

# Introduction to North Carolina's...

**T**raffic  
**E**ngineering  
**A**ccident  
**A**nalysis  
**S**ystem

Sponsored by:

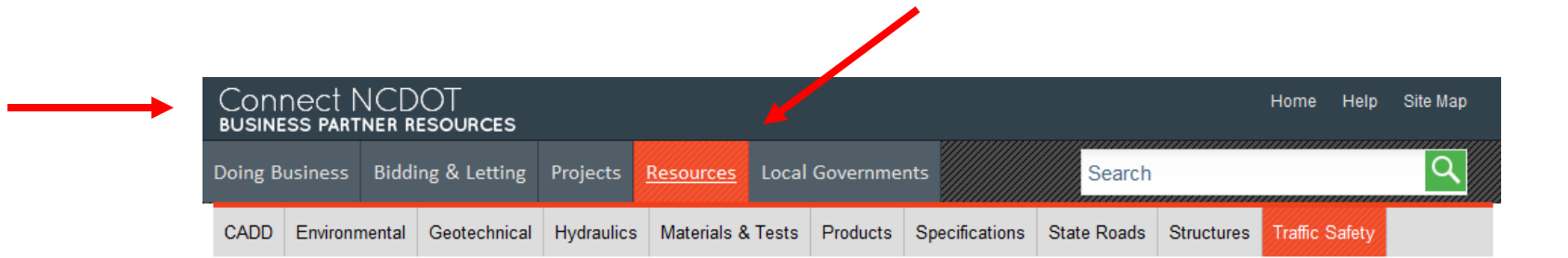
Traffic Safety Unit  
Transportation Mobility and Safety Division  
Division of Highways  
North Carolina Department of Transportation



Road Safety Academy  
Highway Safety Research Center  
University of North Carolina



# TEAAS Information



## Traffic Safety Information and Resources

Programs, projects, crash data, policies and other safety resources for North Carolina.

### Traffic Data

Contractor Resources, Volume Class, Turning Movement, Workstream Information

[Read More](#) →

### Traffic Engineering Accident Analysis System (TEAAS)

Resources and information for this crash analysis software, which is free for government agencies to download and use.

[Read More](#) →

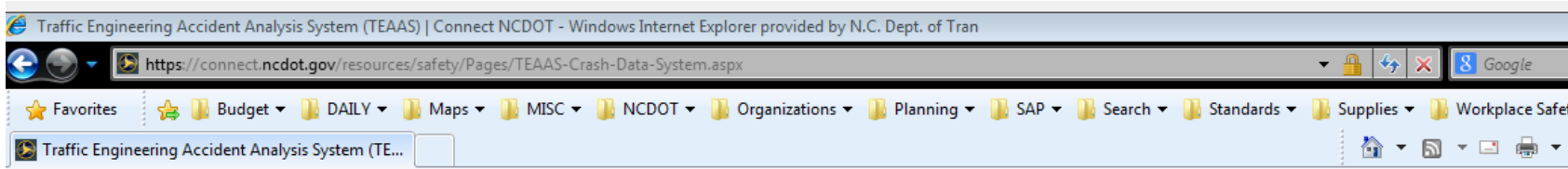
### Traffic Engineering Policies, Practices and Legal Authority

Policies, documentation and information for traffic engineering.

[Read More](#) →

<https://connect.ncdot.gov/resources/safety/Pages/default.aspx>

# TEAAS Information (cont.)



## Traffic Engineering Accident Analysis System (TEAAS)

Resources and information for this crash analysis software, which is free for government agencies to download and use.

A screenshot of the TEAAS website content area. The breadcrumb trail shows: Resources &gt; Traffic Safety &gt; Traffic Engineering Accident Analysis System (TEAAS). The main heading is "TEAAS – Traffic Engineering Accident Analysis System". Below it, a red banner states: "TEAAS crash data is now available through October 2012". The main text describes the system as a crash analysis software available free of charge to state government personnel, municipalities, law enforcement agencies, planning organizations, and research entities. It also mentions ordinance information for state-maintained roads and highways. There are three main sections: "Downloads" with links to "Download the latest version of TEAAS" and "Download the reference material for the latest version"; "Training Dates Times and Locations" with a link to "TEAAS training spans two consecutive days and provides an overview of crash data, routes"; and "Related Content" with a link to "TEAAS Resources and Information Mileposting, TEAAS Links". Below "Related Content" is a "Training Material" section listing four PDF documents: "Evaluation.pdf", "Directions to Garner.pdf", "Chapter 01 Introduction", and "Chapter 02 TEAAS and Safety Data". A blue box titled "Employee Directory" is also visible, containing the text "Staff contacts for Transportation Safety and Mobility." Red arrows point from external text labels to these sections: "Data certification date" points to the red banner; "Software" points to the "Downloads" section; "Classes" points to the "Training Dates Times and Locations" section; "Maps, Volumes, Etc." points to the "Related Content" section; and "Training Chapters" points to the "Training Material" section.

Data certification date

Software

Classes

Maps, Volumes, Etc.

Training Chapters

<https://connect.ncdot.gov/resources/safety/Pages/TEAAS-Crash-Data-System.aspx>

# Definitions

**Access Control** – The type of physical controls of a route that allows access to that route. There are four (4) types of access control: full (interchanges only), limited (interchanges and some at-grade intersections, but no driveways), partial (interchanges, at-grade intersections, and driveways), and none.

**Alternate Name** – A feature name that is not the preferred name. This can include names with prefixes (North, South, etc.) and/or suffixes (Road, Street, etc.) such as “North Main Street” would be an alternate spelling for the preferred name of “Main”. This can also include variable spellings and/or similar sounding names such as “Greene” would be an alternate spelling for the preferred name of “Green” and “Brae Side” would be an alternate spelling for the preferred name of “Brayside”.

**Alternate Route** – A route designated in addition to a mainline route only where both routes are needed to accommodate traffic demand and when the alternate route has substantially the same geometric and structural design standards of the mainline route. Alternate routes are signed with a supplemental “Alternate” plaque above the route number, and begin and end at mainline routes (i.e. US 1 Alternate begins and ends at US 1). Additions, changes, and deletions of North Carolina (NC) alternate routes require approval of the State Traffic Engineer. Additions, changes, and deletions of United States (US) alternate routes require approval of the American Association of State Highway and Transportation Officials (AASHTO).

# Definitions (cont.)

## **American Association of State Highway and Transportation Officials (AASHTO) –**

A nationwide organization that has to approve additions, deletions and changes to interstates (other than high priority corridors) and US routes (mainline, business, bypass, and alternate routes but NOT truck or connector routes).

**Analysis** – The identification of trends, frequencies, rates and other information used to develop counter-measures and assist in the mitigation of crash-related issues.

**Annual Average Daily Traffic (AADT)** – Generally a 48-hour volume count normalized over a year to account for seasonal, special event, and other fluctuations. These numbers are used for crash analyses in order to compute crash rates. Mainline interstates, freeways and major arterials are usually counted every year. Collectors and most local routes are generally counted every other year.

**Average Daily Traffic (ADT)** – Generally an unadjusted 48-hour volume count. These numbers are not used for crash analyses.

**Benefit/Cost (B/C) Ratio** – A ratio calculated by dividing the benefit of a proposed project by the cost of the proposed project. Benefit/cost (B/C) ratios are required for Spot Safety (SS and SF) projects and for Hazard Elimination (W) projects.

# Definitions (cont.)

**Boundary** – A political boundary (state line, county line, or municipal limit).

**Business Route** – A route principally within the corporate limits of a municipality which provides vehicles an opportunity to travel through the business part of the municipality. Business routes are signed with a supplemental “Business” plaque above the route number, and begin and end at mainline routes (i.e. US 1 Business begins and ends at US 1). Additions, changes, and deletions of North Carolina (NC) business routes require approval of the State Traffic Engineer. Additions, changes, and deletions of United States (US) business routes require approval of the American Association of State Highway and Transportation Officials (AASHTO). Additions, changes, and deletions of Interstate (I) business routes require approval of the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO).

**Bypass Route** – A route specifically established to avoid congested areas and/or municipalities (also called a “relief” route). Bypass routes are signed with a supplemental “Bypass” plaque above the route number, and begin and end at mainline routes (i.e. US 1 Bypass begins and ends at US 1). Additions, changes, and deletions of North Carolina (NC) bypass routes require approval of the State Traffic Engineer. Additions, changes, and deletions of United States (US) bypass routes require approval of the American Association of State Highway and Transportation Officials (AASHTO).

# Definitions (cont.)

**Cardinal Directions** – North, South, East, and West.

**Certificate of Rulemaking (COR)** – A listing of ordinances being enacted or repealed on a given date.

**Cluster Analysis** – The identification of locations where crashes are grouped together in close proximity to each other.

**Coinciding Routes** – Routes inventoried on the same stretch of pavement. An example would be US 1 and Capital Boulevard in Raleigh (Wake County).

**Collision Diagram** – A visual representation of crash information.

**Connector Route** – A route specifically established to connect two different mainline routes that do not intersect (i.e. US 117 Connector between US 117 and I 40 in Sampson and Duplin counties). Connector routes may have the same geometric and structural design standards of the mainline routes, are signed with a supplemental “Connector” plaque above the route number, and begin (but not necessarily end) at mainline routes. Additions, changes, and deletions of North Carolina (NC) connector routes and United States (US) connector routes require approval of the State Traffic Engineer.

# Definitions (cont.)

**Counter-Measure (CM)** – Any engineering, enforcement, or education item or method used to reduce crash-related issues (i.e. the installation of turn lanes, increased lighting, signing upgrades, attaching back plates to signals, etc.)

**County GIS Maps** – Maps maintained by county governments primarily for tax purposes and emergency response routing. These maps are usually available on the internet and are the preferred source for local road names and alignments.

**Couplets** – A pair of direction specific pavement that carries one-way traffic in opposite directions. The road may be divided (i.e. I 40 eastbound and I 40 westbound) or paired streets (i.e. US 70 eastbound /Dawson Street and US 70 westbound /McDowell Street in Raleigh).

**Crash Rate** – The number of crashes per 100 million vehicle miles (MVM). Crash rate is calculated by dividing the number of crashes by the exposure.

**Crash Rate (Critical)** – A statistically adjusted statewide crash rate based on a 95% level of confidence (K factor = 1.645). Critical crash rates are usually used for state transportation improvement program (STIP) projects and benefit/cost (B/C) ratio calculations.



# Definitions (cont.)

**Crash Rate (Statewide)** – The number of crashes per 100 million vehicle miles (MVM). Statewide crash rates cover a three-year period by cross-section and are generally published annually. Statewide crash rates are only available for strip segments and not intersections.

**Crash Report** – See “DMV-349”

**Crash Web** – An on-line system maintained by the Division of Motor Vehicles (DMV) for accessing crash reports. Access to this system for TEAAS users is maintained by NCDOT’s Traffic Safety Unit.

**Cross Section** – The type of road being used at a particular location. Examples are two-lane undivided, multi-lane divided with full control access, five-lane undivided with a two-way center turn lane, etc.

**Date Range** – The range of dates used for crash analyses. The standard date range is five (5) years ending with the most recent date available for crash data (posted on the TEAAS web site).

**Direction to Next** – The compass direction from one feature on a route to the next feature on the route, following the direction of the route.

# Definitions (cont.)

**Distance to Next** – The distance from one feature on a route to the next feature on the route, following the direction of the route.

**DMV-349** – The current version of the standardized crash report form for North Carolina maintained by the Division of Motor Vehicles (DMV).

**Dummy Route** – A route inventoried in TEAAS (Interstate 1 with 8-digit code of 10000001) that can be used to consolidate studies (i.e. those in more than one county like TIP projects) or for uploading a subset of crash information (i.e. bicycle crashes).

**Engineering Directions** – Default engineering directions are West to East and South to North.

**Eight (8) Digit Code** – Numeric code with eight (8) digits used in TEAAS and the Linear Referencing System (LRS) to identify routes.

**Equivalent Property Damage Only (EPDO)** – A calculated damage value, based on property damage only (PDO) crashes, assigned to crash level severity: K and A crashes = 76.8, B and C crashes = 8.4, and O and U crashes = 1.

**Exposure** – Used in calculating crash rates. Exposure = (volume)(distance)(time)

# Definitions (cont.)

**Extraterritorial Jurisdiction (ETJ)** – Any area outside a municipality that receives municipal services.

**Fatal Crash** – A crash having at least one person die from their injuries within twelve (12) months of the crash.

**Feature** – One of five (5) items mileposted in the Traffic Engineering Accident Analysis System (TEAAS): at-grade intersections, boundaries (state, county, and municipal), structures that carry the roadway, mile markers, and at-grade railroad crossings.

Feature Name –

**Fiche Report** – Identifies all crashes on specified routes within a given county and date range regardless of whether or not they milepost. This report is usually used for quality control of crash analysis results in TEAAS, but can also be used as a stand-alone study for quick answers to questions.

**Frequency Analysis** – A review of how often something occurs based on crash type, time (month, day, hour), vehicle type, etc.

# Definitions (cont.)

**Hazard Elimination Project (W project)** – A safety project estimated to cost between \$400,000 and \$1,000,000. Hazard elimination (W) projects are generally scheduled in the State Transportation Improvement Program (STIP) along with other projects.

**Heavy Truck** – Any of the following vehicle types: truck/trailer, truck/tractor, tractor/semi-trailer, tractor/doubles, or unknown heavy truck).

**High Order (HO) Route** – Generally the route with the smallest 8-digit code among any coinciding routes on a given segment of road. Exceptions are where route changes have occurred.

**Highway Safety Improvement Program (HSIP)** – A federally mandated program that systematically reviews all crashes to identify locations that meet safety warrants.

**Highway Traffic Ordinance (HTO)** – See “Certificate of Rulemaking”

**Incorporated Municipality** – Any municipality provided with a charter by the General Assembly that allows the municipality to enact ordinances.

**Inventoried Route** – Any route listed in TEAAS.

# Definitions (cont.)

**Law Enforcement Agency (LEA)** – Any agency accredited to enforce laws. Examples include municipal police departments, county sheriff departments, the State Highway Patrol (SHP), the State Capitol Police, university/college police departments, etc.

**Linear Referencing System (LRS)** – The official line work for the State of North Carolina maintained by the Geographic Information Systems (GIS) Unit.

**Local Name** – The name of a route assigned by a County or Municipality (i.e. Main Street, Judd Parkway, Stewart Road, etc.). State Highway System routes can have multiple local names depending on where that portion of the route is located.

**Loop** – When one route intersects another route more than once.

**Low Order (LO) Route** – Any coinciding route that is not the High Order (HO) route.

# Definitions (cont.)

**Mainline Route** – A route with approximately the highest design standards and shortest distance between two points. Mainline routes do not have supplemental plaques above the route number, and begin and/or end at other routes (i.e. NC 561 between US 401 in Franklin County and NC 45 in Hertford County), state lines (i.e. US 17 between the South Carolina state line and the Virginia state line), or serve a specific destination (i.e. NC 345 between US 64 and Wanchese in Dare County). Additions, changes, and deletions of North Carolina (NC) mainline routes require approval of the State Traffic Engineer. Additions, changes, and deletions of United States (US) mainline routes require approval of the American Association of State Highway and Transportation Officials (AASHTO). Additions, changes, and deletions of Interstate (I) mainline routes require approval of the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO).

**Median Year** – The approximate middle year of a crash analysis date range (i.e. for a date range of 2008 – 2012, the median year would be 2010). The median year determines from what year the annual average daily traffic count should be obtained and used in the crash analysis.

**Mile** – English unit of distance. One mile equals 5,280 feet.

**Mile Marker** – A sign indicating the approximate distance, in miles, from the beginning of a route within the state to the sign (i.e. mile marker 145 on I 40 is approximately 145 miles from the Tennessee State line).

# Definitions (cont.)

**Milepost** – An imaginary distance marker, in miles, of a feature from the beginning of a route. Mileposts are specific to counties and routes (i.e. they do not cross county lines and may not be the same from one route to the next).

**Mileposting** – The process of adding features to routes in the Traffic Engineering Accident Analysis System (TEAAS).

**Mile Marker** – A distance marker (green/white sign) indicating the distance of a route from its beginning. Mile markers are not county-specific.

**Mitigation** – The process of reducing the frequency and/or adverse impacts of one or more conditions. Mitigation is usually achieved by implementing one or more counter-measures.

**Municipality** – Any city (or Town, Village, etc.) with defined borders that provides services for its residents. Municipalities may be incorporated or unincorporated.

**National Network (NN)** – A network of roads designated by the United States Department of Transportation (USDOT) in 1983 through the Surface Transportation Assistance Act (STAA) for use by truck tractors with 53' semitrailers, truck tractors with twin trailers (semitrailer and trailer), and truck tractors with semitrailers and/or trailers wider than 96" but not wider than 102". Federal law also allows these vehicles to travel up to one mile from the NN for food, fuel, repairs and lodging.

# Definitions (cont.)

**National Truck Network (NTN)** – See “National Network”

**North Carolina Administrative Code (NCAC)** – The rules of North Carolina that clarify legislation from an operational or situational perspective but are subservient to general statutes.

**North Carolina General Statutes (NCGS)** – The laws of North Carolina.

**North Carolina (NC) Route** – A state highway system primary route that is not an interstate or a secondary road, is usually designated with one, two, or three digits (i.e. NC 3, NC 55, or NC 211), and usually crosses county lines. In general, a NC route will not exist on the same pavement as a secondary road, but may coincide, at least in part, with interstates and other primary routes. Additions, deletions, and changes to NC routes must be approved by the State Traffic Engineer.

**North Carolina Truck Network (NCTN)** – A network of roads in North Carolina including the National Network (NN) and other additional roads designated by the Board of Transportation (BOT) for use by truck tractors with 53' semitrailers and/or truck tractors with twin trailers (semitrailer and trailer). State law also allows these vehicles to travel up to three miles from the NCTN for food, fuel, repairs and lodging.



# Definitions (cont.)

**Ordinance** – A legal and enforceable condition governing the use of the state highway system. Ordinances are location (county and route) specific and include items such as speed limits, parking restrictions, and truck routes. Ordinances must be approved by the State Traffic Engineer.

**Ordinance Package** – See “Certificate of Rulemaking”

**Overlap** – The condition where more than one ordinance occurs on the same segment of road. In most cases this condition is acceptable because the ordinated conditions do not conflict (i.e. a speed limit at the same location as a parking restriction) but in some cases it is problematic because the conditions directly conflict with one another (i.e. a 60 MPH speed limit at the same location as a 70 MPH speed limit).

**Person** – Any person involved in a crash.

**Potentially Hazardous (PH) Location** – Any location identified by the Highway Safety Improvement Program (HSIP) that requires additional analysis and investigation.

**Preferred Name** – The “core” or “preferred” spelling of various similar road names without prefixes or suffixes (i.e. “Green” is the preferred name for “N. Green Street”, “Green St.”, “Greene Road”, etc.).

# Definitions (cont.)

**Primary Data Maintainer (PDM)** – A role in TEAAS that allows an individual to create road and municipal codes, add alternate spellings, and to force lower order routes to be higher order routes.

**Primary Route** – A state highway system route that is not an interstate or a secondary road and is usually designated as a US (United States) or NC (North Carolina) route. Primary routes are designated with one, two, or three digits (i.e. US 401, NC 55, or US 1), and the route numbers usually cross county lines. In general, a primary route will not exist on the same pavement as a secondary road, but may coincide, at least in part, with interstates and other primary routes.

**Private Property (PP)** – Any road or driveway not open for use by the public.

# Definitions (cont.)

**Public Vehicular Area (PVA)** – Any area used by the public for vehicular traffic at any time, including parking lots, upon the grounds and premises of any public or private hospital, college, university, school, orphanage, church, or any of the institutions, parks or other facilities maintained and supported by the State of North Carolina or any of its subdivisions; any service station, drive-in theater, supermarket, store, restaurant, or office building, or any other business, residential, or municipal establishment providing parking space whether the business or establishment is open or closed; any property owned by the United States and subject to the jurisdiction of North Carolina. Public vehicular areas also include beach areas used by the public for vehicular traffic, roads used by vehicular traffic within or leading to a gated or non-gated subdivision or community, whether or not the subdivision or community roads have been offered for dedication to the public, and any area that is a portion of private property used by vehicular traffic and designated by the private property owner as a public vehicular area in accordance with general statute 20-219.4.

**Regular Route** – See “Mainline Route”

**Relief Route** – See “Bypass Route”

**Reportable Crash** – Any crash that results in a fatality, injury, property damage of at least \$1,000 or the damaging of a seized vehicle.

# Definitions (cont.)

**Road Safety Review (RSR)** – An objective review of a location by personnel that do not have a vested interest in the location.

**Route Change** – The creation, change, or deletion of an interstate or primary route that has been approved by the State Traffic Engineer (AASHTO and FHWA approval may also be necessary). These changes may also cause secondary roads to be created, changed, or deleted. Route changes may also affect truck networks, signals, speed limits, bicycle routes, etc.

**Safety Planning** – Reviewing projects for safety issues during the feasibility, planning, and design phases.

**Safety Warrant** – Any of multiple criteria developed for the Highway Safety Improvement Program (HSIP) to assist in identifying potentially hazardous (PH) locations (i.e. the number of frontal impact crashes over a five-year period).

**Secondary Data Maintainer (SDM)** – A role in TEAAS that allows an individual to create, change, and delete inventoried routes and high order (HO) segments.

# Definitions (cont.)

**Secondary Road (SR)** – A state highway system route that is not an interstate or primary route and, in general, will not exist on the same pavement as an interstate or primary route. Secondary roads are designated with four digits (i.e. SR 1234) and the route numbers are specific to the county they are in (i.e. usually change at the county line when the pavement enters a different county). Secondary road numbers are also usually grouped within a specific part of a county, although exceptions may exist for old primary routes and larger volume routes.

**Severity (Person Level)** – One of six (6) injury levels assigned to persons involved in a crash: 1 (K – fatal), 2 (A – disabling), 3 (B – evident), 4 (C – possible), 5 (O – none), and 6 (U – unknown).

**Severity (Crash Level)** – The most severe injury sustained by any person in a crash.

**Severity Index** – The equivalent property damage only (EPDO) divided by the number of crashes.

**Shape File** – A data file generally used by ArcGIS applications.

**Sliding Scale Analysis** – Used to identify crash concentrations on a road based on predetermined criteria (such as the number of crashes within a given distance).

# Definitions (cont.)

**Special Type** – The intersection type (interchange, grade-separated, 3-leg, etc.) or structure type (bridge, culvert, overhead sign, etc.).

**Spot Safety Project (SS or SF project)** – A safety project estimated to cost up to \$400,000 and is funded through state (SS) or federal (SF) funds. Spot safety projects are generally scheduled and let through the Divisions and are expected to be completed with twelve (12) months.

**State Highway System (SHS)** – The system of interstates, primary routes, and secondary roads operated by the Department of Transportation.

**Structure** – A bridge or culvert that carries a roadway.

**Study** – Identification of crashes on a specified road or roads for a given county and time period.

**Surface Transportation Assistance Act (STAA)** – A federal act passed in 1982 regulating the movement of truck tractors with 53' semitrailers, truck tractors with twin trailers (semitrailer and trailer), and truck tractors with semitrailers and/or trailers wider than 96" but not wider than 102" and creating the National Network (NN).

**Technical Query User (TQU)** – A role in TEAAS that indicates an individual is competent in completing crash studies.

# Definitions (cont.)

**Traffic Engineering Accident Analysis System (TEAAS)** – System used by local and state governments, and some prequalified consultants, to identify crash histories, ordinances, and mileposts.

**Truck Route** – A route specifically established to direct trucks and other heavy vehicles along a preferred route. Truck routes are signed with a supplemental “Truck” plaque above the route number, and begin (but not necessarily end) at mainline routes. Additions, changes, and deletions of North Carolina (NC) truck routes and United States (US) truck routes require approval of the State Traffic Engineer.

**Unincorporated Municipality** – Any municipality without a charter from the General Assembly allowing the municipality to enact ordinances

**United State (US) Route** – A state highway system primary route that is not an interstate or a secondary road, is usually designated with one, two, or three digits (i.e. US 1, US 15, or US 401), usually crosses county lines, and in many cases crosses state lines. In general, a US route will not exist on the same pavement as a secondary road, but may coincide, at least in part, with interstates and other primary routes. Additions, deletions, and changes to mainline, business, alternate, and bypass US routes must be approved by AASHTO. Additions, deletions, and changes to connector and truck US routes do not need AASHTO approval.

# Definitions (cont.)

**Vehicles Per Day (VPD)** – The volume of a given segment of road.

**Volume** – The number of vehicles per day (VPD) using a road.

**Wildcard** – Any character ( \* , %, &) used to assist in searches.

**Y-Line** – The distance along an intersecting route. The term “Y-Line” comes from roadway plans. The standard Y-line for intersection analyses is 150 feet, and the standard Y-line for strip analyses is 0 feet.



# TEAAS Teaser

Which location has a potential problem?

Location:	Rural	Urban
Road Type:	NC	US
Lanes:	2	4
Median:	Undivided	Undivided
Length (miles):	7.3	2.1
Volume (VPD):	500	10,000
<i>January 1, 2000 - December 31, 2002</i>		
Total Crashes, Rate:	8, 200.16	120, 521.85
Fatal Crashes, Rate:	0, 0.00	1, 4.35
Severity Index:	4.70	2.80
<i>January 1, 2000 - December 31, 2004</i>		
Total Crashes:	25	150
Fatal Crashes:	1	2
Severity Index:	7.58	3.19