the TRS is that it supports high-quality decision making to improve highway safety. The remainder of this section of the Advisory presents details about the various components of the TRS.

2-A: Crash Data Component

Advisory Excerpt:

- *Description and Contents*
  The Crash Data Component should document the time, location, environment, and characteristics (e.g., sequence of events, rollover, etc.) of a crash. Through links to other TRS components, the Crash Data Component should identify the roadways, vehicles, and people (e.g., drivers, occupants, pedestrians) involved in the crash. These data should help to document the consequences of the crash (e.g., fatalities, injuries, property damage, and violations charged), support the analysis of crashes in general, and the analysis of crashes within specific categories defined by:

  - *person characteristics (e.g., age or gender)*
  - *location characteristics (e.g., roadway type or specific intersections)*
  - *vehicle characteristics (e.g., condition and legal status)*
  - *the interaction of various components (e.g., time of day, day of week, weather, driver actions, pedestrian actions, etc.)*

  The Crash Data Component of the TRS contains basic information about every reportable (as defined by State statute) motor vehicle crash on any public roadway in the State.

- *Applicable Guidelines*
  Details of various data elements to be collected are described in a number of publications. The MMUCC provides a guideline for a suggested minimum set of data elements to be collected for each crash. Additional information should be collected for crashes involving an injury or fatality to meet the tracking and analysis requirements for the State and other systems (e.g., the FARS, SafetyNet).

- *Data Dictionary*
  Crash data should be collected using a uniform crash report form that, where applicable, has been designed and implemented to support electronic field data collection. Law enforcement personnel should receive adequate training at the academy and during periodic refreshers, to ensure that they know the purpose and uses for the data as well as how to complete each field on the form accurately.

  Information from the quality control program should be used to develop and improve the content of training. The training manual on crash reporting should be available to all law enforcement personnel. The instructions in the manual should match the edit checks that are performed on the crash data prior to its being added to the statewide crash database. The edit checks should be documented and sufficient to flag common and serious errors in the data. For example, these errors include missing or out of range values in single fields and logical inconsistencies between the data recorded in multiple fields (e.g., time of day is midnight and the lighting condition is coded as daylight). All data element definitions and all system edits should be shared with collectors, managers, and users in the form of a data dictionary that is consistent with the training manual and the crash report form.

- *Process Flow*
  The steps from initial crash event to final entry into the statewide crash data system should be documented in process flow diagrams. The diagram should be annotated to show the time required to complete each step and to show alternate flows and timelines depending on whether the reports are submitted in hardcopy or electronically to the statewide system. The process flow diagram should include procedures for error correction and error handling (i.e., returning reports to the originating officer/department, correction, resubmission, etc.). Process flow diagrams should show all major steps whether accomplished by staff or automated systems and should clearly distinguish between the two.

- *Interface with Other Components*
  The Crash Data Component has interfaces, using common linking variables shown in Table 3, to other TRS components to support the following functions:

- *Driver and vehicle data should be used to verify and validate the person and vehicle information during data entry and to flag records for possible updating in the driver or vehicle files when a discrepancy is identified. Key variables such as driver license number, vehicle identification number (VIN), license plate number, name, address, and date of birth should be available to support matching of records among the files. The Driver Data Component should also enable access to drivers' histories of crashes and convictions for traffic violations.*
- *Crash data should be linked to roadway inventory and other roadway characteristics based upon location information and other automated and manual coding methods. This linkage supports location-based analysis of crash frequency and severity as well as crash rate calculations based on location-specific traffic counts.*
- *Law enforcement personnel should be able to link crash, contact, incident, citation, and alcohol/drug test results through their own department's records and/or a secure law enforcement information network. For agencies with computer-aided dispatch and/or a records management system, the crash data should be linked to other data through incident, dispatch, and/or crash numbers and by names and locations to support analysis at the local level.*
- *Linkage to injury surveillance data should be possible either directly or through probabilistic linkage in order to support analysis of crash outcomes and overall costs of treatment. Key variables for direct linkage include names of injured persons or EMS run report number. Key variables for probabilistic linkage include the crash date and time, crash location, person characteristics such as date of birth and gender, EMS run report number, and other particulars of the crash.*

Table 3: Common Linking Variables between Crash And Other Data Components of a Traffic Records System

Crash Linkages to Other Law Enforcement and Court Files	- *Incident Number* - *Location (street address, description, coordinates, etc.)* - *Personal ID (name, address, DL number, etc.)*
Crash Linkages to Roadway Information	- *Location Coding (linear referencing system, reference post, coordinates, local street codes)*
Crash Linkages to Driver and Vehicle Information	- *Driver License Number* - *Vehicle Identification Number* - *Personal Identifiers (name, address, date of birth, etc.)*
Crash Linkages to Statewide Injury Surveillance System Information	- *Personal Identifiers (where allowed by law)* - *Crash Date, Time, Location* - *EMS Run Report Number* - *Unique Patient ID Number*

Furthermore, there should be data transfer and sharing linkages between State and local crash databases. The State crash data system should support the electronic transfer of crash data from a variety of law enforcement agencies' (LEAs) records management systems. The State's crash data system management should publish the specifications and editing requirements for generating the outputs from the various agency systems that can be processed into the official State crash data system.

- ❑ *Quality Control Program*

The crash data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the information in the Crash Data Component should be assured based on a formal program of error/edit checking as the data are entered into the statewide system. In addition, the custodial agency and the TRCC frequently work together to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The crash data managers should receive periodic data quality reports. There should be procedures for sharing the information with data collectors through individual and agency-level feedback, as well as training and changes to the crash report instruction manual, edit checks, and data dictionary. Example measurements are presented in Table 4

Table 1: Examples of Quality Control Measurements for Crash Data

Timeliness	- *# days from crash event to receipt for data entry on statewide database* - *# days for manual data entry* - *# days for upload of electronic data* - *Average # of days to enter crashes into the system* - *Average # of days of backlogged crash reports to be entered*
Accuracy	- *% of crashes "locatable" using roadway location coding method* - *% VINs that are valid (e.g., match to vehicle records that are validated with VIN checking software)* - *% of interstate motor carriers "matched" in MCMIS* - *% crash reports with uncorrected errors* - *% crash reports returned to local agency for correction*
Completeness	- *% LEAs with an unexplained drop in reporting one year to the next* - *% LEAs with expected number of crashes each month* - *% FARS/MCMIS match* - *% FARS/State Crash fatality match*
Consistency	- *% time that an unknown code is used in fields with that possible value* - *% logical error checks that fail* - *% compliance with MMUCC guidelines*

The measures in Table 4 are examples of high-level management indicators of quality. The crash file managers should have access to a greater number of measures and be prepared to present a standard set of summary measures to the TRCC on a periodic schedule, such as monthly or quarterly.

2-A: Crash Data Component Status

Description and Contents

The North Carolina Department of Transportation (NCDOT), Division of Motor Vehicles (DMV) Vehicle Services/Traffic Records Branch (TRB) is the official custodian of the State's crash file. The crash file is supported by an Oracle database and contains every data element captured from all of the structured data fields as well as the officer's full narrative from the North Carolina crash report form. The current crash file was implemented in 1999 and there has not been a major re-write of the database since its inception.

The crash report is documented in North Carolina in two formats. The paper form DMV-349 is still in use and accounts for approximately 45 percent of the annual volume of about 281,000 crash reports submitted. Electronic crash reports account for the remainder of the balance and are generated from two sources. The first source is the State-supplied Traffic and Criminal Software known as the National Model originally developed by the State of Iowa and in use in various states throughout the country. Known primarily by its acronym name "TraCS", this form-based crash reporting software was developed for North Carolina use by the NCDOT Information Technology (IT) staff and contains over 300 data fields and performs validation edit routines of State-mandated business rules for accuracy and completeness. The second source of the electronic report submissions comes from a variety of Records Management System (RMS) third-party software vendors who offer crash data field collection modules as part of their RMS product. These third-party vendor software products are called "e-crash". E-crash reports also conform to the State mandated business rule edits. Although created electronically, e-crash reports must be printed by the agency and submitted in hard copy to the TRB at this time.

Approximately 700 local, tribal, and state law enforcement agencies contribute crash reports to the TRB as mandated by North Carolina Statute §20-166.1. North Carolina motor vehicle laws require a report of investigation to be made whenever a motor vehicle traffic crash results in a fatality, personal injury, property damage equal to or in excess of $1,000.00, or property damage of any amount to a vehicle seized by the police that is subject to forfeiture. The aforementioned statute mandates that reportable crashes are documented on forms supplied by the DMV and requires the appropriate law enforcement agency of jurisdiction to make a report of the crash within 24 hours. Completed crash reports must be forwarded to the TRB within ten days.

The DMV-349 crash report documents the time, date, location, environment and characteristics of the crash. Roadway names consistent with those in the State-maintained roadway file are provided in drop down boxes on the electronic versions of the form. Links to the driver file within the application allow users of the electronic form to make queries by name or driver license number for importing DMV record information on the driver into the form without the need for keystroke entry by the officer. In similar fashion, officers can link to the vehicle file to obtain vehicle descriptive and ownership information by entering the registration number affixed to the vehicle if registered in North Carolina. Data collected on both versions of the crash form adequately documents the crash with respect to the roadways, vehicles, people involved, and the consequences of the crash. In addition, the crash data form sufficiently supports the analysis of crashes in North Carolina within the various categories outlined in the *Advisory*.

Applicable Guidelines
North Carolina uses the MMUCC guidelines and ANSI D16.1 standards to capture and classify crash data, i.e., first harmful event, school bus, work zone, occupant protection, non-motor vehicle crashes, etc. A 2007 internal assessment to determine the percentage of MMUCC compliance indicated North Carolina's rate of compliance to be approximately 96 percent at the attribute level. NCDOT TRB oversees the State's participation in the Fatality Analysis Reporting System (FARS) and North Carolina is meeting the requirements for reporting to FARS. North Carolina recorded 1,224 fatal crashes resulting in 1,311 fatalities in 2010. Likewise, North Carolina is also meeting its obligations for reporting to the Motor Carrier Management Information System/SafetyNet. The North Carolina State Highway Patrol (NCSHP) administers the State's participation in SafetyNet. Although North Carolina reported having poor ratings in previous periods from SafetyNet within the past five rating periods they have achieved a status of "green" in all categories of completeness, accuracy, and timeliness for both crash and inspection reporting. North Carolina recorded 12,049 CMV crashes in 2010, 124 of which were fatal CMV crashes.

Data Dictionary
A well-documented data dictionary exists describing in detail each data element including the element's definition, source, attributes, and rationale. This document was recently updated and published November 4, 2011 by NCDOT DMV. The data dictionary supports both paper and electronic field data collection.

Training
Law enforcement officers are required to receive 620 hours of Basic Law Enforcement Training prior to becoming employed as a law enforcement officer within the State. Some of the larger police departments operate recruit academy training but a large number of future officers are trained by community colleges providing and following the state minimum mandated curriculum. Training in crash investigation and reporting varies depending on the academy supplying the training. As few as 20 hours and as many as 80 hours are provided to recruits in the area of crash investigation and reporting. Input from stakeholder agencies, not just law enforcement participants, indicated there needs to be more emphasis on academy training and follow up in-service training. North Carolina also mandates a minimum number of in-service training and agency participants reported a recent block of four hours of instruction to address issues related to the completion of the e-crash form.

A training manual is available for both paper and electronic reporting. The manuals are available in PDF and hard copy. The manuals support the edit checks performed by the TRB prior to the crash report being accepted into the crash database. Issues identified from the quality control program to be described in detail later within this section should be used to enhance the quality of the training. Unfortunately this is not being done at this time and should become one of the primary goals of the TRB and the Traffic Records Coordinating Committee (TRCC) in its future planning sessions.

Process Flow
Process flow diagrams for the paper form DMV-349 as well as the e-crash and TraCS electronic submission processes are available and document the steps in the process as well as procedures for error correction and error handling. Some of the areas missing from each of the process flow diagrams: the timeframes required to complete each process, the documentation of the steps to the assignment of the crash, and those involved by the individual agency's in-house quality control review prior to submission to the TRB.

Interface with Other Components
Driver and vehicle files are used during the crash data collection process to validate and verify the drivers and vehicles involved in the crash. The electronic crash collection process provides a direct linkage to the driver and vehicle file to query by key field and import data from each file into the appropriate fields in the e-crash and TraCS applications. There is no additional capability between the crash collection process and the driver and vehicle file. No other communication between the other TRS files is known to exist to support the crash data collection process.

Crash, citation, and Computer Aided Dispatch (CAD) data may be contained within local agency RMS systems. Most agencies who have a RMS do store their own data; however, some use the State-supplied resources when made available to them. RMS data for crash, citation, and CAD are linked by common fields and are used to support analysis of these datasets at the agency level.

As for the individual files of the TRS, two that are truly routinely linked or merged together for analysis are the roadway and crash files. Location data common to both files creates the linkage capability enabling NCDOT engineers to produce meaningful statistical analysis information on specific roadways, at specific intersections, or along specific milepost segments of its roadway system utilizing the Traffic Engineering Accident Analysis System (TEAAS) software. The crash data in TEAAS is a mirror image of the Oracle crash file and is transmitted to TEAAS every two hours. More information about TEASS can be found at https://dmvcrashweb.dot.state.nc.us/TEAAS.

Key linking fields common to other files exist and support research analyses when two or more of the files are examined together. Except for the crash and roadway files, while linkages exist, the other files of the TRS are not regularly linked or merged together except for specific research requests. North Carolina cited instances when driver and crash data were analyzed together as were medical outcome and crash data but only for specific research purposes.

Quality Control Program
The North Carolina crash report database is supported by a strong quality control program beginning with two versions of electronic reporting paths that include field validation error checking rules intended to improve the accuracy and completeness of the electronic crash reports. NCDOT has included field edit checks to structured data fields designed to enforce compliance with business rules and approved field content. North Carolina makes use of drop down boxes very effectively by forcing the selection from approved data field content tables.

Roadway names are selected in this manner and this process helps to properly name and ultimately locate the roadways involved in the crash.

Paper crash reports submitted on the DOT form DMV-349 are subjected to the same validation edit checks during the data entry process at the TRB.

Agencies completing the e-crash electronic version from their RMS vendors complete the form electronically and during the collection, the entry is subjected to the field edits described as well as a final overall validation upon completion. If the e-crash report does not pass validation, the report cannot be submitted to the agency for approval. Once the report is successfully validated, the officer electronically submits the crash report to a middleware component of their RMS. Most agencies then have their vendor extract portions of the data for import to their RMS and some import the entire report. Supervisors review and approve or reject the report for corrections to be made by the officer. When finally approved the report must be printed and forwarded in hard copy to the DOT TRB for data entry. For both paper completed forms and printed forms generated from e-crash systems, agencies will forward them to the TRB via US Mail with a frequency that is economical and convenient. For example, agencies will generally wait for a bulk number to accumulate before they mail the completed reports to the TRB. While the law mandates the reports be submitted to the TRB within ten days, some batches of reports arrive after the ten day benchmark, but this process does not seem to be problematic and no concerns were expressed where timeliness was an issue. NCDOT IT staff just recently completed a pilot with three local agencies who use the same RMS vendor to enable their system to submit completed and successfully validated e-crash reports electronically using an eXtensible Markup Language (XML) exchange. This pilot with Garner PD, Charlotte-Mecklenburg PD, and Raleigh Police Department was successful and the NCDOT is poised to address the other vendors who supply RMS software in North Carolina. NCDOT estimated that 30 percent of the total crash report volume annually is submitted by printed reports from RMS vendors' systems that capture crash reports electronically. Addressing these additional vendor systems as quickly as possible now after the successful completion of the pilot will improve the timely submission of these reports and also eliminate the redundant data entry imposed on the data capture staff.

Agencies completing the TraCS version of the electronic report are able to electronically submit completed reports to the TRB. TraCS users collect the data in a similar fashion as e-crash users and the data are subjected to the same field edits and validation process. For local law enforcement completed TraCS reports are first sent to a server within their agency for supervisory review and approval. Once approved, the agency may extract the data to their RMS, print and file a hard copy or rely on the Crash Website where NCDOT makes the PDF images available to user agencies. The only exception to this process flow occurs with NCSHP TraCS users who submit their completed and successfully validated reports directly to the TRB. No supervisory approval process occurs within the NCSHP. Supervisors, as well as individual officers, can monitor the status of their crash reports for any corrections via the NCDOT Crash Website. During the submission process to the TRB from the NCSHP, a program extracts key data fields and automatically uploads this data to the NCSHP mainframe crash file. The NCSHP mainframe crash file does not contain all the data elements from the submitted crash reports; instead the file contains sufficient data fields for crash analysis by the NCSHP for the agency's internal use.

Submitted paper DMV-349 crash reports from law enforcement agencies are processed by the TRB Crash Reporting Unit. Paper crash reports are reviewed and any fatal crash reports are separated and a copy is made and placed in a mail bin for FARS entry. All paper crash reports are reviewed and sorted by age with the oldest reports staged to be the first entered. Each report is scanned into a PDF image. A second group of people called the Data Capture Staff bring up the scanned images one at a time on their computer screen and from this image the entry clerk keys the data from the form one field at a time into the front-end data entry screens in the same sequence they are presented in the report. Approximately 300 fields are entered during the process depending on the complexity of the crash. The staff is trained to enter only what they see on the report, and the daily goal of each data entry staff member is 55 crash reports per day. Once the process is complete, the keyed-in report must once again pass validation edits. If it does not pass, errors are listed and the data entry staff tries to resolve them. If they cannot, they try to contact the officer or the agency for assistance. If that effort is unsuccessful the report is returned to the officer for correction and tracked through a log to ensure they are returned. It is rare for the TRB to have to return paper copies of the report, and they can usually resolve the problem by contacting the officer or the supervisor. If the paper crash report passes all of the validation edits after being keyed into the system, the report is then uploaded into the Oracle crash database and given a tracking number. The PDF image is appended to the Crash Website and linked to the record in the crash database.

Electronic receipts of submitted crash reports are electronically subjected to the same validation process as the keyed manual reports. Fatal crash reports having an injury class of 1 (field value for a fatal injury) are printed and placed into the mail bin for the FARS analysts. During the XML transfer from the submitting agency, an image is created from the XML transmission. Notification of a rejected report is made to the officer via email or phone and the officer can view the error, the data from the report, and the image of the report on the DOT Crash Website. The officer simply corrects the error(s) and resubmits the report. If the correction(s) made pass the validation process, the report is appended into the Oracle crash database and given a tracking number. The image remains on the Crash Website and is linked to the record in the crash database. As indicated earlier officers and supervisors have the ability to monitor the status of their submissions on the Crash Website. Once they log into the system, they would see if any reports have been returned to their agency and the specific officer whose report was returned can make the changes necessary and resubmit the crash to the TRB.

The Data Capture Staff are currently entering paper crash reports from the end of December 2011. It takes approximately five days from the date of receipt of a paper crash report to be successfully entered into the Oracle crash database. Electronic reports are usually successfully entered electronically within 24 - 48 hours after receipt. There does not appear to be any concern or issues related to untimely entry or the requirement to address any significant queue or backlog.

A special form to notify the FARS analyst of the occurrence of a fatal crash is provided by the DOT DMV TRB. This form is called the Crash Fatality Notification Form and is supposed to be submitted by an investigating agency within 24 hours of the occurrence of a fatal crash. The form is submitted by email to the FARS analyst and this provides the information for entry into

FAST FARS. The FARS analyst noted monitoring a variety of sources to ensure notification of all fatalities and was confident that all fatal crash reports are identified and submitted for entry into FARS. Not every agency interviewed was aware of the existence of the notification form in use and it will be a recommendation that some outreach by the TRB take place to ensure consistency in the use of the notification form. BAC results of deceased drivers as well as other supplemental information not available in the original report appear to be consistently obtained. North Carolina experiences approximately 1,200 fatal crashes each year and is exceeding the threshold 95 percent established by FARS for timely, accurate, and completeness in reporting fatal crash data.

Crashes involving Commercial Motor Vehicles (CMV) are processed in the regular order of business. Paper CMV crash reports are subjected to the edit validation process during and after entry by the Data Capture staff that checks these reports for the required data elements necessary for inclusion with a CMV crash. Initial errors caught during the validation process are either returned or corrected as previously indicated. When CMV crash reports successfully pass the final validation and are appended into the crash file Oracle database, an electronic transfer of the CMV crashes that were uploaded is made in the form of a spreadsheet and submitted electronically to the NCSHP CMV Unit SafetyNet analyst. The SafetyNet analyst reviews the data, makes any corrections necessary, and then transfers the data electronically to SafetyNet. NCSHP has 250 CMV enforcement units statewide whose members provide inspection services upon request in crashes involving CMVs. Local agencies handle their own CMV crashes. Recent training for local officers and a push by NCSHP to encourage calls to them for assistance in conducting inspections for local agencies investigating CMV crashes has led to a better understanding of the information required to be collected in CMV crash investigations and how and where to obtain it. In addition, this renewed effort has led to an improved reporting and inspections rating for the state involving CMV crashes. Previously the responsibility of NCDOT, the SafetyNet program now falls under the NCSHP. North Carolina had been experiencing unsatisfactory ratings from FMCSA/SafetyNet in 2010 and in prior years. North Carolina has corrected the problem areas of reporting to FMCSA and recommitted itself to achieving satisfactory ratings by making some organizational and operational changes. This rededication to submit timely, accurate, and complete CMV crash and inspection data to SafetyNet has been a combined effort between North Carolina DOT and NCSHP resulting in favorable “green” ratings for the last five quarter reporting periods.

North Carolina has a very impressive business process that results in a high degree of confidence and accuracy in its crash file. Users expressed this and it is evident by the care they take to identify and correct errors prior to any report being formally accepted into the crash file. There are however some areas of concern. Not all fields can be validated and one thing North Carolina seems to need is an accurate way of determining what areas of the crash report collection process require additional training. For example, some areas mentioned that were confusing to the officers were the collision type, i.e., angle type collisions, the classification of injuries, and in particular, roadway identification in order for NCDOT to properly milepost a given crash. It would seem that NCDOT TRB does a great job identifying errors but apparently does not keep track of these errors once they are corrected and only provides metrics for final successful entry into the Oracle database where the detected error rate has to be zero. Some fields cannot be validated like location information where roadway names, incorrectly identified intersecting

roadways, or distances to such references cause problems in the milepost process. These errors do slip through and usually do not get identified until DOT engineers encounter them in the TEAAS application. NCDOT needs a process to communicate the root cause of these errors back to the collecting officers, their agencies, or even to ensure the issue is covered in in-service or academy training curriculums. The team identified no routine metric performance-based reports that are prepared and communicated back to the law enforcement agencies. In addition, the lack of sufficient training hours dedicated to understanding the need for crash collection, why it is done, and an emphasis on properly collecting crash data on the report was also identified as a need. As it stands today, only 20 hours on average are dedicated to recruit training for most officers in the area of crash investigation.

The DMV-349 form in both formats includes a very comprehensive dataset documenting the crash event. One area that appeared to be deficient was the lack of a specific place to enter citation numbers on the report. Citation numbers are included by the officer on the paper form, but there is apparently no field in the electronic report or in the Oracle crash file to store citation numbers issued to a driver at a crash. This would prevent an opportunity to link the crash and citation files by the most obvious key field in the citation file.

Some issues were identified that if solutions were implemented could result in an improved crash report product. One was the ability to provide value-added information to the officer by checking the state and national warrant file whenever a name and personal identifier was entered into the crash form. This can be automated in the electronic version of the crash report by a search routine using middleware to make a direct call to the respective warrant databases. Another recommendation is to explore how image files (digital photos) could be attached, submitted, and stored with the master crash record.

One final concern the assessment team discovered was there may be a demand to create a short form of the DMV-349 report. Charlotte-Mecklenburg PD had their RMS vendor create a short form crash report that could be used to document crashes falling under the reporting threshold for damage-only crashes. Currently, NCDOT does not accept such crashes and it was felt that crashes being documented on this form may actually be reportable. Because officers are not trained to estimate damage accurately what may statistically appear to be a decrease in reportable crash rates may actually be a false indicator. For example, officers may intentionally under-estimate the amount of damage so they can use the short form. This should not be discounted as a valuable suggestion for improvement. NCDOT should carefully examine this option for it appears this could be a reasonable solution to address minor crashes, especially those involving a single vehicle with an animal. This would have to be carefully weighed and implemented to solve a problem but not create a new one. NCDOT does not accept crashes not meeting the reporting threshold but they easily could and this suggestion by Charlotte-Mecklenburg PD should be explored by NCDOT as a new opportunity. NCDOT should identify the various options to capitalize on Charlotte-Mecklenburg's effort and creativity and involve that agency in the eventual solution. Ultimately, NCDOT can achieve a win-win for everyone by finding a way to continue to obtain the crash data it needs while helping to make crash reporting easier when the circumstances fit.

NCDOT future plans include a migration from their current TraCS version 7.3 to TraCS web and TraCS version 10.0. They will have to also consider what changes come into play in the migration that will also affect the third-party RMS vendor solutions and the potential cost involved in this declining economy. Furthermore, it does not appear likely that NCDOT will be able to completely eliminate the paper based form from the process. Because they want to have consistency among all three versions, the TRCC and the NCDOT TRB need to weigh this decision carefully and evaluate the risks and opportunities to such a decision.

Metrics provided by NCDOT TRB are reflected in the table below.

Timeliness	# days from crash event to receipt for data entry on statewide database = **within 30 days** # days for manual data entry = **One Week** # days for upload of electronic data = **24 – 48 hrs.** % reports entered into the system within 30 days of the crash = **> 95%** % reports aged more than 60 days = **0**
Accuracy	% of crashes "locatable" using roadway location coding method = **75%** % VINs that are valid (i.e., match to vehicle record and decode) = **95%** % of interstate motor carriers "matched" in MCMIS = **99%** % crash reports with 1 or more uncorrected "fatal" errors = **0** % crash reports with 2 or more uncorrected "serious, non-fatal" errors = **0** % crash reports with 5 or more uncorrected "minor" errors = **0**
Completeness	% LEAs with > 10% unexplained drop in reporting one year to the next = **0** % LEAs within 5% of "expected" number of crashes each month = _____ % FARS/MCMIS match = **104%**
Consistency	% of time "unknown" code is used in fields with that possible value = **5.29%** **Note: This number is based on the Crash Reports for the year 2010 with the fields that had "UNKNOWN" value on the NC DMV-349 form for one of the 50 code types** % logical error checks that fail = **1.53%** **Note: This is based on the number of reports that were rejected by in-house and electronically processed reports.** % compliance with MMUCC guidelines = **96%** **2007 Assessment** (please provide a date and source for this estimate)

Recommendations:

- ❑ Expand the capability as soon as possible to allow the remaining third-party vendors to electronically submit e-crash reports generated from their software.

- ❑ Develop and implement a broader and more specific data quality metric report that can leverage the validation error logs and share them regularly with the law enforcement community. Such an effort will more clearly indicate the level of training required to use and understand the crash report.

- ❑ Develop a process to share the errors identified by Traffic Engineering Accident Analysis System users to communicate those errors to the Traffic Records Branch and the user community.

- ❑ Annotate the process flow diagrams depicting the crash report process to include all steps in the life cycle of the crash report, the time frames required for each step, and any alternate flows possible in the process.

- ❑ Provide for a specific structured field to document citation numbers on all versions of the crash report and include this field in both the data entry process and the Oracle database crash file.

- ❑ Work through the Traffic Records Coordinating Committee to plan for value-added enhancements recommended by law enforcement interviewed in the assessment process, namely automatic warrant checks and the ability to attach digital files to crash report submissions.

- ❑ Study the case for accepting non-reportable crash data into the crash file and work with the Traffic Records Coordinating Committee to develop a short form crash report to address crashes that can easily be handled without a full DMV-349 report. If developed, carefully implement and market the short form crash report to ensure there is no intentional degradation in the reportable crash experience.

- ❑ Evaluate opportunities for the use of GPS devices, (handheld units, locator tool for TraCS, Automated License Plate Reader Technology, Digital Video Cameras, GPS enabled modems, etc.) to enhance the collection of GIS data for identifying location of crash and citation events. Such technology could supplement the existing milepost location reference system and provide greater accuracy and confidence to the locations provided on the crash report and citations using the current method.

- ❑ Utilize the Traffic Records Coordinating Committee to advocate that more recruit and in-service training hours for obtaining and maintaining basic law enforcement training certification be dedicated to proper crash report data collection and CMV identification and documentation. Recommend that this be an integral part of the North Carolina officer training curriculum.

- ❑ Ensure all law enforcement agencies are aware of and regularly use the Crash Fatality Notification Form.

2-B: Roadway Data Component

Advisory Excerpt:

- ❑ *Description and Contents.*
  Roadway information includes roadway location, identification, and classification, as well as a description of a road's total physical characteristics and usage. These attributes should be tied to a location reference system. Linked safety and roadway information are valuable components that support a State's construction and maintenance program development. This roadway information should be available for all public roadways, including local roads.

  The State Department of Transportation (DOT) typically has custodial responsibility for the Roadway Data Component. This component should include various enterprise-related files such as:

  - *Roadway Inventories*
    - *Pavement*
    - *Bridges*
    - *Intersections*
  - *Roadside Appurtenances*
    - *Traffic Control Devices (TCD)*
    - *Guard Rails*
    - *Barriers*
  - *Traffic*
    - *Vehicle Miles Traveled (VMT)*
    - *Travel by Vehicle Type*
  - *Other*
    - *Geographic Information Systems (GIS)*
    - *Location Reference System (LRS)*
    - *Project Inventories*

- ❑ *Applicable Guidelines*
  The major guideline that pertains to the Roadway Data Component is the HPMS. This provides guidance to the States on standards for sample data collection and reporting for traffic volume counts, inventory, capacity, delay, and pavement management data elements. Guidelines and tools that address roadway data, as well as identifying which of these are expected to have the greatest correlation with crash incidences, should be considered part of this advisory. Examples of these resources are the Highway Safety Manual, Safety Analyst, and the Interactive Highway Safety Design Model. In addition, the American Association of State Highway and Transportation Officials (AASHTO) is developing a series of guides for its Strategic Highway Safety Plan. This multi-year cooperative effort includes guidelines relevant to several TRS components.

- ❑ *Data Dictionary*
  Roadway information should be available for all public roads in the State whether under State or local jurisdiction. The contents of the Roadway Data Component should be well documented, including data definitions for each field, edit checks, and data collection guidelines that match the data definitions. Procedures for collection of traffic data and calculation of vehicle miles traveled (VMT) should be documented as well.

- ❑ *Process Flow*
  The steps from initial event to final entry onto the statewide roadway data system should be documented in process flow diagrams for each file that are part of the Roadway Data Component. The diagrams should be annotated to show the time required to complete each step and to show alternate flows and timelines depending on whether data are submitted in hardcopy or electronically to the statewide system. The process flow diagram should include processes for error correction and error handling (i.e., returning reports to the original source for correction, resubmission, etc.). Process flow diagrams should show all major steps whether accomplished by staff or with automated systems and clearly distinguish between the two.

- ❑ *Interface with Other Traffic Records System Components*
  A location reference system should be used to link the various components of roadway information as well as other TRS information sources, especially crash information, for analytical purposes. Compatible location coding methodologies should apply to all roadways, whether State or locally maintained. When using a GIS, translations should be automatic between legacy location codes and geographic coordinates. This process should be well

established and documented. Compatible levels of resolution for location coding for crashes and various roadway characteristics should support meaningful analysis of these data.

- *Quality Control Program*
  The roadway data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the roadway data should be assured based on a formal program of error and edit checking as the data are entered into the statewide system and procedures should be in place for addressing the detected errors. In addition, the custodial agency and the TRCC should frequently work together to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The roadway data managers should receive periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback, as well as training and changes to the applicable instruction manuals, edit checks, and roadway data dictionary. Audits and validation checks should be conducted as part of the quality control program to assure the accuracy of specific critical data elements. Example measurements are shown in Table 5.

Table 3: Examples of Quality Control Measurements for Roadway Data

Timeliness	- *% of traffic counts conducted each year* - *# days from crash event to location coding of crashes* - *# days from construction completion to roadway file update*
Accuracy	- *% of crashes locatable using roadway location coding method* - *% errors found during data audits of critical data elements*
Completeness	- *% traffic data based on actual counts no more than 3 years old* - *% public roadways listed in the inventory*

The measures in Table 5 are examples of high-level management indicators of quality. The managers of individual roadway files should have access to a greater number of measures. The custodial agency should be prepared to present a standard set of summary measures to the TRCC monthly or quarterly.

2-B: Roadway Data Component Status

Description and Contents

The North Carolina highway safety community is fortunate to have access to exceptional highway safety information and analytic resources for problem identification and project development and for ad hoc highway safety research. North Carolina has built a solid reputation as a national leader in the area of highway safety and many of the model safety programs that are now utilized across the nation were initially developed and implemented within the State.

The Highway Safety Research Center (HSRC) at the University of North Carolina and the Institute for Transportation Research and Education (ITRE) at the North Carolina State University are available resources for the State's major highway safety stakeholders. The State has made significant improvements in the highway safety information environment since the last traffic records assessment conducted in January of 2007.

Because the electronic collection of traffic crashes has increased appreciably the ability to locate the crash occurrence on the public road system has also increased appreciably. This was due to a software routine built into the automated system that aids in the location process. The North Carolina Department of Transportation (NCDOT) has also made great progress in the development and implementation of the Arc Geographic Information System (GIS) used to house and display roadway characteristics data on the State road system.

The North Carolina Highway System consists of a network of Interstate and State highways managed by NCDOT. North Carolina has one of the largest state maintained highway networks in the United States at almost 80 thousand miles. There is an additional 22 thousand miles of local roads and streets under the jurisdiction of local government authorities.

The NCDOT uses two department information systems to help manage these infrastructure assets and to oversee the safety and mobility of the traveling public. These are the Arc GIS and the Traffic Engineering Accident Analysis System (TEAAS).

An Arc GIS layer displays a visual representation of a subset of road characteristics for the State road system. Each record is split where road characteristics change along a route. This is a digital file of the NCDOT's road inventory database that represents a subset of road characteristic attributes of the State road system. The State road system is comprised of Interstate, US, NC numbered highways and secondary routes, and ramps.

The GIS layer also contains some additional routes to meet the Federal Highway Administration's (FHWA) data requirements for the Highway Performance Monitoring System (HPMS). The additional routes include projected routes that will become part of the National Highway System (NHS) when they are built. There is no connectivity between the State-maintained roads and non-State maintained roads. Data quality is tracked using the *revision document fields*. Road characteristics data are updated on an ongoing basis to improve data quality and the *revision document fields* are updated accordingly. As new data are added the geometry and spatial location are verified with the most current information available.

The TEAAS is a crash analysis software system downloadable from the internet and available free of charge to state government personnel, municipalities, law enforcement agencies, planning organizations, and research entities. TEAAS contains information on all reportable traffic crashes occurring in North Carolina since 1990. It also contains all ordinance information for all state maintained roads and highways.

The analytic process for road safety problem identification and project development is conducted by the Traffic Safety Unit in the Division of Transportation Mobility and Safety.

The major safety initiatives pursued by NCDOT are based on analysis of crash data and are included in the SHSP and the Department's Highway Safety Improvement Program (HSIP).

- The HSIP includes studies of highway segments and intersections with high frequency crash rates, studies of corridors with fatal and serious injury crashes, and road safety audits conducted in the pre-design stage of a road project.
- The North Carolina SHSP was developed under the guidance and direction of the Executive Committee for Highway Safety (ECHS). A vital factor in any successful SHSP is access to quality crash data and other traffic records. With nearly 100,000 miles of state and local maintained roads, having an accurate, up to date traffic records system is imperative to identify and remediate highway safety issues. The ECHS adopted North Carolina's Traffic Records Coordinating Committee (TRCC) as a working group. The TRCC works through the Traffic Safety Unit and the many other agencies that are represented on the ECHS.

The Winston-Salem Department of Transportation conducts a Low Cost Safety Improvement Program that has achieved very positive results to the extent that the NCDOT is embarking on an initiative to entice other large communities in the State to emulate the Winston-Salem experience.

Applicable Guidelines

Guidelines and standards were taken into consideration with the development of the roadway data systems especially with respect to the FHWA's HPMS. The HPMS is a national guideline for reporting to FHWA certain road data on federally aided roads. The HPMS provides guidance to the states on standards for sample data collection and reporting for traffic volume counts, inventory, capacity and delay, and pavement management data elements.

The Traffic Safety Unit is aware of the analytic software tools recommended in the *Highway Safety Manual (HSM)*. Their research analysts are weighing the benefits/costs and feasibility for use in North Carolina. Adoption would require the collection of additional roadway features data and adherence to data requirements for use with the analytic safety software tools. In conjunction with the use of these tools, they are also considering the resources required to collect and maintain the data elements suggested in the Model Inventory of Roadway Elements (MIRE) guideline.

A subset of the MIRE roadway and traffic data elements that are fundamental to support their HSIPs is referred to as the Fundamental Data Elements for HSIP (FDE/HSIP). The fundamental data elements are a basic set of elements an agency would need to conduct enhanced safety analyses regardless of the specific analysis tools used or methods applied. The elements are based on findings in the FHWA report *Background Report: Guidance for Roadway Safety Data to Support the Highway Safety Improvement Program*. Definitions of fundamental data elements may be found in this Background Report. The fundamental data elements have the potential to support other safety and infrastructure programs, in addition to the HSIP.

Data Dictionary
The NCDOT maintains a data dictionary for the roadway files that defines each individual data element and contains data definitions and data collection guidelines.

Process Flow
Process flow diagrams are maintained by NCDOT for the roadway features and inventory systems. The diagrams include the processes for error correction and handling and show both automated and manual processes.

Interface with Other Traffic Records System Components
The NCDOT uses route and milepost as the prime location reference system (LRS) for the State highway system. The road files also include latitude/longitude coordinates as supplemental LRS. The analysis capability is greatly enhanced with the interface of roadway features, traffic volume and crash data to provide merged sets of data which reside in the TEAAS database.

Any traffic records data system that is spatial can be displayed on the LRS and in theory connected to the roadway file or any other data set with a spatial reference.

The HSM, published by the American Association of State Highway Transportation Officials (AASHTO), provides background, analysis methodology and instruction to integrate quantitative estimates of crash frequency and severity into planning, project alternatives analysis, and program development and evaluation, enabling safety to become a meaningful project performance measure.

By applying the HSM tools, improvements in safety have a better chance to be achieved. As public agencies work toward their safety goals, the quantitative methods in the HSM can be used to evaluate which programs and project improvements are achieving desired results. While the Traffic Safety Unit has not implemented the analytic software tools suggested in the HSM they are in agreement with the conceptual methods and are considering either adopting the software available or developing software in-house that would provide similar results.

Quality Control Program

The following table was provided by the Traffic Safety Unit in response to the pre-assessment questionnaire.

Examples of Quality Control Measurements for Roadway Data

Timeliness	- *% of traffic counts conducted each year* **Approximately 60% of all monitoring stations updated annually** - *# days from crash event to location coding of crashes* ***Varies. For electronic reporting we generally have the crash in our system within a couple of days after it has occurred. For those agencies still sending in paper copies, we typically have those crashes available to us within 30 days from the time the crash occurred.*** - *# days from construction completion to roadway file update* **NC has recently trimmed down a significant project backlog of over 300 projects in 2008 to elimination of the backlog in early 2012. The current systems and workflows should allow for all projects to be entered and published within 6 months of being open to traffic.**
Consistency	- *#of data elements consistent with historic data definitions* **Most data elements have followed HPMS requirements for reporting throughout existence, though some differences in interpretation of definitions have been made throughout the existence of NC's roadway data.**
Completeness	- *% traffic data based on actual counts no more than 3 years old* **100% of traffic data based on counts<3 years old** - *% public roadways listed in the inventory* **All known public roads are included in the inventory. Approximately 80% are represented in our LRS data.**
Accuracy	- *% of crashes locatable using roadway location coding method* **Approximately 75%.** - *% errors found during data audits of critical data elements* **This is not currently measured, though audits are being conducted and errors discovered since the inventory has been linked to the LRS and can be mapped.**
Accessibility	- *#of road files accessible to safety stakeholders* **Our LRS is updated and published quarterly on our public facing website. We have crash summary statistics available on the Traffic Safety public facing website. Any safety data is available to the public upon request. Research agencies get copies of the crash database on regular intervals (minus any personal information).**
Data Integration	- *#of other traffic records component files l inked to road files* **Not sure if any other components other than crash data is linked to the roadway files.**

Recommendation:

- ❑ Perform a benefit/cost analysis of collecting the subset of fundamental data elements of MIRE for use in enhanced safety analyses.

2-C: Driver Data Component

Advisory Excerpt:

- *Description and Contents*
  Driver information should include data about the State's population of licensed drivers, as well as data about convicted traffic violators who are not licensed in that State. Information about persons licensed by the State should include: personal identification, driver license number, type of license, license status, driver restrictions, convictions for traffic violations in this State and the history of convictions for critical violations in prior States, crash history whether or not cited for a violation, driver improvement or control actions, and driver education data.

  Custodial responsibility for the Driver Data Component usually resides in a State Department or Division of Motor Vehicles. Some commercial vehicle operator-related functions may be handled separately from the primary custodial responsibility for driver data. The structure of driver databases should be typically oriented to individual customers.

- *Applicable Guidelines*
  The ANSI D-20 standard should be used to develop data definitions for traffic records-related information in the driver and vehicle files. Driver information should be maintained to accommodate information obtained through interaction with the NDR via the PDPS and the CDLIS. This enables the State to maintain complete driving histories and prevent drivers from circumventing driver control actions and obtaining multiple licenses. Data exchange for PDPS and CDLIS should be accomplished using the American Association of Motor Vehicle Administrators (AAMVA) Code Dictionary. Security and personal information verification should be in accordance with the provisions of the Real ID act.

- *Data Dictionary*
  At a minimum, driver information should be available for all licensed drivers in the State and for all drivers convicted of a serious traffic violation (regardless of where or whether the person is licensed). The contents of the driver data files should be well documented with data definitions for each field, and where applicable, edit checks and data collection guidelines that match the data definitions. Procedures for collecting, reporting and posting of license, conviction, and license sanction information should be documented.

- *Process Flow*
  The steps, from initial event (licensure, traffic violation, etc.) to final entry onto the statewide driver and vehicle data files, should be documented in process flow diagrams for each file that is part of the Driver Data Component. The diagram should be annotated to show the time required to complete each step and to show alternate flows and timelines depending on whether the data are submitted in hardcopy or electronically to the statewide system. The process flow diagram should include processes for error correction and error handling (i.e., returning reports to the original source for correction, resubmission, etc.). The process flow should also document the timing, conditions, and procedures for purging records from the driver files. Process flow diagrams should show all major steps whether accomplished by staff or automated systems and clearly distinguish between the two. The steps also should be documented in those States that have administrative authority to suspend licenses based on a DUI arrest independent of the judicial processing of those cases.

- *Interface with Other Traffic Records System Components*
  The Driver Data Component should have interfaces (using common linking variables shown in Table 6) to other TRS components such that the following functions can be supported:

  - *Driver component data should be used to verify/validate the person information during data entry in the crash data system and to flag records for possible updating in the driver or vehicle files when a discrepancy is identified. Key variables such as driver license number, name, address, and date of birth should be available to support matching of records among the files. Social Security Numbers should be validated for interstate records exchange.*

  - *Driver and vehicle owner addresses are useful for geographic analyses in conjunction with crash and roadway data components. Linkage in these cases should be based on conversions of addresses to location codes and/or geographic coordinates in order to match the location coding method used in the roadway data component and in the GIS.*

  - *Links between driver convictions and citation/adjudication histories are useful in citation tracking, as well as in systems for tracking specific types of violators (DUI [Driving Under the Influence] tracking systems, for example). Even if a citation tracking system is lacking, there is value in being able to link to data from enforcement or court records on the initial charges in traffic cases. These linkages should be based usually on driver name and driver license number but other identifiers may be used as well. The National Center for State Courts (NCSC) is looking for these identifiers in addition to methods to improve data sharing. "NCSC offers solutions that enhance court*

operations with the latest technology; collects and interprets the latest data on court operations nationwide; and provides information on proven best practices for improving court operations." (http://www.ncsconline.org/)

- *Linkage to injury surveillance data should be possible either directly or through probabilistic linkage in order to support analysis of crash outcomes and crash risk associated with specific driver characteristics (e.g., the driver's history of violations or crash involvement). Key variables should include names, date of birth, dates, times, and locations of crashes and citations.*

Table 6: Common Linking Variables between Driver And Other Data Components of a Traffic Records System

Driver Linkages to Other Law Enforcement & Court Files	- *Citation Number & Case Number* - *Location (street address, description, coordinates, etc.)* - *Personal ID (name, address, DL number, date of birth, etc.)*
Driver Linkages to Roadway Information	- *Driver Addresses (location code, coordinates)*
Driver Linkages to Crash Information	- *Driver License Number* - *Personal Identifiers (name, address, date of birth, etc.)*
Driver Linkages to Statewide Injury Surveillance System Information	- *Personal Identifiers (where allowed by law)* - *Crash Date, Time, Location*

❑ *Quality Control Program*

The driver data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the information in the Driver Data Component should be assured based on a formal program of error/edit checking as data are entered into the statewide system and procedures should be in place for addressing the detected errors. In addition, the custodial agency (or agencies) and the TRCC should work together frequently to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The driver data managers should receive periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback, as well as through training and changes to the applicable instruction manuals, edit checks, and the driver and vehicle data dictionaries. Audits and validation checks to assure the accuracy of specific critical data elements should be conducted as part of the formal quality control program. Example measurements are presented in Table 7.

Table 2: Examples of Quality Control Measurements for Driver Data

Timeliness	- *Average time to post driver licenses* - *Average time to post convictions after receipt at DMV* - *Average time to forward dispositions from court to DMV*
Accuracy	- *% of duplicate records for individuals* - *% "errors" found during data audits of critical data elements*
Completeness	- *% drivers records checked for drivers moving into the State* - *% of driver records transferred from prior State*
Consistency	- *% of SSN verified online* - *% of immigration documents verified online* - *% violations reported from other States added to driver history*

The measures in Table 7 are examples of high-level management indicators of quality. The managers of individual driver files should have access to a greater number of measures. The custodial agency should be prepared to present a standard set of summary measures to the TRCC monthly or quarterly.

2-C: Driver Data Component Status

The Division of Motor Vehicles (DMV) in the North Carolina Department of Transportation administers driver licensing, maintains driver history information, and conducts driver control and improvement programs.

Basic Characteristics

Driver license applications and examinations are conducted at the DMV headquarters or in DMV offices located throughout the State. In 2008 the DMV changed from over-the-counter driver license issuance to central issuance. Now, determination is made initially whether an applicant is qualified for a license. That involves examination of required identification documents, vision and skills testing where needed, a check of the NDR/PDPS, and a check with the CDLIS if the application is for a commercial driver license. Documentation is required to establish lawful presence also as a prerequisite to qualify for a license. The SSOLV process and the SAVE systems are queried for non-US citizen applicants. SAVE has been in use since 2007.

When the applicant is accepted, a photograph is taken, and a 20-day temporary license is issued. The temporary license has a 1-D barcode. The driver license number is a generated 9-character record identifier that has no significance other than its uniqueness.

The State Automated Driver License System (SADLS) is the driver database containing the active records of approximately 7.2 million drivers including over 300,000 for commercial drivers—about 4.6 percent. The images of the new temporary license holders are processed through the facial recognition software to determine if the applicant already has a record. Image comparisons are also being made as applicants pass through various steps of testing to identify any substitutions that could occur if a person has arranged to have a different person appear to take any test on behalf of the applicant. Problems disclosed through the use of the images abort issuance of a permanent license and initiate contact with the person applying falsely.

Permanent licenses are mailed to qualified persons. The document includes the demographic information about the license holder, the license class, any restrictions, and a PDF-214 barcode.

A rewrite of the SADLS and STARS (vehicle title and registration system) is projected for completion by the end of 2012. Some aspects of the new procedures and system have been deployed. When the DMV driver and vehicle data system upgrade is implemented, data capture for record information will be acquired by scanning the barcodes on the licenses including licenses from other jurisdictions and those issued to North Carolina drivers including those on temporary licenses. The process will be faster and less likely to contain errors.

As in the past, North Carolina has a graduated license program, administrative license revocation authority, and information on learner permits and provisional licenses. Driver education information includes a document identifier, customer number, completion date, and school or institution information. Driver education information is maintained in the driver history. The DMV has authority to cancel a license if application information is falsified.

The driver information correlated with crash and citation information has been used to provide information to the legislature when considering possible changes to the provisions of the graduated license program and the stipulations specified in the North Carolina helmet law.

Data Input
The DMV provided the following information about the receipt of conviction information from the courts. "SADLS contains traffic conviction information including information on juvenile offenses. Most of the courts report convictions electronically. Until recently, the electronic conviction record did not show the original charge on records received from most courts. Those submitted on paper require input processing at the DMV, and those (older) records include the original charge. The DMV has coordinated with the courts, and the courts are now beginning to include the original charge in the electronic submissions. This means that essentially all conviction information will contain the original charge and the adjudicated charge from now on."

The discussion of input from the courts revealed that about 89 percent of the records are submitted electronically, and a major portion of the workload for the DMV stems from error conditions in both paper and electronic submissions containing incorrect codes that cause a record to be rejected and then require correction and interactions with the reporting court. Although a few of the courts submit paper abstracts, much of the problem stems from the (local) Wake County that includes Raleigh and the larger surrounding municipalities.

Crash involvements are posted automatically during the entry of reports into the crash database, and if a conviction is associated with a crash, that information is specified. BAC results are also entered when reported.

Driver histories from previous states of record are included in the driver file for both commercial and non-commercial operators.

There is a point system leading to a withdrawal of licenses. Information about points and the consequences is available on the DMV web site and in the driver license handbook (that can be downloaded).

Applicable Guidelines
The AAMVA Code Dictionary (ACD) is used to translate the conviction offenses for non-commercial drivers as well as the automatic processing in CDLIS.

Data Dictionary
There is a data dictionary document for the driver file that defines each data field and specifies the values for each field and contains edit checks. All licensing personnel are employees of the DMV. Examiners are required to attend a basic examiner school and receive certification of completion upon graduation. Examiners are also provided a manual as a reference guide. The Training & Development Section provides the instructions for examiners. Fraudulent document recognition is included in the training.

The Training Section conducts training for all examiners and includes the AAMVA-approved fraudulent document recognition course.

Process Flow
There are process flow diagrams, including error identification and corrections, for the following paper and electronic functions: license application to license issuance, receipt of conviction information to posting on the correct record, license suspension based on a DUI arrest, request for non-routine statistics from the driver file, and production of periodic management reports and summaries. Those functions are documented for both paper and electronic transactions.

Interface with Other Traffic Records System Components
The SADLS links with DMV's State Titling and Registration System (STARS) in the customer-centric database for the two functions. The driver and crash systems are not interactive, but crash involvements are posted to the driver histories as an automatic function of crash file updating.

There is no direct interaction with the citation file, but when a conviction results from a citation, the primarily electronic conviction information from the courts contains the original charge as shown on the citation in addition to the adjudicated charge. There is no interface with the injury surveillance system, but information is received from vital records. Driver data and demographics are provided to those linking and analyzing highway safety data.

Quality Control Program
There is a formal program of error/edit checking as data are entered into the driver file: error edit reports are produced daily and are used for training and changes to instruction manuals as needed. They are also used in updating error edits and/or the data dictionary as appropriate.

The DMV provided the following response to the quality control measurements.

Quality Control Measurements for Driver Data

Timeliness	– Average time from accepted application to create driver record = 4 minutes – Average time to mail license to driver from time of application = 6 days – Average time to post convictions after receipt at DMV = overnight – Average time from court disposition to receipt at the DMV = 24 to 48 hours
Accuracy	– % of duplicate records for individuals requiring correction = less than .5% – Frequency of audits to assure data validity = as needed – % of errors found during audits of critical data elements = less than .5%
Completeness	– % of records checked for drivers moving into the state = 100% of 800 daily – % of driver records requested from prior state = not available – % of driver records received from prior state = not available
Consistency	– % of SSN verified online = 100% – % of immigration documents verified online = 100% of 300 daily – % non-CDL violations reported from other states added to driver history 0%

Recommendations:

None

2-D: Vehicle Data Component

Advisory Excerpt:

- *Description and Contents*
  Vehicle information includes information on the identification and ownership of vehicles registered in the State. Data should be available regarding vehicle make, model, year of manufacture, body type, and vehicle history (including odometer readings) in order to produce the information needed to support analysis of vehicle-related factors that may contribute to a State's crash experience. Such analyses would be necessarily restricted to crashes involving in-State registered vehicles only.

  Custodial responsibility for the vehicle data usually resides in a State Department or Division of Motor Vehicles. Some commercial vehicle -related functions may be handled separately from the primary custodial responsibility for all other vehicle data. The structure of vehicle databases is typically oriented to individual "customers."

- *Applicable Guidelines*
  Title and registration information, including stolen and salvage indicators, should be available and shared with other States. The National Motor Vehicle Title Information System (NMVTIS) facilitates such exchanges. In addition, some States empower auto dealers to transact vehicle registrations and title applications following the Business Partner Electronic Vehicle Registration (BPEVR) guidelines from AAMVA. The International Registration Plan (IRP), a reciprocity agreement among U.S States and Canadian provinces, administers the registration processes for interstate commercial vehicles.

- *Data Dictionary*
  Vehicle information should be available for all vehicles registered in the State. The contents of the Vehicle Data Component's files should be well documented, including data definitions for each field, and where applicable, edit checks and data collection guidelines that match the data definitions. Procedures for collection, reporting and posting of registration, title, and title brand information should be documented.

- *Process Flow*
  The steps from initial event (registration, title, etc.) to final entry onto the statewide vehicle data files should be documented in process flow diagrams for each file that is part of this component. The diagram should be annotated to show the time required to complete each step and to show alternate flows and timelines depending on whether the data are submitted in hardcopy or electronically to the statewide system. The process flow diagram should include processes for error correction and error handling (i.e., returning reports to the original source for correction, resubmission, etc.). The process flow should also document the timing, conditions, and procedures for purging records from the vehicle files. Process flow diagrams should show all major steps whether accomplished by staff or automated systems and should clearly distinguish between the two.

- *Interface with Other Traffic Records System Components*
  The Vehicle Data Component has interfaces (using common linking variables shown in Table 8) to other TRS components such that the following functions should be supported:

  - *Vehicle data should be used to verify/validate the vehicle information during data entry in the crash data system, and to flag records for possible updating in the vehicle files when a discrepancy is identified. Key variables such as VIN, license plate number, names, and addresses should be available to support matching of records among the files.*

  - *Vehicle owner addresses are useful in geographic analyses in conjunction with crash and roadway data. Linkage in these cases should be based on conversions of addresses to location codes and/or geographic coordinates in order to match the location coding method used in the Roadway Data Component and in the GIS.*

  - *As with crash data, linkage to injury surveillance data should be possible either directly or through probabilistic linkage in order to support analysis of crash outcomes and crash risk associated with specific driver characteristics (e.g., the driver's history of violations or crash involvement). Key variables should include names and dates, date of birth, times, and locations of crashes.*

Table 8: Common Linking Variables between Vehicle And Other Data Components of a Traffic Records System

Vehicle Linkages to Other Law Enforcement & Court Files	- *Location (street address, description, coordinates, etc.)* - *Personal ID (name, address, DL number, etc.)*
Vehicle Linkages to Roadway Information	- *Owner Addresses (location code, coordinates)*
Vehicle Linkages to Crash Information	- *Vehicle Identification Number* - *Personal Identifiers (name, address, date of birth, etc.)*
Vehicle Linkages to Statewide Injury Surveillance System Information	- *Personal Identifiers (where allowed by law)* - *Crash Date, Time, Location*

- *Quality Control Program*

  The vehicle data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the vehicle data should be assured based on a formal program of error/edit checking as the data are entered into the statewide system and procedures should be in place for addressing the detected errors. In addition, the custodial agency (or agencies) and the TRCC should work together frequently to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The vehicle data managers should receive periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback, as well as training and changes to the applicable instruction manuals, edit checks, and the driver and vehicle data dictionaries. Audits and validation checks should be conducted to assure the accuracy of specific critical data elements as part of the formal Quality Control Program. Example measurements are presented in Table 9.

Table 9: Examples of Quality Control Measurements for Vehicle Data

Timeliness	- *Average time for DMV to post title transactions* - *% title transactions posted within a day of receipt*
Accuracy	- *% of duplicate records for individuals* - *% errors found during data audits of critical data elements* - *% VINs successfully validated with VIN checking software*
Completeness	- ***%** of records with complete owner name and address*

The measures in Table 9 are examples of high-level management indicators of quality. The managers of individual vehicle files should have access to a greater number of measures. The custodial agency should be prepared to present a standard set of summary measures to the TRCC monthly or quarterly.

2-D: Vehicle Data Component Status

Description and Contents

The State Title and Registration System (STARS) remains in use by the North Carolina Department of Transportation, Division of Motor Vehicles (DMV) as the database containing all titles and registrations. STARS includes temporary registrations and stolen vehicle information. Vehicle and License Plate Renewal Offices throughout the State's 100 counties process registrations and title applications in addition to the processing at the DMV facilities. Authorized automobile dealers also process registrations and title applications. Renewals may be processed through the Internet.

A rewrite of the STARS and the State Automated Driver License System (SADLS), the driver record system, is projected for completion by the end of 2012. Some aspects of the new procedures and system have been deployed. Commercial vehicles are included in the database, but specialized information pertaining to commercial vehicles (such as taxation and carrier identification and records) are managed through the IRP and PRISM. The types of information on commercial vehicles required by the Federal Motor Carrier Safety Administration are not addressed in this report.

The R. L. Polk VINA program is run when a vehicle record is created. VINA extracts the following data elements to populate the vehicle record: vehicle make, model, year, body style, shipping weight, gross weight and fuel type. When a discrepancy occurs, it is resolved by an inspection of the vehicle and a posting of the correct information for the file. Some of the auto dealers are also able to extract data from the VIN for the vehicle record. Vehicles are classified by plate category, plate use, and weight. The STARS registration document barcode is linear, and the IRP registration contains a 2-D barcode.

The scope of descriptive information on vehicles meets the recommendations of the *Advisory,* and the data scope is adequate for participation in AAMVA applications. The DMV is still providing batch updates to the NMVTIS, and real-time participation in NMVTIS is anticipated when the STARS rewrite enables that functionality.

Odometer readings are required when vehicles are inspected. In locations where emissions inspections are required, those transactions require updating the odometer reading. The odometer reading is captured at time of titling, title correction and issuance of duplicate titles. Title brands from other states are retained in the vehicle file.

The DMV provided the following description of how notices of stolen vehicle are entered and withdrawn:

> The License and Theft Bureau receives notices of all vehicles reported as stolen in the State and all vehicles registered in North Carolina that are reported stolen anywhere in the country that are entered in NCIC. A stop is then placed on the record and no title work is processed until the vehicle is cleared in NCIC. When the vehicle is recovered in NCIC the hold is removed and a letter indicating the recovery is sent to the owner and any lienholder of record in the DMV database. All stolen vehicle information is received from the NC State Bureau of Investigation Division of Criminal Information.

The DMV also provided the following description of the other types of cautions or restrictions applied to a vehicle record and how are they entered and withdrawn:

> **County Tax Stops**- entered and withdrawn through the county. DMV can also remove through the STARS system. **Insurance stops**- applied through STARS systems. **DWI Stop**- applied and only removed by Administrative Office of the Courts. **Bad Debt Stop**- STARS applies this stop. **Correspondence Stop**- applied through STARS. **Inspection and Emission Stops**- applied through STARS. **IRP/Audit Stop**- applied through STARS. **Unified Carrier Registration Warning**- applied through STARS. **Child Support Stop**- County applies the stop and only the Division of Human Resources can clear the stop. **Dealer Stop**- applied and removed through STARS. **FHVUT (**Federal Heavy Vehicle Use Tax**) Stops**- are entered and removed thru STARS. **Federal out of service orders**- programmer enters from download thru FMCSA and removes by the same process. **Stolen Vehicle Stop**- applied and removed by License and Theft Bureau.

Applicable Guidelines
The data content is compatible with the recommendations of the American Association of Motor Vehicle Administrators and interfacing with the National Crime Information Center.

Data Dictionary and Reference Materials
There is a data dictionary document for the vehicle file that defines each data field and specifies values for each field.

Registration and title personnel are employees of the DMV, local government and tag agencies and authorized auto dealers that process registrations and title applications. The Staff Development Specialist is responsible for training of all who process STARS transactions. The resources used for training include Title Manuals, Official Bulletin Books, NADA, and Broadcast Messages.

Process Flow
Process flow diagrams, including error identification and corrections, were reported as available for the following:

- Registration and title application to registration and title issuance,

- None for requests for non-routine statistics from the vehicle file, and
- Production of periodic management reports and summaries.

Documentation and flow diagrams for those processes can be found in the STARS Technical Specification manuals.

There are no process flow diagrams for non-routine processes. The STARS team will process all special requests for ad-hoc information. All requests must be submitted via DMV and approved by the Director of Vehicle Services. All queries are saved in a central folder.

DMV business staff will determine the appropriate branding for any vehicle coming into North Carolina at the time of titling. Documentation and flow diagrams can be found in the STARS Technical Specification manuals.

Summaries and User Access
The following periodic summaries are included among those produced from STARS:

- Registration Of Motor Vehicles By Type (Vfrfhw56)
- Analysis Of Vehicles By Body Style (Vyrssr52)
- Statistics From STARS System (Vyrssr52)
- Vehicle Registrations By Counties And Towns (Vrrrtc82)

Interface with Other Traffic Records System Components
STARS is integrated with the driver file, SADLS and with the enforcement-oriented data systems such as the NCIC and local enforcement inquiries. It is not interactive with the other components of the North Carolina traffic records system, but inquiries will be serviced for the crash file.

Quality Control Program
The DMV provided the following information about quality controls for the STARS:

- Endeavor for version control of all changes
- Unit and system integration testing
- Peer and Technical reviews of all changes prior to client testing
- Client testing
- Controlled monthly releases of non-urgent changes
- Backups of STARS data for recovery purpose
- Disaster Recovery

Quality Control Measurements for Vehicle Data

Timeliness	– Average time to post registrations = 2 minutes – Average time to process title documents = 5 or 6 minutes – Average time to produce completed titles = 7 to 10 days – % title brands posted with 24 hours of receipt = 80.73% – % registrations posted within 24 hours = 99%
Accuracy	– % of duplicate records for individuals = 1.84% – % "errors" found during data audits of critical data elements = 0.05% – % VINs successfully validated with VIN checking software = 97.13%
Completeness	– % of records with incomplete owner name and address = 0.02%

Recommendations:

- ❑ None

2-E: Citation/Adjudication Data Component

Advisory Excerpt:

- ❑ *Description and Contents*
  Information, which identifies arrest and adjudication activity of the State, should be available, including information that tracks a citation from the time of its distribution to a law enforcement officer, through its issuance to an offender, its disposition, and the posting of conviction in the driver history database. Case management systems, law enforcement records systems, and DMV driver history systems should share information to support:

  - *citation tracking*
  - *case tracking*
  - *disposition reporting*
  - *specialized tracking systems for specific types of violators (e.g., DUI tracking systems)*

  Information should be available to identify the type of violation, location, date and time, the enforcement agency, court of jurisdiction, and final disposition. Similar information for warnings and other motor vehicle incidents that would reflect enforcement activity are also useful for highway safety purposes and should be available at the local level.

  The information should be used in determining the level of enforcement activity in the State, for accounting and controlling of citation forms, and for detailed monitoring of court activity regarding the disposition of traffic cases.

  Custodial responsibility for the multiple systems that make up the Citation/ Adjudication Data Component should be shared among local and State agencies, with law enforcement, courts, and the Department of Motor Vehicles (DMV) sharing responsibility for some files (e.g., portions of the citation tracking system). State-level agencies should have responsibility for managing the law enforcement information network (e.g., a criminal justice information agency), for coordinating and promoting court case management technology (e.g., an administrative arm of the State Supreme Court), and for assuring that convictions are forwarded to the DMV and actually posted to the drivers' histories (e.g., the court records custodian and the DMV).

- ❑ *Applicable Guidelines*
  Data definitions should meet the standards for national law enforcement and court systems. Applicable guidelines are defined for law enforcement data in:

  - *National Crime Information Center (NCIC)*
  - *Uniform Crime Reporting (UCR)*
  - *National Incident-Based Reporting System (NIBRS)*
  - *National Law Enforcement Telecommunication System (NLETS)*
  - *Law Enforcement Information Network (LEIN)*
  - *Traffic Court Case Management Systems Functional Requirement Standards*

  Applicable guidelines should be defined for court records in the National Center for State Courts (NCSC), and jointly for courts and law enforcement in the GJXDM (with specific Traffic Processing Standards created through a national committee). Tracking systems for citations (i.e., a citation tracking system) and for specific classes of violators (e.g., a DUI tracking system) should meet the specifications for such systems published by NHTSA.

- ❑ *Data Dictionary*

  The citation/adjudication data files should be well documented, including data definitions for each field and where applicable, edit checks and data collection guidelines that match the data definitions. Procedures for collection, reporting and posting of license, registration, conviction, and title brand information should be documented.

  Law enforcement personnel should receive adequate training at the academy and during periodic refreshers to ensure they know the purpose and uses for the data. Training also should ensure that officers know how to access information on violators and process citations and arrests properly. The training manual should be available to all law enforcement personnel and the instructions should match, as appropriate, the edit checks that are performed on the data prior to its being added to the local records management system and statewide databases. The edit checks should be documented and both common and serious errors in the data should be flagged, including missing or out-

of-range values and logical inconsistencies. The data element definitions and system edits should be shared with all collectors, managers, and users in the form of a data dictionary that is consistent with the training manual and the crash report form. Court case management systems and tracking systems (citation tracking and DUI tracking) should be well documented to include definitions of all data elements and corresponding edit checks to ensure accuracy.

- *Process Flow*
  The processing of traffic violations, citations, arrests, and court cases should be documented in a series of flow diagrams showing the typical procedures and their average time to completion for each step. The administrative handling of payment in lieu of court appearance should be shown separately from those violations that are not handled administratively. The processes for detecting drugs or collecting blood alcohol concentration (BAC) values through various methods (breath test, blood or urine tests) should also be documented. The processes for tracking DUI cases in a DUI tracking system should also be included in the set of process flow diagrams. Processes for paper and electronic filing and reporting should be shown separately. Process flow diagrams should show all major steps whether accomplished by staff or automated systems and clearly distinguish between the two.

- *Interface with other traffic records system components*
  NCIC, GJXDM, NIBRS, LEIN, and NLETS guidelines all define methods and data standards for information transfer and sharing at the State and national level. Typically, there are State-level equivalents of the various networks and standards governing the sharing of law enforcement and court-related data. For the purposes of safety analysis at a State and local level, linkage between the Citation/Adjudication Data Component and other components of the TRS is important because it is useful for analyzing the geographic distribution of traffic violations and incidents, as well as monitoring the effectiveness of countermeasures that involve enforcement or court processes. It also enables the creation and updating of adverse driver histories for the purpose of driver control. Key linkages within the TRS for citation/adjudication information are listed in Table 10.

Table 10: Common Linking Variables between Citation/Adjudication and Other Data Components of a Traffic Records System

Citation/Adjudication Linkages to Other Law Enforcement Files and Tracking Systems	- *Computer Aided Dispatch (CAD) Record Number* - *Citation/Arrest/Incident Number, Court Case Number* - *Location (street address, description, coordinates, etc.)* - *Personal ID (name, address, DL number, etc.)*
Citation/Adjudication Linkages to Driver/Vehicle Files	- *Driver and Owner Names, Driver License Number* - *Driver & Owner Addresses (location code, coordinates)* - *Vehicle Plate Number, VIN*
Citation/Adjudication Linkages to Statewide Injury Surveillance System Information	- *Personal Identifiers (where allowed by law)* - *Crash-Related Citation/Arrest Date, Time, Location*

- *Quality Control Program*
  The citation/adjudication data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the citation/adjudication data should be assured based on a formal program of error/edit checking as the data are entered into the statewide system, and procedures should be in place for addressing the detected errors. In addition, the custodial agency (agencies) and the TRCC should frequently work together to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The data managers receive regular, periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback as well as training and changes to the applicable instruction manuals, edit checks, and the driver and vehicle data dictionaries. Audits and validation checks should be conducted to assure the accuracy of specific critical data elements as part of the formal Quality Control Program. Example measurements are presented in Table 11.

Table 11: Examples of Quality Control Measurements for Citation/Adjudication Data

Timeliness	- *Average time for citations to be sent from LEAs to courts* - *Average time for convictions to be sent to DMV*
Accuracy	- *% errors found during data audits of critical data elements* - *% violations narratives that match the proper State statute*
Completeness	- *% of cases with both original charges and dispositions in citation tracking system*
Consistency	- *% traffic citations statewide written on a single uniform citation*

The measures in Table 11 are examples of high-level management indicators of quality. The managers of individual citation/adjudication files should have access to a greater number of measures. The custodial agency should be prepared to present a standard set of summary measures to the TRCC monthly or quarterly.

2-E: Citation/Adjudication Data Component Status

Description and Contents

North Carolina has been using electronic citations throughout the state since 1999. There is a uniform citation used throughout North Carolina which is developed and maintained by the Administrative Office of the Courts (NCAOC). North Carolina AOC reported that of the 1.3 million citations issued last year, 82.3 percent were issued electronically. Criminal traffic offenses where the officer must or chooses to arrest the offender (arrestable offenses) may not be filed electronically at this time, although it is reported that a project is underway to allow for electronic submission of such offenses. This accounts for the majority of paper citations. Charges involving an arrest are entered electronically at the magistrate's office through NCAWARE in 98 out of 100 counties. With the NCAWARE data being transferred into the Automated Criminal Infraction System (ACIS), these paper-based citations theoretically become electronic at the time of submission to the court.

Both the electronic and paper citation processes are tracked from inception to disposal of the citation. Paper citations are tracked from NCAOC to the agency to which they have been assigned. It is then the responsibility of the agency to track the citations to the officer level. Tracking for electronic citations is through ACIS at a state level. The North Carolina State Highway Patrol (NCSHP) also performs regular audits of the citations within their agency. It appears there is a discrepancy among agencies as to whether audits are performed on electronic citations. Local agencies do not seem to be involved in any audits of electronic citations. It is only when an issue arises or a complaint is made that the electronic citation numbers not submitted to the court are reviewed. When citation blocks are assigned to an officer, they are locked into a single computer. An officer logging into a different computer is assigned an additional block of citation numbers. This could cause agencies to spend more time on tracking unused citations if officers use multiple vehicles. The citations are transmitted to NCAOC by the officer initiating the transmittal process.

Once a citation is issued and printed by the officer, it is automatically uploaded to ACIS unless the officer overrides the upload and chooses to transmit at a later time, when wireless coverage is available. This may result in a defendant showing up for court or paying a citation while NCAOC does not have a case. This situation was noted by local law enforcement to be an issue within some of their departments. There is no standard process to determine if any citations issued to a violator were not subsequently transmitted to NCAOC by the officer. If the citation numbers can be assigned in a more consistent fashion, the audit and tracking of missing citations could become more feasible without putting the extra burden on the agency to locate every computer used by an officer to find the unused citation numbers when an issue may occur.

The electronic citation system used by law enforcement across the State has been implemented in the majority of law enforcement agencies. The system was developed and is maintained by the NCAOC. Each citation can have up to two violations listed before issuing a new citation number. This does not mean the officer needs to enter the data multiple times if there are more than two citations issued, as information from one citation can be duplicated to a subsequent citation automatically. Fields are also automatically populated for the officer if the vehicle or driver is from North Carolina. This is because the system is linked to the NCDMV records to

retrieve information based off registration or driver license number. There is no entry mechanism other than by hand to capture out-of-state driver and vehicle information. There is a pilot project within the Commercial Vehicle Enforcement section of the NCSHP to implement the use of 2-D barcode scanning. It has been reported to be going well. This will increase accuracy of the data and reduce the time it takes to complete a citation. It has been reported that a paper citation had taken upwards of 20 minutes and has been reduced to approximately eight minutes when using the electronic application. Use of barcode scanning technology could reduce the average amount of time on a traffic stop even more. It will also increase the accuracy of the data for out-of-state violators.

There are many data elements captured on the traffic citation. There are identifiers for the person, vehicle and roadway in order to link to multiple systems throughout the traffic safety community. One very strong linkage not usually found on citations is the structured data for roadways. The street on which the offense occurred and the nearest crossroad are structured data elements. This is normally a very difficult field to standardize and link, but North Carolina has done a very good job standardizing these fields. The State should continue to expand the use of this structured data in other traffic safety systems and it will realize the ease of using this field as a linkage between the systems with different data which cannot otherwise be linked. Some agencies using the data may require location data to be more precise than others. If the location field is expanded to allow block or street number, all agencies could use the location data more effectively. GPS coordinates are not part of the citation. If implemented, this should reduce the amount of time taken to geocode traffic enforcement efforts for analysis. This will also provide a very strong element, if captured correctly, to link across multiple datasets.

The Administrative Office of the Courts oversees North Carolina's Unified Judicial System. They receive electronic citation data directly from the field officer into ACIS. Since the data ares immediately available NCAOC can offer online payments in near real time. The online payment system is a simple yet effective way to collect fines. It requires minimal manpower to collect and manage the fines for cases at the customer's convenience. This is also the only way a violator can pay with a credit or debit card.

There is a nightly process to send adjudication data to the DMV for driver records. Disposition data are available to the agencies that are involved in the violations; however, not many are aware they have that data at their disposal. There are standard statistical reports available publicly on a yearly basis. Data are available monthly to any law enforcement or judicial agency. Besides the transfer of conviction data to the Department of Motor Vehicles (DMV), the data are transferred to NCSHP and Department of Correction for use by probation and prison officials. This is a dataset that may be underutilized for analysis as NCSHP personnel were not aware the data were available to their commanders or analysts. Local agencies that were represented also requested disposition data be made available. These data have been available according to NCAOC but agencies may need to be educated on their availability.

There is not a DUI Tracking system within North Carolina. ACIS is as close to a tracking system as exists for any traffic safety related cases. ACIS is not tailored for a specific tracking purpose and may not have all the reporting functionality required; however, it does have everything needed to capture and report the DUI process. One metric the Traffic Safety

Resource Prosecutor (TSRP) would like to see for DUI cases is the case age. NCAOC has been working on and making the data available since July 2011. The ability to add this type of functionality to ACIS will enable the TSRP to gather the requested data to successfully prosecute traffic safety related cases and to gauge the workload and the currency of the courts' caseloads.

Applicable Guidelines

The majority of citations are being submitted through an electronic traffic citation system in use by law enforcement directly to ACIS or through NCAWARE at the magistrate's office. NCAOC has implemented standards to transfer the citation data to ACIS from NCAWARE. This standard is compliant to the National Information Exchange Model (NIEM). Other available feeds from and to ACIS are not believed to be using a national standard. The ability to share data easily and efficiently depends on the well-defined standards for the data to be shared. Such standards are useful when there are multiple streams of data from different providers. It is also useful to allow multiple agencies to retrieve data in a format that can be reused. This reduces development and maintenance costs when one standard data format is implemented. These are issues that coordination of information among agencies by the Traffic Records Coordinating Committee (TRCC) and the Traffic Records Coordinator can address and simplify.

There is a re-write and update for ACIS and the electronic citation application in progress. It has been reported the eCitation system will not change tremendously during the initial re-write, but is a means to ensure the newest operating systems will support the application architecture. The standards used for the transfers in the re-write should be compliant with NIEM. North Carolina AOC is fortunate to have a member on the national committee developing the NIEM standards.

Data Dictionary

A data dictionary and code tables exist but were not provided for the citation data repository. Business rules and edits for electronic citations are inherent in the application developed by NCAOC. There is a document within NCAOC which describes the data elements and validation rules set forth within the application. The rules seem to be fairly concrete and are catching most errors without any user intervention.

Process Flow

The citation process is well documented within NCAOC. The paper and electronic citation process revolves around ACIS. For NCSHP there is still a paper citation process for every offense which requires an appearance in front of the magistrate. The magistrate or the law enforcement officer begins the process to enter data electronically into NCAWARE which transfers the traffic information to ACIS. For agencies that use paper citations for all violations, there is still data entry into NCAWARE or ACIS occurring at NCAOC. ACIS generates the electronic citation numbers which are pulled by each officer in blocks. Numbers for electronically issued citations are uploaded by the officer in the vehicle. Once the officer issues and prints the citation, the citation is automatically transmitted to ACIS, which contains validation rules. The officer may choose to override the transmission so that the citation can be transmitted at a later time when wireless coverage is available. The data are submitted to ACIS, including the court date and time for the citation to be calendared. Once disposed through payNCticket, payment by mail or in person, or at a court hearing, the citation is closed and the conviction is transferred to the DMV nightly. If the violation goes to trial, a court copy of the

citation is printed out and given to the prosecutor. The process becomes paper-based until after disposition. The case disposition is taken by the court clerk and entered into ACIS.

Throughout the process, every violation for court is paper-based. An interface within ACIS to allow the court to view the data and reduce the clerk's disposition entry will be a great improvement to an already solid system. There was mention of real time reporting to DMV. If DMV were prepared, the electronic process to enter disposition data at the time of the proceedings would improve the accuracy and timeliness of the real-time reporting to DMV.

Interface with other Components of the Traffic Records System

Citations have structured data elements for location. Crash reports have GPS fields while citations do not. Interfacing between citation data and crash data is helpful for traffic safety. GPS coordinates on citations will allow for the data mapping of these two traffic safety systems. This is not easy to implement and will not cure all issues presented with locations. GPS coordinates are not always available or accurate to the location of the violation or crash site. Road names alone do not always have enough detail for all systems. This is where a combination of fields can assist in narrowing the location to a more accurate position on a roadway. This is always a topic for discussion throughout the traffic safety systems. With roadway files as complete as they are in North Carolina, the data could be used to accurately capture a very difficult field to standardize.

Disposition data are now being transferred electronically nightly to DMV and are directly and immediately entered onto the driver history file. This is a key system to interface in order to reduce errors and manpower required to update driver files.

Systems outside the traffic safety community receive the data for other purposes. The Department of Justice and the Criminal Justice Law Enforcement Automated Data Services (CJLEADS) were mentioned as external systems that receive the data. NCAOC regularly shares the data with GHSP for analysis.

Law enforcement agencies can retrieve the citation data from NCAOC. This process has been implemented in many jurisdictions to populate local records management systems. Although the file is standardized, it does not appear to be in a national standard to allow the data feed to be reused for other types of systems ingesting the same data.

Data linkage is present between other traffic safety systems. Although ACIS is not offender-based, there are still fields based off person and vehicle to link with other traffic safety data systems. Once entered into ACIS, there is also a court case number assigned to the violations; however, the court number is not in any other system to use for linkage. The court file number is kept in the Department of Justice, Department of Correction, and in CJLEADS systems. The law enforcement agencies also link citations received from ACIS with a local case number for any additional data they have in their local records management systems.

Data from warning tickets are not being captured nor transmitted to a location for the traffic safety community's use. The warning ticket can be populated through the electronic citation application; however, it is not transmitted to any database electronically. If the officer were to

issue a warning ticket, he must print out the warning ticket and turn it into his department. It is then the department's responsibility to enter the data into a database. Realizing the NCAOC does not need or deal with the warning ticket data, there are reasons to implement a process to allow the warning tickets to be transmitted and retrieved from a central database.

When looking at enforcement data from traffic violations, warning tickets are a portion of that enforcement effort which is lost in the process. This data can be used in conjunction with the existing citation data to paint a larger picture of enforcement efforts throughout the State. These data are just as valuable as citation data when looking at traffic safety and evaluating enforcement countermeasures.

There are other enforcement efforts for which the data can be used. If a violator is receiving multiple warning tickets from multiple jurisdictions, there may be a need to issue a citation next time the driver is violating the same traffic offense. There is no way to effectively use this warning ticket data in the discretionary process the officer goes through when determining whether a violator will receive a warning ticket or traffic citation.

Quality Control Program

There are citation edits in place which will not allow the citation to be submitted if certain key elements are not correct or are incomplete. Any eCitation rejected for an error is returned to the officer's machine immediately with the error message in order that the officer can correct them and immediately re-transmit the citation. Paper-based citations containing errors are sent back to the officer's agency for correction before being entered into ACIS. Percentages given for completeness and consistency are 100 percent due to the automated correction process; however, citations rejected for corrections are not tallied and tracked within the process to give an accurate metric for number and types for errors. With that said, the error rate for citations transmitted electronically was reported as below one percent.

Timeliness is listed as immediate by NCAOC although there is a process to upload the electronic citations which allows officers to by-pass the automatic upload. Through discussions with law enforcement, it appears there are times citations are not uploaded in a timely fashion. This usually comes to the attention of the courts and agencies when the violator shows up for court or attempts to pay a fine for a ticket that has not been uploaded at the NCAOC. While allowing the officer to modify a citation before is has been transmitted may reduce errors or corrections, it is not believed to be a major problem that would require that ability to modify the data. There is no metric to determine how often the officer may unlock a citation for modification prior to submission. Though it may have minimal impact, eliminating the need for the officer to manually transmit in situations other than the lack of wireless capability, there will be a decrease in citations that have not been transmitted. The paper citations are still slower due to the time-consuming process of manual entry into ACIS by NCAOC employees. This is not a major concern as these make up less than 13 percent of all citations. This percentage includes the citations entered into NCAWARE by the magistrates. This percentage is also expected to reduce with the re-write of the electronic citation application to allow the offenses where violators are arrested to be entered.

NCAOC relies on the edits in place for elements to be completed and accurate. There can be data entry errors from officers who have to manually enter all the violator and vehicle information. Even though there are fields that just cannot be audited for accuracy, populating driver and vehicle information from standardized 2-D barcodes can help with accuracy of the data. There is an existing AAMVA standard for barcodes on driver licenses and vehicle registration cards that most states have followed. There have been reports of violators contacting North Carolina because of entry errors on a citation. This is not the norm; however, when an out-of-state resident who has never been to North Carolina is suspended due to such errors, it should be a major concern for the State.

Offense codes are not fully implemented due to the magnitude of local ordinances and State codes which need to be supported. There does not appear to be a concern from NCAOC or law enforcement that entry of free text charges is a major issue. The violations entered into free text are stored locally for reuse, but not shared with other users of the system. NCAOC does review each free text code that comes through to determine if it is used enough to assign it a four digit court code. Realizing the magnitude of local ordinances and changes occurring through legislative sessions, implementing a full edit table of offense codes is a way to accurately enter the information. It may not necessarily prompt a court code assigned to it; however, creating local ordinance charge files maintained by the appropriate locality may reduce the free text entry mistakes and incorrect court coding entered by the officer.

There is also no means to share data entered onto a citation with any other data capture applications such as crash reporting. The officer is entering the information into multiple systems when needed. There is a process being reviewed to allow the data to be stored locally and allow the officer to import the data to other applications. This would be an improvement that could be implemented to allow, for example, crash and citation data to be consistent for events involving the use of both systems. Since there are law enforcement agencies that use both the state-owned crash and citation applications, there is an ability to implement this process for these two specific systems. Each system may be under the control of different agencies, but they both have the same common goal to collect data in a timely and more accurate manner.

Recommendations:

- ❑ Develop an effective way of sharing data across multiple systems within the data collection process, such as crash and citation, for consistency and accuracy of data.
- ❑ Continue to pilot and implement the use of barcode scanners to improve accuracy of out-of-state license and registration information and to speed processing.
- ❑ Use GPS coordinates on the electronic citations.
- ❑ Create electronic citation audit procedures to ensure citations are tracked from time of issuance to disposition of citations.
- ❑ Develop a centralized database for warning tickets that is available to law enforcement officers and others in the traffic records community.

2-F: Statewide Injury Surveillance System (SWISS) Data Component

Advisory Excerpt:

- *Description and Contents*

  With the growing interest in injury control programs within the traffic safety, public health, and enforcement communities, there are a number of local, State, and federal initiatives that drive the development of a SWISS. These systems typically incorporate pre-hospital (EMS), trauma, emergency department (ED), hospital in-patient/discharge, rehabilitation and morbidity databases to track injury causes, magnitude, costs, and outcomes. Often, these systems rely upon other components of the TRS to provide information on injury mechanisms or events (e.g., traffic crash reports). The custodial responsibility for various files within the SWISS typically is distributed among several agencies and/or offices within a State Department of Health.

  This system should allow the documentation of information that tracks magnitude, severity, and types of injuries sustained by persons in motor vehicle related crashes. Although traffic crashes cause only a portion of the injuries within any population, they often represent one of the more significant causes of injuries in terms of frequency and cost to the community. The SWISS should support integration of the injury data with police reported traffic crashes and make this information available for analysis to support research, public policy, and decision making.

  The use of these data should be supported through the provision of technical resources to analyze and interpret these data in terms of both the traditional traffic safety data relationships and the specific data relationships unique to the health care community. In turn, the use of the SWISS should be integrated into the injury control programs within traffic safety, and other safety-related programs at the State and local levels.

- *Applicable Guidelines*

  NHTSA has produced the National Emergency Medical Service Information System (NEMSIS) to serve as a guideline for a uniform pre-hospital dataset. It applies to all EMS runs, not just those related to traffic crashes. The American College of Surgeons (ACS) certifies trauma centers and provides guidelines for trauma registry databases and for a National Trauma Databank. Emergency Department and in-patient data guidelines (UB-92) are available from the US Department of Health and Human Services. The National Center for Health Statistics, within the Centers for Disease Control (CDC), sets ICD-9 codes and E-codes for injury morbidity/mortality. These codes are updated as needed and the ICD-10 codes are expected by the fall of 2007. The CDC also sets standards for reporting to their injury database and for use of the Public Health Information Network for data sharing.

- *Data Dictionary*

  The contents of the SWISS Data Component's files should be well documented to include data definitions for each field, and where applicable, edit checks and data collection guidelines that match the data definitions. Procedures should be documented in instruction manuals for collection, reporting, and posting of EMS run data on a uniform run report, uniform data in various hospital and trauma databases, and for tracking morbidity and mortality for each system.

  Training should include (where applicable) data collection, data entry, use of various injury coding systems (ICD and E-codes) as well as injury and trauma severity scoring systems such as the Injury Severity Score (ISS), Revised Trauma Score (RTS), and Abbreviated Injury Score (AIS) scales.

- *Process Flow*

  The information and processes involved in transport and treatment of victims of crash-related injuries should be documented in a series of flow diagrams showing the typical data collection and management processes and their average time to completion for each step in the data flow process. Processes for paper and electronic filing and reporting should be shown separately. Process flow diagrams should show all major steps whether accomplished by staff or automated systems and clearly distinguish between the two.

- *Interface with other Traffic Records System Components*

  Data transfer and sharing between local systems and the SWISS should be governed by data definitions, quality control requirements, and data transfer protocols defined by the custodial agencies. Transfer and sharing between SWISS files and the relevant national databases are governed by the data definitions, quality control requirements, and data transfer protocols for those systems (e.g., National Trauma Database).

  The CODES project is the primary example of data sharing and integration between SWISS and the other components of a TRS. It can take the form of direct linkage using personal identifiers or probabilistic linkage using other data elements such as incident time, date, date of birth, and locations, responding officer/agency, and others. Key linkages within the TRS for SWISS information are listed in Table 12.

Table 12: Common Linking Variables between SWISS And Other Data Components of a Traffic Records System

Linkages Internal to the SWISS data on injury and healthcare treatments/outcomes	- *Patient name* - *Patient ID number* - *EMS run report number* - *Social Security Number*
Linkages between SWISS data and Crash Data	- *Personal Identifiers: Name, address, date of birth (direct linkage)* - *CODES linking variables (probabilistic linkage)* - *EMS run report number* - *Crash Report Number*
Linkages between SWISS data and other (non-Crash) components of the traffic records system	- *Name & SSN linked to driver file (direct linkage)* - *Location/address* - *Event & treatment date and time*

- *Quality Control Program*

  The SWISS data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the information in the SWISS Data Component should be assured based on a formal program of error/edit checking as the data are entered into the statewide system and procedures should be in place for addressing the detected errors. In addition, the custodial agency (or agencies) and the TRCC should work together frequently to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The data managers should receive periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback, as well as to provide modifications to applicable training and instruction manuals, edit checks, and the SWISS data dictionaries. Audits and validation checks to assure the accuracy of specific critical data elements should be conducted as part of the formal Quality Control Program. Example measurements are presented in Table 13.

Table 13: Examples of Quality Control Measurements for the Statewide Injury Surveillance System

Timeliness	- *Average time for EMS run reports to be sent to governing agency* - *% EMS run repots sent to governing agency in the prescribed time* - *Average time from treatment & discharge from ED to record availability in the ED discharge database* - *Average time from patient discharge to record availability in the hospital discharge database* - *Average time from date of incident to record appearing in the trauma registry* - *# days from death to appearance of record on mortality database*
Accuracy	- *% EMS run locations that match statewide location coding* - *% correct ICD-9 and E-codes* - *% "errors" found during data audits of critical data elements in EMS, ED, trauma registry, hospital discharge, & mortality databases*
Completeness	- *% of traffic crash-related EMS runs in the EMS database* - *% of ED visits for crash-related injuries recorded in ED discharge database.* - *% of trauma cases represented in the trauma registry* - *% of SCI/TBI cases represented in the SCI/TBI registries*
Consistency	- *% correct ICD-9 and E-codes (see also accuracy)* - *CODES match rate (where applicable)* - *% crash-related deaths with motor vehicle crash in cause of death field on death certificate*

The measures in Table 13 are examples of high-level management indicators of quality. The managers of individual medical data files should have access to a greater number of measures. The custodial agencies should be prepared to present standard sets of summary measures to the TRCC monthly or quarterly.

2-F: Statewide Injury Surveillance System (SWISS) Data Component Status

Description and Contents
North Carolina claims two disparate injury surveillance systems. One injury surveillance system resides within the Office of Emergency Medical Services. It was reported that the injury surveillance system is not fully integrated although every component listed in the *Advisory* is included to some extent:

- Hospital discharge and emergency department data
- Emergency medical services data
- Long-term care data
- Traffic crash events
- Vital statistics
- Crime events

A second injury surveillance system resides within the Injury Epidemiology Unit of the Division of Public Health, Injury and Violence Prevention Branch. This injury surveillance system is comprised of emergency department, hospital discharge, and vital statistics (death) data.

While there is not a mandate for an injury surveillance system in the State, legislation was passed in 2007 designating the Division of Public Health as the lead agency for injury prevention. The legislation tasks the Division of Public Health with developing a comprehensive injury prevention plan for the State, collaborating with other State agencies and private and community organizations to establish injury prevention programs, and maintaining an injury prevention program to include data collection and surveillance.

The North Carolina EMS System

Applicable Guideline
The Emergency Medical Services Act of 1973 established a statewide emergency medical services system in the North Carolina Department of Health and Human Services. The Office of Emergency Medical Services (OEMS), within the Division of Health Service Regulation, operates under 10A NCAC 13P *Emergency Medical Services and Trauma Rules*.

The Rules set the requirements for EMS Systems within the state, including medical oversight for the EMS Systems, data collection, credentialing and continuing education for EMS personnel, and enforcement for noncompliance of the Rules.

As a state public health authority, the OEMS is not subject to the Health Insurance and Portability and Accountability Act of 1996 (HIPAA). Patient confidentiality is governed by NC G.S. § 143-518 *Confidentiality of patient information*. The statute allows for linkage between the EMS data and other health care data systems for the purposes of quality management, peer review, and public health surveillance. The EMS data are not to be released or made public although there are exceptions, such as if the data are de-identified or for use in health care

research if approved by an IRB and the request meets certain criteria. Any use of the EMS data requires a data use agreement.

Since 1999, the EMS Performance Improvement Center (EMSPIC), part of the Department of Emergency Medicine at the University of North Carolina at Chapel Hill, has worked on behalf of the OEMS as follows:

- collecting and maintaining the EMS data and PreMIS;
- providing feedback to the OEMS regarding submission timeliness and data quality; and
- conducting research and statistical analyses.

Extensive security measures protect the data collected and maintained at the EMSPIC. Access to the EMS data is role-based; the level of detail accessible by staff is determined by their role within the EMSPIC.

Data Dictionary
North Carolina OEMS refers to the NEMSIS Version 2.2.1 Data Dictionary, available online through the NEMSIS website.

Process Flow
An EMS patient care report (PCR) must be completed for each patient contact which results in some assessment component. All patient care data are submitted electronically to PreMIS in one of two ways. Agencies employing commercial software can transmit their data into PreMIS via the NHTSA Version 2.1.1. XML standard. Agencies that cannot purchase commercial software can enter data directly into PreMIS through an online application provided to the agency at no cost. It was estimated that ten percent of the EMS agencies in the State use the online application; the other ninety percent collect the patient care data using commercial software.

Regardless of the mechanism, patient care data are submitted to and maintained by EMSPIC. The data are available typically within two days from the date of the incident. The EMS data are linked to the emergency department data on a daily basis.

Reports are available at the State level and the agency level; however, reports can be generated only by an individual with a Credentialing Information System (CIS) login. Agency level reports are accessible only by the EMS Agency Administrator, Primary Contact, Medical Director and the Agency Director.

State level reports provide aggregate information about the number of EMS agencies by type and primary service, EMS vehicles by type, and personnel by certification within the State.

Agency level reports address response times, procedures, call volume (by day and time), disposition and destination, and data submission.

North Carolina submits approximately 210 NEMSIS data elements to the National EMS Database.

Quality Control
The North Carolina EMS data are NEMSIS Gold compliant.

Quality issues, while reported to be minor, seem to be more prevalent for those agencies employing commercial software.

EMS agencies in North Carolina are required to submit patient care data within 24 hours of the incident. One hundred percent of the EMS providers in the State submit data to the statewide database and nearly 100 percent do so within 24 hours of the incident. However, there are some agencies using commercial software that experience delays in submitting patient care reports from incidents occurring on weekends if personnel with the software vendor are unavailable for patient care report review. In these instances, data submission occurs within 72 hours of the incident. Patient data are available within 24 hours of submission.

Patient care data imported into PreMIS are subject to business and scoring rules incorporated into the software. The internal rules are the primary quality controls to which the EMS data are subject; additional quality checks are not conducted at the agency or State level. PCR Error Reports, generated at the agency level, enable an EMS agency to identify and correct data quality errors. The report identifies and describes the data quality error, the number of affected records within a given date range, and the associated NEMSIS data element code. Errors identified by the PCR Error Reports are corrected at the agency level and resubmitted to the State; the corrected patient care reports overwrite the original patient care reports.

Data quality issues occur when the patient care data collected in commercial software map incorrectly to the State EMS System. For example, a procedure defined in the commercial software is not defined the same way at the State level. When this type of data quality issue occurs, the EMS agency works with their software vendor to correct the problem.

There are no statewide initiatives to develop data quality checks beyond those inherent to the data collection software and PreMIS. The North Carolina OEMS has plans to adopt NEMSIS Version 3.1.0, with the goal of 100 percent compliance by 2015.

Interface with other Traffic Records System Components
It was reported that there is an ongoing linkage among the EMS, trauma, crash, and emergency department data. These linked data are used primarily for research, injury surveillance, training, public health, legislation, and federal grant projects. No additional details were provided.

In addition, the EMSPIC was awarded Section 408 grant funds to develop the North Carolina EMS Outcome Data System. This data linkage project would link the same databases as the ongoing data linkage discussed above, as well as the Medical Examiner's data. The linkage was to be accomplished by developing a data warehouse, a process for linking the databases, a formal data request process, and creating an oversight structure.

A few issues are unclear:

- how the data are linked as the hospital discharge and emergency department data do not contain personal identifiers to facilitate linkage;
- if the ongoing linkage project is the same as the North Carolina EMS Outcome Data System;
- the extent to which the injury surveillance system within the OEMS is integrated and functional.

North Carolina Hospital Discharge and Emergency Department Data

Applicable Guidelines

Each hospital and freestanding ambulatory surgical facility is required to submit discharge data to a statewide data processor under North Carolina G.S. § 131E-2142.2. The discharge databases include short term acute care hospital (inpatient), ambulatory surgery, and emergency department data.

Thomson Reuters serves as the statewide data processor for North Carolina's discharge databases. Thomson Reuters is charged with collecting, compiling, and maintaining the hospital discharge data and ensuring that data are available as appropriate to medical care providers, third-party payers, medical care consumers, and health care planners. De-identified hospital discharge data are shared with the North Carolina State Center for Health Statistics (SCHS), a department within the Division of Public Health, Department of Health and Human Services as well as the Cecil G. Sheps Center for Health Services Research (University of North Carolina) which works under contract with the Division of Health Service Regulation to store, maintain, and analyze the health care databases.

In addition, the statewide data processor is responsible for analyzing the discharge data, compiling reports, and responding to requests from interested persons.

With regard to patient confidentiality, Thomson Reuters is subject to State and Federal regulations and must be compliant with the Security and Privacy Rules as set forth by the Health Insurance Portability and Accountability Act of 1996 as amended by the Health Information Technology for Economic and Clinical Health in 2009.

North Carolina G.S. § 10.349(b), Article 22 of Chapter 130A-480 mandates the submission of emergency department data to a central site for public health surveillance. The legislation limits the submission of data elements to those captured by hospitals electronically and prohibits the submission of specific patient identifiers including, but not limited to, patient names, contact information, geographic residential information, and numerical identifiers.

Emergency department data from the North Carolina Hospital Emergency Surveillance System (NCHESS) are submitted to the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) at the Carolina Center for Health Informatics (CCHI) in the Department of Emergency Medicine at the University of North Carolina at Chapel Hill.

Patient data, regardless of source, are not public records under Chapter 132 of the NC General Statutes.

Data Dictionary
The hospital discharge, ambulatory surgery, and emergency department data are submitted in accordance with the electronic specifications of UB-04 billing data; as such elements contained in the databases are typical of hospital billing records. A data dictionary for each of the databases is accessible through the UNC Sheps Center website.

There is an abbreviated version of a data dictionary that lists each data element and a description of that element; that document is accessible on the NC DETECT website.

Process Flow
In accordance with the Medical Care Data Act, all hospitals are required to submit discharge data to Thomson Reuters within 60 days after the close of each quarter. Hospitals submit their Universal Billing Form (UB-04) data to Thomson Reuters. Thomson Reuters provides a de-identified copy of the hospital discharge data to the SCHS.

Emergency department data are posted to NC DETECT every 12 hours in HL-7-like format; data posted include some external cause of injury codes (E-codes), clinical notes, and narratives that assist in the description of the cause of injury. The emergency department data are updated every three to six weeks to capture the E-codes and other diagnostic and clinical information not available upon initial entry. Data are collected from all emergency department visits.

Access to NC DETECT is role-based and limited to hospital staff who can view their own facility data and public health officials. Geography, data source (emergency department, poison, PreMIS), and approval from the Department of Public Health determine who can access data and at what level. NC DETECT supports the creation of additional levels of role-based access, increasing accessibility for a wider range of users.

The Injury and Violence Prevention Branch (IVPB) within the Department of Public Health receives a copy of the hospital discharge data for secondary analysis applicable to their area of research. The IVPB also has authorization to access NC DETECT. Generally, the IVPB will collaborate with data partners to ensure that the analysis of the health care data matches the analyses of other database analyses. For example, the number of injuries due to a motor vehicle crash (per E-code) aligns with the number of injuries reported on the crash data as found by the Highway Safety Research Center at the University of North Carolina. The IVPB also receives a flat file copy of annual NC DETECT data.

Quality Control
Thomson Reuters is responsible for ensuring that all hospitals submit the discharge databases within the required time, 60 days after the date of discharge, and in accordance with the uniform billing standards (UB-04). Provisional hospital discharge data for a calendar year are available 18 months after the close of the calendar year; a final file is provided to SCHS two years after the close of the calendar year.

The SCHS performs additional quality checks once they receive a copy of the hospital discharge data. The SCHS does not have the authority to request that hospitals resolve data issues, so those issues are reported back to Thomson Reuters who may then request a hospital resubmit corrected data.

Hospitals posting to NC DETECT standardize their emergency department data in accordance with the *Data Elements for Emergency Department Systems* (DEEDS). DEEDS, published by The Centers for Disease Control and Prevention's (CDC) National Center for Injury Prevention and Control (NCIPC), provides uniform specifications for emergency department data elements minimizing data incompatibility across disparate emergency departments. Emergency department data are available in near real-time; an annual flat file is available within four months after the end of the calendar year.

Ninety-seven percent (115) of the emergency departments in the State post to NC DETECT and have since 2007; the three facilities that do not are low volume but are scheduled to participate within the year.

Data quality, including completeness, reliability, and validity of emergency department data, is a priority for NC DETECT. The staff continuously monitors the quality of the emergency department data.

While Thomson Reuters provides an emergency department database to the SCHS, the SCHS prefers to use the emergency department data from NC DETECT and recommends to other data requestors and users the same. The data from NC DETECT is of a much higher quality and it is timelier (real-time). The two drawbacks to the NC DETECT data are the lack of personal identifiers to facilitate linkage and the lack of charge or cost data elements to calculate the economic burden of injuries.

The IVPB was awarded a five year cooperative agreement from the CDC to improve the quality of hospital and emergency department data. This funding gives the IVPB an opportunity to look at data quality issues more extensively than was possible in the past. The first priority will be the quality of the E-code. While 93 percent of the NC DETECT injury records are E-coded, 15 percent of those have been assigned an E-code of "unspecified". Only 86 percent of the hospital discharge records for injuries are E-coded and 14 percent of those are coded "unspecified".

Interface with other Traffic Records System Components

Health data has been linked to crash data for special research studies at the UNC Injury Prevention Research Center as well as the Highway Safety Research Center. One example is linking the health data with the crash data to study the impact of crashes on pregnant women and if that event affects the delivery and fetal survival.

North Carolina Trauma Registry

Applicable Guidelines

The Emergency Medical Services Act of 1973 established a statewide emergency medical services system in the Department of Health and Human Services. Under statutory authority (10A NCAC 13P *Emergency Medical Services and Trauma Rules*), the Office of Emergency Medical Services (OEMS), within the Division of Health Service Regulation, maintains a statewide trauma system, including the Trauma Registry. To assist with the registry, OEMS currently subcontracts with UNC - Chapel Hill to serve as the primary data collection agency. In this capacity, UNC also assists with research endeavors and processes trauma registry reports.

Trauma data are subject to the Health Insurance Portability and Accountability Act of 1996. The State Trauma Advisory Council is developing guidelines and a process for requesting trauma data that will comply with State and federal privacy regulations.

North Carolina has six Level I, three Level II, and three Level III trauma centers. Initial trauma center designation by the State is effective for three years. Renewal designations are effective for four years. A hospital may choose to be verified by the American College of Surgeons (ACS) when renewing their designation; verification by the ACS is effective for three years.

Data Dictionary

The Trauma Registrar has updated and reformatted the North Carolina Trauma Registry (NCTR) data dictionary to include the National Trauma Data Standards and mirror information found in the National Trauma Data Standards, the National Trauma Data Bank, and the Trauma Quality Improvement Program.

The Trauma Registry data dictionary must be approved by a committee that meets to review the data dictionary biannually. It is anticipated the updated data dictionary will be posted to the Trauma Registry website by the end of February 2012.

Process Flow

Trauma data is collected at the individual facility and transmitted using Digital Innovations software to the Trauma Registry. Data are submitted weekly to the NCTR.

Trauma centers verified by the ACS are required to submit their data directly to the National Trauma Data Bank (NTDB). Non-trauma hospitals may voluntarily submit to the NTDB as well. According to the Trauma Registry website last updated September 2011, 12 designated trauma centers and two non-designated trauma centers submit data to the NCTR. Four non-trauma center facilities submit trauma data to the registry and two additional facilities are slated to start submission within the year.

Most personal identifiers are submitted to the NCTR including date of birth, social security number, and resident zip code; first and last names are not included in the submission to the Registry.

Quality Control

Trauma data are collected in accordance with the National Trauma Data Standards. Data validation is done at the facility level; random data points are validated at the State level. The number of critical data elements found to be missing was reported as "unknown". Ninety-five percent of the trauma discharges contained a valid E-code.

Interface with other Traffic Records System Components
Trauma records are linked to the EMS patient care reports to populate the pre-hospital data in the Trauma Registry. Conversely, the Trauma Registry data added to the PreMIS patient care data allow EMS providers to examine the outcomes of transported trauma patients.

North Carolina Vital Statistics

Applicable Guidelines
North Carolina G.S. Chapter 130A, Article 4 charges the Department of Health and Human Services with maintaining a Vital Statistics Program. Vital Records is a unit of the State Center for Health Statistics (SCHS), within the Division of Public Health, Department of Health and Human Services.

Death data are public record in North Carolina; there are no statutes or restrictions on their release.

Data Dictionary
North Carolina maintains a data dictionary for the death certificate data. The certificate of death contains the standard data elements as found on the certificate of death prepared by the National Center for Health Statistics.

Process Flow
A physician may complete the cause of death and sign the certificate for all non-medical examiner deaths. A medical examiner initiates death certificates for a death resulting from unintentional and intentional injuries and certifies cause and manner of death. The funeral director or appropriate person disposing of a body is responsible for filing a death certificate with the local registrar (county health director) within five days after death. The local registrar checks the records for accuracy and completeness, requests further information as necessary, prepares copies of the death certificates for the Register of Deeds, and forwards original death certificates to Vital Records.

Once received at Vital Records, additional data are added to the certificate including the demographic data of the individual and cause of death (identified by ICD-10, International Classification of Disease codes). The ICD-10 system is used to code and classify mortality data from death certificates.

The death records are keyed from the paper copy into the State repository. Finally, the data are transmitted to the National Center for Health Statistics.

Quality Control

The collection and entry of mortality data is a manual process, requiring the Vital Statistics team at the SCHS to perform extensive and thorough quality control checks on an ongoing basis. Checks are in place to assess the quality of geographic, demographic, and cause of death coding. Every data element in the file is analyzed to assess statistically significant change in the data and determine the source of errors.

Implementing an Electronic Registration System to collect the mortality data would improve the data quality issues associated with the manual process and decrease the extensive and laborious process of manually coding records and key entering the data. However, a lack of funding is the major obstacle to implementing an Electronic Registration System.

Interface with other Traffic Records System Components
The mortality data have not been linked with other traffic records system components.

Integration of the SWISS with Motor Vehicle Crash Information

Integrated health and crash data can be used to inform decisions regarding all types of traffic safety programs related to behavior and occupant/non-occupant demographics: teen driving, distracted, impaired, aggressive driving, and restraint use to name a few. The inclusion of location and roadway information can further provide insight into the impact of environmental issues on persons involved in crashes. The potential for problem identification and program development and evaluation for traffic safety stakeholders at the State and county level is endless.

A true injury surveillance system integrates the individual components to provide a longitudinal look at what happens to injured persons from the time of the incident resulting in an injury through the health care setting (or upon death). The individual components are linked using person identifiers and event identifiers common across the databases.

North Carolina collects data for each of the major injury surveillance system components: EMS, hospital discharge, emergency department, trauma registry, and vital records. In fact, the State reports two injury surveillance systems, one within the OEMS (includes crash data) and the other at the IVPB (does not include crash data). Each injury surveillance system contains different components and each system has its own set of users. The existence and use of two different injury surveillance systems introduces the opportunity for conflicting reports and statistics.

It seems as though there is a lack of collaboration, communication, and cooperation among the data owners and/or custodians, creating an obstacle to a fully realized, functional, and comprehensive injury surveillance system. Policies set prior to creating an integrated injury surveillance system can alleviate trust issues that arise when having to share data. For example:

- Data owners retain control over their own data at all times.
- Protocols that govern what data can be released, at what level, and to whom.
- Policies that plainly state when a data request requires the permission of the data owners for release and when permission is not required.

The cliché "easier said than done" comes to mind, but one injury surveillance system inclusive of all components, including the crash data, is possible if the data owners and custodians can work together to make it happen.

Recommendations:

- ❑ Develop and formalize data quality metrics for the EMS data at the State level to ensure completeness, consistency, and accuracy. Report findings back to the agencies; recognize those meeting high quality standards and agencies most improved.

- ❑ Develop and formalize data quality metrics for the Trauma Registry data at the State level to ensure completeness, accuracy, and timeliness.

- ❑ Improve the quality of the hospital discharge and emergency department data by taking advantage of the five-year data quality improvement grant from the CDC. Foster a relationship with the North Carolina Health Information Management Association, the professionals who code the medical records in the hospitals.

- ❑ Leverage the relationship with the North Carolina Hospital Association to challenge the hospitals and Thomson Reuters to provide healthcare datasets in a timelier manner on behalf of the users of hospital discharge data.

- ❑ Work with Thomson Reuters to obtain a unique patient identifier that will aid in un-duplication efforts and calculating recidivism rates.

- ❑ Determine the feasibility of obtaining additional information for the death certificate from the FARS analyst in the Department of Transportation.

- ❑ Develop one comprehensive, inclusive-of-all-components, injury surveillance system.

    - o Employ the services of the North Carolina Institute of Medicine whose mission, according to their website, is "To seek constructive solutions to statewide problems that impede the improvement of health and efficient and effective delivery of healthcare for all North Carolina citizens."

    Or

    - o Form a subcommittee of the Traffic Records Coordinating Committee, including representation from all components of the injury surveillance system. The subcommittee would be charged with:

        - Developing policies and procedures to govern the integrated data.

        - Identifying obstacles to data linkage for each component and solutions to overcome said obstacles.

        - Identifying gaps in the components' data and solutions to close those gaps.

- Determining the best agency or entity to perform the linkage, house, and maintain the data. The agency or entity would be responsible for analyzing and/or releasing the linked data only. Data owners and/or custodians would remain responsible for any requests for their respective component. The best type of agency or entity would be one that is HIPAA compliant whether as a covered entity or business associate.

- Other tasks as necessary to realize an injury surveillance system.

❑ Revisit the State legislation that prohibits the collection of patient identifiers on health care databases. Leverage the relationship with the North Carolina Hospital Association to accomplish this.

APPENDFIX A

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APPENDIX B

Abbreviations and Acronyms

AAAM	Association for the Advancement of Automotive Medicine
AAMVA	American Association of Motor Vehicle Administrators
AASHTO	American Association of State Highway and Transportation Officials
ACS	American College of Surgeons
AIS	Abbreviated Injury Score
ANSI	American National Standards Institute
ATSIP	Association of Transportation Safety Information Professionals
BAC	Blood Alcohol Concentration
BPEVR	Business Partner Electronic Vehicle Registration
CDC	Center for Disease Control
CDLIS	Commercial Driver License Information System
CODES	Crash Outcome Data Evaluation System
DMV	Department of Motor Vehicles
DOT	Department of Transportation
DUI	Driving Under the Influence
ED	Emergency Department
EMS	Emergency Medical Service
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
GES	General Estimates System
GIS	Geographic Information System
GJXDM	Global Justice XML Data Model
GPS	Global Positioning System
HPMS	Highway Performance Monitoring System
ICD	Injury Coding System
IRP	International Registration Plan
ISS	Injury Surveillance Score
LEIN	Law Enforcement Information Network
MCMIS	Motor Carrier Management Information System
MMUCC	Model Minimum Uniform Crash Criteria

NCIC	National Crime Information Center
NCSC	National Center for State Courts
NDR	National Driver Registry
NEMSIS	National Emergency Medical Service Information System
NGA	National Governor's Association
NHTSA	National Highway Traffic Safety Administration
NIBRS	National Incident-Based Reporting System
NLETS	National Law Enforcement Telecommunication System
NMVTIS	National Motor Vehicle Title Information System
PDPS	Problem Driver Pointer System
RTS	Revised Trauma Score
SHSP	Strategic Highway Safety Plan
SWISS	Statewide Injury Surveillance System
TCD	Traffic Control Devices
TRCC	Traffic Records Coordinating Committee
TRS	Traffic Records System
UCR	Uniform Crime Reporting
VIN	Vehicle Identification Number
VMT	Vehicle Miles Traveled

TEAM CREDENTIALS

CHRISTOPHER D. COREA, SERGEANT

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Summary of Experience

Sergeant Corea has been a sworn member of the Maryland State for over 10 years, holding the ranks of Trooper, Trooper First Class, Corporal and Sergeant.

Sergeant Corea worked on Interstate 95 for the first four years of his career patrolling from the Delaware/Maryland state line to Baltimore City. When assigned to the JFK Highway Barrack, Sergeant Corea began improving officer efficiency and the accuracy of reporting by developing multiple applications for the agency. He was nominated for Trooper of the Year twice while on patrol and he received the award in 2003. He participated in round table discussions and reviews of different technologies as a representative for the Maryland State Police

Sergeant Corea then transferred to the Information Technology Division in 2004 where he became the lead application developer for the Maryland State Police Development Unit. He continued to maintain and improve applications that were existing in the agency until 2006 when the development of E-TIX, an electronic citation application, began. Sergeant Corea developed the application that is now used by over 50 percent of the law enforcement agencies in Maryland for issuing electronic citations, warnings and Safety Equipment Repair Orders. Sergeant Corea helped with legislation to authorize electronic citations in Maryland. He has also worked closely with other state agencies on standards for registration card barcodes and data transfer between agencies as it relates to law enforcement data. He has been credited with changing the way law enforcement officers do their jobs as it relates to traffic enforcement in the State of Maryland. He continues to work on data sharing initiatives and open source projects for government. He has also been dedicated to improving officer efficiency while increasing the accuracy of data collected for public safety.

Sergeant Corea is currently the supervisor of the Application and Development Section for the Maryland State Police. He is directly involved in Statewide deployments of applications for law enforcement throughout Maryland. Along with deploying the E-TIX to more agencies, Sergeant Corea is also in the process of deploying electronic crash reports and field interview/gang activity reports throughout Maryland.

Professional Experience

- Certified Drug Recognition Expert since 2005
- Certified Drug Recognition Expert Instructor since 2006
- Manager for all development occurring in the Maryland State Police
- Committee with State Agencies to develop and testify for legislation change Maryland law to allow electronic citations
- Developed the statewide electronic citation application for Maryland
- Responsible for the statewide deployment and maintenance of the Electronic Citation system in Maryland
- Continues to teach officers in the use and guidelines for the Electronic Citation Application with over 3500 officer currently trained
- Speaks regularly around Maryland on topics dealing with Electronic Citations, Crash Reporting and Data Sharing initiatives within Maryland Law Enforcement
- Selected to speak at the IACP LIEM Annual Conference - 2008
- Selected to speak at the National Association for Justice Information Systems Annual Conference - 2008
- Selected to attend the National Institute of Justice Technology Institute for Law Enforcement – 2009
- Speaker at the Maryland Crash Reconstruction Conference – 2010, 2011
- Recently appointed to the Traffic Records Committee Technical Council – 2011

Continuing Education

- 35 Hour Project Management Training
- SOA Architecture for .NET
- NEIM Standards Training
- Crystal Reports Level 1 and 2 training
- Microsoft .NET
- Drug Recognition Expert
- Drug Recognition Expert Instructor
- Standardized Field Sobriety Testing Instructor
- Alcohol Enforcement Specialist

Formal Education

- B.S. Criminal Justice, Richard Stockton College of New Jersey

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After earning an Associate Degree from the University of Delaware, Mike joined the Delaware State Police on September 8, 1978. During his career, Mike was assigned to a number of operational divisions within the state police. His most notable assignment was as a charter member of the Fatal Accident Investigation and Reconstruction Team known as F.A.I.R. His responsibilities included investigating all fatal motor vehicle accidents and personal injury accidents having the likelihood of becoming a fatality. During the six years he spent with the F.A.I.R. team, Mike was recognized as an expert witness in accident reconstruction, testifying in all levels of the courts in Delaware. Mike was promoted to sergeant out of the F.A.I.R. team in 1988 and assigned to the patrol division. In 1984, Mike earned his Bachelor of Science Degree from the University of Delaware in Business Administration with a concentration in Operations Management.

In 1990 Mike was selected to attend the Federal Bureau of Investigation's National Academy in Quantico, VA and graduated from the 164th National Academy class. This school provides leadership training and is one of the most renowned and respected advance command schools in the nation. Mike held administrative positions from 1990 until 1992 when he was promoted to Captain and assigned as a Troop Commander. Mike was assigned to the Executive Staff in February 1993. Later that same year, he was promoted to the rank of Major and permanently assigned to Headquarters to manage the Division's budget and the Information Technology Section. In 1998, he was selected as a recipient of the Exceptional Performance award, and is credited even today with developing the Division's original and continuing vision for information technology and its business process reengineering model. Mike held this position until his retirement from active service in July 1999 when he accepted a civilian position with the agency as the Director Information Technology.

In addition to his duties with the Division, Mike also represents the State Police on a variety of boards and committees at the local and national level most notably as the CJIS Systems Officer for Delaware for the FBI's National Crime Information Center (NCIC) and the International Justice and Public Safety Information Sharing Network (*Nlets*). He is the northeast regional working group representative for Delaware to the FBI's shared management model of NCIC and a member of the FBI's Advisory Policy Board; the group that advises the Director of the FBI regarding changes in the NCIC system. He is also a past Chairman of the Finance and Management Committee for *Nlets*. Mike is also a member of the Delaware Justice Information System (DELJIS); the Board of Managers who oversee criminal justice information within the state.

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EDUCATION

Saint Bonaventure University, Olean, NY — *Master of Business Administration*
Concentration: Management — December 1994

St. Vincent College, Latrobe, PA — *Bachelor of Science*, May 1993
Major: Management — Minor: Industrial Relations

PROFESSIONAL WORK HISTORY

Program Manager I

South Carolina Budget and Control Board, Office of Research and Statistics

2007 - Present

- Interprets policies and rules for the Health and Demographics Section in the areas of data sharing, use, release of data and privacy and security of data as well as other issues related to federal and state laws, regulations and guidelines.
- Develops and maintains office-wide policy and procedures manual related to data use and release.
- Provides staff training as dictated by federal and state laws, regulations and guidelines regarding privacy and confidentiality of data.
- Develops, reviews, and edits data sharing agreements and contracts with other agencies and organizations.
- Manages grants and contracts for the section; monitors compliance with contractual provisions.
- Represents the office in national and state-sponsored meetings, making presentations, and providing consultative services; prepares progress reports to grantor agencies and assists in preparation of grant applications.
- Assists in section's budget preparation and monitoring.
- Manages database design, data quality improvement and analytic design with staff in partnering agencies.

Program Coordinator II

South Carolina Budget and Control Board, Office of Research and Statistics 1997 - 2007

- Served as lead programmer and analyst on the CODES grant since receiving funding
- Linked crash, emergency medical services, and hospital data to analyze medical and economic outcomes as a result of motor vehicle crashes using probabilistic methods every year since 1999 in accordance with the CODES grant

- Performed statistical analyses on restraint usage and associated medical costs by payer using the CODES linked data as requested by the legislature in drafting primary seatbelt enforcement laws
- Designed edit reports to monitor data quality and logistics for the Uniform Traffic Collision Report and the DHEC Patient Care Form
- Developed a sophisticated probabilistic matching program linking reported incidents of residential fires, addresses of residences receiving smoke alarms, and UB-92 hospital data to determine the effectiveness of smoke alarms in reducing the number and severity of injuries due to residential fire and flame
- Linked data to identify mothers with high risk factors indicative of problem pregnancies as part of the High Risk Channeling Project for the South Carolina Department of Health and Human Services
- Performed statistical analyses on Traumatic Brain Injury data for use by the legislature in determining the need of a comprehensive TBI center

Corporate Writer

Technology Solutions, Inc., Columbia, SC 29221 **1996 - 1997**

- Ensured the corporation's Employee Handbook complied with state and federal employee/labor laws
- Researched and analyzed advertising opportunities to determine the most effective advertising avenue
- Created, developed, and wrote public relations materials and advertising for marketing and recruiting
- Enrolled, terminated, and counseled employees on medical, dental, and life insurance plans; administered and counseled employees on 401k retirement plan
- Assisted employees with company policies, insurance matters, and payroll

Technical Writer

Avtec, Gilbert, SC 29054 **1995 - 1996**

- Created custom Installation and Maintenance Manuals for radio/telephone dispatching systems
- Developed and organized user-friendly Operator Manuals for ACCESS and DSPatch workstations
- Created training documentation for use by Project Engineers and Field Technicians
- Edited and proofread sales and advertising copy

Lead Technical Writer

South Carolina Electric & Gas, Columbia, SC 29218 **1995**

- Wrote user manual and training documentation for the Fuel Management System
- Created context-sensitive online help for a Windows application using Doc-To-Help
- Performed system testing, product design reviews, quality and functionality testing
- Trained diverse groups of users on final application
- Assisted in final revisions of the SCE&G Disaster Recovery Plan

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Independent Consultant

PROFESSIONAL EXPERIENCE

Mr. Spell entered his professional career in traffic records systems and data exchange over 50 years ago. He is nationally recognized for his work in development of traffic records systems, especially interchange (NDR and CDL) of information amongst various users and the development and promulgation of data standards in information processing.

He served as a member of D16.1 committee. He developed the AAMVA Violations Exchange Code or "ANSI" code (predecessor of the AAMVAnet Code Dictionary or ACD which he also co-developed) while employed with AAMVA and later served as the Accident (Crash) Subcommittee Chairman for the ANSI D-20 Standard, A States Model Motorist Data Base, while employed with the National Highway Traffic Safety Administration.

While employed with NHTSA he created the original reporting forms and file structure for the Fatality Analysis File which was renamed in 1975 as the Fatal Accident Reporting System (FARS) and later renamed again, the Fatality Analysis Reporting System (FARS). He and his staff conducted the training for all of the original analysts.

As an independent consultant, he conducted the NHTSA Uniform Traffic Ticket Study to determine the extent and details of emerging Citation Tracking Systems. He conducted all aspects of the study including on-site State visits and assessments to determine the extent of control being exercised in citation issuance, processing of conviction information through the courts, and recording conviction dispositions in driver history files.

In the private sector, he developed numerous Crash Report forms, instruction manuals for crash reporting, data input procedures, all edits to assure data quality, and reporting and analysis procedures for problem identification. He also developed the EMS Run Report for Kentucky.

He designed the graphical user interface for the Highway Traffic Records Information System for the Virginia Department of Transportation (VDOT) and provided training in the use of the system to the district offices of VDOT.

He was involved in the design and developmental efforts for the Commercial Driver Licensing Information System (CDLIS) and its AAMVAnet environment and was a member of the AAMVAnet "Tiger Team" that made the assessments of selected states to become pilots and eventual founding states in the National Motor Vehicle Title Information System. His background, experience and interested cover the entire spectrum of traffic records systems.

HISTORY

1992 – Present	Independent Consultant (now essentially retired)
1977 – 1992	Senior Traffic Records Analyst National ConServ, Inc. (but 1980 to 1983: Independent Consultant)
1974 – 1977	Vice President GENASYS (Systems Division) (now Keane, Inc.)
1968 – 1974	Chief, Information Systems, NHTSA, US Department of Transportation
1966 – 1968	Director of Data Systems for the AAMVA
1958 – 1966	Staff Specialist in MVRs (driver histories) for Retail Credit Co. (now Equifax) Atlanta, GA

MEMBERSHIPS IN PROFESSIONAL ASSOCIATIONS (FORMER)

Traffic Records Committee, Transportation Research Board

American National Standards Institute, D-16, D-20, and X3L8 Committees

Executive Board, Traffic Records Committee, National Safety Council

Society of Automotive Engineers Committee on Standardization of Vehicle Identification Numbers

EDUCATION

Boston University ..... S.T.B., 1956

Duke University ..... A.B. 1953

JOHN J. ZOGBY, PRESIDENT

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Summary of Experience

Mr. Zogby has over 40 years of experience in highway safety engineering and management and motor vehicle and driver licensing administration.

Mr. Zogby's transportation career began in the Bureau of Traffic Engineering in the Pennsylvania Department of Highways, where he was responsible for the statewide application of highway signs and markings. He was instrumental in developing the state's first automated accident record system in 1966. In the late 1960's he helped initiate and was project director for the statewide safety improvement program and the state's in-depth accident investigation function.

Mr. Zogby worked in the private sector in traffic safety research for several years before returning to public service as the Director of the Bureau of Accident Analysis in the Pennsylvania Department of Transportation. He was appointed Deputy Secretary of Transportation for Safety Administration in February of 1979, a position he head for 13 years, until his retirement from public service in December 1991.

Since his retirement from state government, Mr. Zogby has been engaged as a consultant on management and policy issues for federal, state and local government agencies in the area of transportation safety and motor vehicle/driver licensing services.

Professional Business Experience

- Subcontract with GeoDecisions Consulting on a Safety Analysis Management System (SAMS) for the state of Mississippi.
- Subcontract with iTRANS Consulting, Inc. on NCHRP project 17-18-(05), Integrated Management Process to Reduce Highway Injuries and Fatalities Statewide for the Transportation Research Board.
- Contract with the National Academy of Sciences (NAS) to provide AASHTO Strategic Highway Safety Plan – Case Studies (17-18(06A) for the Transportation Research Board.
- Subcontract with ISG, a systems integration consulting company, conducting a re-engineering contract with the Pennsylvania Department of Transportation in the area of motor vehicle processes.
- Subcontractor with the Pennsylvania State University to research the impact of an education provision in state law governing novice drivers.
- Conducted a three week course on safety management for the Ministry of Communications in the Kingdom of Saudi Arabia.

- Subcontractor with a Moroccan engineering firm to develop a national highway safety plan for the country of Morocco.
- Completed a study for the state of Mississippi, Department of Public Safety to develop a Strategic Plan for Highway Safety Information.
- Contracted by the Federal Highway Administration, Office of Motor Carrier Safety to help in the final implementation phase of the Commercial Driver License (CDL) program.
- Participated as a team member conducting Traffic Records Assessments with states in assessing their Traffic Records capabilities to address highway safety program management needs
- Project director and principal instructor for a Federal Highway Administration (FHWA) contract to develop, implement, and instruct a training program for the Highway Safety Management System.

Professional Societies and National Committees

- Member Institute of Transportation Engineers (ITE).
- Member Emeritus of the Transportation Research Board (TRB) Committee on Transportation Safety Management.
- Member of Association of Transportation Safety Information Professionals.
- Past President of the Mid-Atlantic Section of ITE.
- Past Chair of the National Safety Council's Traffic Records Committee.
- Past President of Region 1 of the American Association of Motor Vehicle Administrators.
- Past Chair of the Governing Board of the International Registration Plan.
- Past Chair of a subcommittee of the NGA Working Group on State Motor Carrier Taxation and Regulation.
- Completed six year tenure as the Chair of the TRB Committee on Planning and Administration for Transportation Safety.

Community

- President, Duncannon Area Revitalization, Inc.
- Pastoral Associate, St. Bernadette Church, Duncannon, PA.

Education

- B.S., Economics, Villanova University
- MPA, Penn State University