

Final

Crash Analysis Summary

CAPE FEAR SKYWAY

New Hanover and Brunswick Counties

STIP No. U-4738

Prepared for:



July 2009

I. PROPOSED ACTION

The North Carolina Turnpike Authority (NCTA) proposes to construct a project known as the Cape Fear Skyway, which would be a limited access toll road extending from US 17 in Brunswick County to US 421 in New Hanover County, including a crossing of the Cape Fear River.

According to the *Feasibility Study for the Wilmington Southern Bridge from US 17 Bypass near Bishop to US 421* prepared by the North Carolina Department of Transportation (NCDOT) in August 2003, the project would serve multiple users, including the Port of Wilmington, the military, commuters, and tourists. Figure 1 shows the general project location and study area.

The Cape Fear Skyway project is listed in the NCDOT *2009-2015 State Transportation Improvement Program (STIP)* as STIP Project No. U-4738, and is described as a new route from “US 17 to Independence Boulevard-Carolina Beach Road Intersection. Construct a new facility with structure over the Cape Fear River (9.5 miles)”.

The *Wilmington Urban Area 2030 Long Range Transportation Plan* was adopted by the Wilmington Urban Area Metropolitan Planning Organization (WMPO) in 2005. The Cape Fear Skyway is listed as one of six priority projects in the Plan, and includes a recommendation for the extension of I-140 (Wilmington Bypass) east from US 17 to Independence Boulevard at US 421. The project is described as a four-lane, median divided freeway that would include a 225-foot high bridge over the Cape Fear River.

The purpose of this Crash Analysis is to evaluate and summarize the recent crash history for the primary roadways on which the proposed project would potentially change traffic volumes. The information provided will be used in determining whether safety should be identified as a purpose and need for the proposed project.

II. MAJOR ROADWAY EXISTING CONDITIONS

US 17 / US 17 Business

US 17 enters the study area from the west as a four-lane divided highway with driveways and at-grade intersections, with a speed limit of 55 miles per hour (mph). As US 17 approaches the US 74/76 interchange, multiple superstreet intersections are utilized to serve commercial properties to the north and south, and the speed limit is reduced to 45 mph. US 17 east of US 74/76 is a four-lane divided freeway with interchanges at US 74/76, NC 133, and US 421 in Brunswick County. US 17 has a speed limit of 60 mph until just east of the NC 133 interchange where it transitions to 55 mph. US 17 splits to the north and merges with US 421, traveling north/south along the Cape Fear River to I-140 and around the north side of Wilmington. US 17 Business (Market Street) begins at the US 17/US 421/NC 133 interchange and continues east across the Cape Fear River into the City of Wilmington by way of the Cape Fear Memorial Bridge (as does US 74, US 76, and US 421) with a speed limit of 45 mph. The freeway segment of US 17 Business (Market Street) ends at South Front Street in downtown Wilmington (New Hanover County), with the speed limit transitioning to 35 mph.

NC 87

NC 87 is a north/south route that is located in the western portion of the study area. NC 87 is a two-lane undivided roadway with no control of access and has a speed limit of 55 mph.

US 74/76

US 74/76 enters the study area from the north-west as a four-lane divided highway with at-grade intersections and interchanges, and has a speed limit of 60 mph. US 74/76 then merges with US 17, with the speed limit transitioning to 55 mph east of the NC 133 (River Road)/SR 1472 (Village Road) interchange. Just west of the Cape Fear River, US 17 and US 74 turn north following US 421 and NC 133, while US 17 Business (Market Street) and US 76 continue east, transitioning to a speed limit of 45 mph before crossing the Cape Fear River. US 17 Business (Market Street) and US 76 then exit the study area with a speed limit of 35 mph.

NC 133

NC 133 is a north/south route that is located in the central portion of the study area. NC 133 enters the study area from the south as a two-lane undivided roadway with a speed limit of 45 mph transitioning to a speed limit of 35 mph approximately a mile south of the US 17/74/76 interchange. NC 133 then continues east, following US 17/74/76 until the US 421 interchange, where US 421 and NC 133 continue to the north, exiting the study area. NC 133 then separates from US 421, with US 421 continuing to the north and NC 133 turning east crossing the Northeast Cape Fear River via the Isabel Holmes Bridge.

US 421

US 421 enters the study area from the southeast. US 421 (Carolina Beach Road) from Independence Boulevard to US 421/SR 1140 (South Front Street) is a four-lane undivided roadway with a two-way left-turn lane (or center-turn lane). There are signalized and unsignalized intersections and driveways along the corridor. The speed limit ranges from 45 mph as it enters the study area from the southeast and changes to 35 mph closer to downtown Wilmington. North of South Front Street, US 421 continues as a four-lane facility with driveways, unsignalized and signalized intersections along the corridor north to US 17 Business (Market Street). US 421 then merges with US 17 Business to the west over the Cape Fear River and then splits from US 17 Business and merges with US 17/NC 133 and ultimately exiting the study area to the north.

III. CRASH ANALYSIS SUMMARY

The analysis included roadway segments which the proposed project would potentially affect and was conducted utilizing crash data provided by the NCDOT for a three-year period from June 1, 2004 to May 31, 2007. The data included the crash type summaries and the following crash rates: Total Crash Rate, Fatal Crash Rate, Non-Fatal Crash Rate, Night Crash Rate, and Wet Crash Rate. These crash rates, for the roadways analyzed, were compared to the Statewide

Average Crash Rates for the years of 2005 through 2007, for similar routes to determine if the segment exceeded the statewide average. However, a more appropriate method is the Critical Crash Rate method, which is a statistically derived number that can be used to identify locations where crash occurrence is higher than expected for a given facility type. Safety measures could be considered for locations identified in this manner. For planning purposes, the confidence level used to calculate the Critical Crash Rate is 95 percent. The calculated Critical Crash Rate is beneficial as it accounts for exposure (traffic volumes) and varying segment lengths. If a segment has a crash rate higher than the Critical Crash Rate, the location may have a potential highway safety deficiency and should receive additional analysis. Tables 1 and 2 show each roadway segment that was analyzed and whether the corresponding Total Crash Rate of these roadways exceeded the Statewide Average Crash Rate and/or the Critical Crash Rate for a similar roadway type and configuration. This is also depicted in Figure 1.

The following is a crash type summary of the primary roadways which the proposed project would potentially affect:

An 11.22-mile segment of US 17 (from Town Creek Road to US 421) and US 17 Business (from US 421 to South Front Street) was analyzed. This segment included a total of 467 crashes, of which three resulted in fatalities and four involved pedestrians. These crashes resulted in an estimated \$2,562,797 in property damages. Of the total 138 crashes recorded for the 0.91 mile long segment of US 17 Business (Market Street), 102 of the crashes occurred at milepost marker 0.220 which has been identified as the western limit of the Cape Fear Memorial Bridge. The highest concentration of crashes consisted of 89 rear-end crashes (approximately 64 percent). These types of crashes are expected to occur where a combination of high traffic volumes and a large number of slowing, stopping, and/or turning movements cause interruptions to the traffic flow. The second most common crash type consisted of 20 fixed-object collisions (approximately 15 percent). These types of crashes are expected to occur where obstructions are too close to the roadway, adequate pavement marking/lighting is not provided, signs or guardrail is incorrectly placed, the roadway design is insufficient, slippery/wet roadway conditions exist, or excessive speed is used.

A 0.53-mile segment of Wooster Street (from South Front Street to South Eighth Street) was analyzed which included a total of 202 crashes, of which four involved pedestrians; however, no fatalities occurred. These crashes resulted in an estimated \$1,204,110 in property damages. A review of the crash data resulted in 139 angle crashes (approximately 69 percent) as the most common type, with 34 rear-end crashes (approximately 17 percent) as the second most common. Angle type collisions typically occur when a driver fails to respond to traffic signal changes (running red lights) or attempts to use insufficient gaps in the opposing traffic stream. It should be noted that crash rates may be skewed for roadways where data is provided for segment lengths less than one mile.

A 0.67-mile segment of Dawson Street (from South Front Street to South Eighth Street) was analyzed which included a total of 81 crashes, of which one involved pedestrians; however, no fatalities occurred. These crashes resulted in an estimated \$363,110 in property damages. A review of the crash data resulted in 44 angle crashes

(approximately 54 percent) as the most common type, with 10 rear-end crashes (approximately 12 percent) as the second most common. It should be noted that crash rates may be skewed for roadways where data is provided for segment lengths less than one mile.

A 1.33-mile segment of US 74/US 76 (from SR 1437 (Old Fayetteville Road) to US 17) was analyzed which included a total of 15 crashes, of which no involvement with pedestrians or fatalities occurred. These crashes resulted in an estimated \$84,600 in property damages. A review of the crash data did not result in a predominant crash type for this segment of roadway.

Two segments of NC 133 were analyzed. The first segment consisted of a 6.19-mile segment of NC 133 (River Road) and a 0.65-mile segment of SR 1472 (Village Road) to fully encompass the interchange. This segment included a total of 254 crashes, of which one resulted in a fatality and two involved pedestrians. These crashes resulted in an estimated \$981,151 in property damages. A review of the crash data resulted in 58 angle crashes (approximately 23 percent) as the most common type, with 53 rear-end crashes (approximately 21 percent) as the second most common. The second segment of NC 133 consisted of a 0.62-mile segment to evaluate the Isabel Holmes Bridge crossing of the Northeast Cape Fear River. This segment included a total of 16 crashes, of which no involvement with pedestrians or fatalities occurred. These crashes resulted in an estimated \$182,450 in property damages. A review of the crash data did not result in a predominant crash type for this segment of roadway.

Two segments of US 421 were analyzed. The first segment consisted of a 1.59-mile segment north of US 17 which included a total of 103 crashes, of which three resulted in fatalities; however, no crashes involved pedestrians. These crashes resulted in an estimated \$635,575 in property damages. A review of the crash data resulted in 31 left-turn crashes (approximately 30 percent) either to or from US 421 as the most common type, with 23 rear-end crashes (approximately 22 percent) as the second most common. The second segment of US 421 consisted of 4.79-miles south of US 17 Business, which included a total of 541 crashes, of which four resulted in fatalities and 14 involved pedestrians. These crashes resulted in an estimated \$2,745,975 in property damages. A review of the crash data resulted in 207 angle crashes (approximately 38 percent) as the most common type with 180 rear-end crashes (approximately 33 percent) as the second most common type.

Table 1: Crash Rate Comparison to Statewide Average Crash Rate*

		Exceeds Statewide Average Crash Rate				
Roadway	From/To	Total	Fatal	Non-Fatal	Night	Wet
US 17	from Town Creek Road to NC 87					
US 17	from NC 87 to SR 1438 (Lanvale Road)					
US 17	from SR 1438 (Lanvale Road) to US 74/76		X			
US 17	from US 74/76 to SR 1472 (Village Road)/NC 133 (River Road)					
US 17	from SR 1472 (Village Road) to US 421/NC 133		X			
US 17 Business (including the Cape Fear Memorial Bridge)	from US 421/NC 133 to South Front Street	X		X	X	X
Wooster Street	from South Front Street to South Eighth Street	X		X	X	X
Dawson Street	from South Front Street to Eighth Street	X		X	X	X
NC 87	from SR 1414 (Goodman Road) to US 17	X		X	X	X
SR 1438 (Lanvale Road)	from Lewis Road to US 17		X	X	X	
US 74/76	from SR 1437 (Old Fayetteville Road) to US 17					
SR 1472 (Village Road)/NC 133 (River Road)	from SR 1435 (Navassa Road) to SR 1555 (Mellany Lane)					
US 421/NC 133	from NC 133 to US 17/74/76		X			X
NC 133	over the Northeast Cape Fear River (Isabel Holmes Bridge only)					
South Front Street	from Ann Street to SR 1140 (Burnett Boulevard)/South Third Street					
US 421 (South Third Street)	from Ann Street to South Front Street/US 421 (Carolina Beach Road)	X	X	X	X	X
US 421 (Carolina Beach Road)	from SR 1140 (Burnett Boulevard)/South Third Street to George Anderson Drive		X	X		X
US 117 (Shipyard Boulevard)	from beginning to South 17th Street		X	X		
SR 1100 (River Road)	from US 117 (Shipyard Boulevard) to Barnards Creek		X			
Independence Boulevard	from SR 1100 (River Road) to South 17th Street					

* Comparison of segment Crash Rates to 2005-2007 Three Year Statewide Average Crash Rates, both of which were provided by NCDOT, Traffic Engineering and Safety Systems Branch, Traffic Safety Systems Management Unit.

Table 2: Crash Rate Comparison to Critical Crash Rate*

		Exceeds Critical Crash Rate				
Roadway	From/To	Total	Fatal	Non-Fatal	Night	Wet
US 17	from Town Creek Road to NC 87					
US 17	from NC 87 to SR 1438 (Lanvale Road)					
US 17	from SR 1438 (Lanvale Road) to US 74/76					
US 17	from US 74/76 to SR 1472 (Village Road)/NC 133 (River Road)					
US 17	from SR 1472 (Village Road) to US 421/NC 133					
US 17 Business (including the Cape Fear Memorial Bridge)	from US 421/NC 133 to South Front Street	X		X		X
Wooster Street	from South Front Street to South Eighth Street	X		X	X	X
Dawson Street	from South Front Street to South Eighth Street	X		X	X	
NC 87	from SR 1414 (Goodman Road) to US 17	X		X	X	X
SR 1438 (Lanvale Road)	from Lewis Road to US 17				X	
US 74/76	from SR 1437 (Old Fayetteville Road) to US 17					
SR 1472 (Village Road)/NC 133 (River Road)	from SR 1435 (Navassa Road) to SR 1555 (Mellany Lane)					
US 421/NC 133	from NC 133 to US 17/74/76		X			
NC 133	over the Northeast Cape Fear River (Isabel Holmes Bridge only)					
South Front Street	from Ann Street to SR 1140 (Burnett Boulevard)/South Third Street					
US 421 (South Third Street)	from Ann Street to South Front Street/US 421 (Carolina Beach Road)	X		X	X	X
US 421 (Carolina Beach Road)	from SR 1140 (Burnett Boulevard)/South Third Street to George Anderson Drive			X		X
US 117 (Shipyard)	from beginning to South 17th Street		X			
SR 1100 (River Road)	from US 117 (Shipyard Boulevard) to Barnards Creek					
Independence Boulevard	from SR 1100 (River Road) to South 17th Street					

* Comparison of segment Critical Crash Rates (calculated by URS based upon Statewide Average Crash Rate) and 2005-2007 Three Year Statewide Average Crash Rates provided by NCDOT, Traffic Engineering and Safety Systems Branch, Traffic Safety Systems Management Unit.

IV. HIGHWAY SAFETY IMPROVEMENT PROGRAM

The Highway Safety Improvement Program (HSIP) is a federally mandated program that was developed to provide a continuous and systematic procedure that identifies and reviews specific traffic safety concerns throughout the state and to determine potentially hazardous locations. The ultimate goal of the HSIP process is to reduce the number of traffic crashes, injuries, and fatalities by reducing the potential for these incidents on public roadways. The 2007 HSIP is a preliminary list of locations (which are divided into the following five categories: intersections, sections, bridges, bicycle/pedestrian intersections, and bicycle/pedestrian sections) that have been identified as potentially exceeding at least one of the safety warrants. The safety warrants are intended to identify a specific crash type, pattern, or condition and are based on five years of crash data (unless specifically noted otherwise). Locations included on the HSIP are then evaluated in the field to determine if a project should be developed for spot safety or hazard elimination funding.

According to the 2007 HSIP, no bridges, bicycle/pedestrian intersections, or bicycle/pedestrian sections were listed within the study area. Intersections and sections included in the 2007 HSIP, within or immediately adjacent to the study area, are shown in Table 3, as well as their rank statewide for each particular warrant. The warrants identified in the table are defined as follows in the 2007 HSIP:

Warrant I-1: Frontal Impact

Locations with a minimum of 25 total crashes AND a minimum of 50% of all crashes were frontal impact crashes AND a minimum of 25% of the total crashes occurred in the last 2 years. For the purposes of this warrant, a frontal impact crash is considered to be one of the following crash types:

- *Angle*
- *Left Turn (same or different roads)*
- *Right Turn (same or different roads)*
- *Head On*

Warrant I-2: Last Year Increase

Locations with a minimum of 25 total crashes AND a minimum of 38% of the total crashes occurred in the last year.

Warrant I-3: Frequency with a Severity Index Minimum

Locations with a minimum of 25 total crashes AND a minimum severity index of 7.0 AND a minimum of 40% of the total crashes occurred in the last 2 years.

Warrant I-4: Night Location without Streetlights

Location with a minimum of 25% of the total crashes occurring in the last two years AND the greater of the following:

- (a) *Locations with a minimum of 15 crashes occurring at night AND a minimum of 12.5% of the total crashes occurred at night (intended for urban locations) or*

(b) Locations with a minimum of 12 crashes occurring at night AND a minimum of 25% of the total crashes occurred at night (intended for rural locations).

Warrant S-3: Wet Road Condition

Locations that met the minimum total crash and crash rate for the respective facility type AND a minimum of 50% of the total crashes occurred during wet road conditions.

Table 3			
Highway Safety Improvement Program Specified Locations			
ROUTE	INTERSECTION OR REFERENCE FEATURE	STATEWIDE RANK	WARRANT (S)
Brunswick County			
NC 133	At SR 1551 (Blackwell Road)	1953	I-1
US 17	At NC 87	1968	I-4
New Hanover County			
US 421	At US 17 Southbound (SB) Couplet	44	I-1
US 17	At US 17 SB Couplet	124	I-1
US 17 SB Couplet	At Eighth Street	191	I-1, I-3
US 74	At SR 1411(Dawson Street)	47	I-1
US SB Couplet*	At US 17 Business	520	I-1
US 17	At US 76 Westbound (WB) Couplet	552	I-1
US 17	At Fifth Street	578	I-1
US 17 SB Couplet	At US 76 WB Couplet	734	I-1
US 17 Business	At SR 1627	965	I-1
US 17 Business	At Tenth Street	1003	I-1
US 421	At Bell Street	1182	I-1
US SB Couplet	At Fifth Street	1539	I-1
US 17 Business	At Twelfth Street	1636	I-1
US 17	At Tenth Street	1699	I-1
US 17	At Front Street	1764	I-2
US 421	At Central Boulevard	1872	I-3
US 17 Business	At Orange Street	1988	I-1
US 17	At Dock Street	2074	I-1
US 421	In the Vicinity of Kentucky Avenue	154	S-3
Notes: A total of 2,318 potentially hazardous intersection locations and 520 potentially hazardous section locations were identified in the 2007 HSIP.			
* A couplet consists of two one-direction roadways used to accommodate two directions of traffic.			

Source: North Carolina Department of Transportation, 2007 North Carolina Highway Safety Improvement Program.

It should be noted that even though US 17 is a north/south route, within the Wilmington area, US 17 was previously the major east/west corridor, which routed traffic through downtown Wilmington via the Dawson and Wooster Street couplet to the 16th and 17th Street couplet to Market Street before exiting Wilmington to the east. As of 2006, US 17 was rerouted north on US 421 to I-140, which created a more direct connection to and from I-40. The 2007 HSIP intersections and sections identified above do not reflect the new route designation.

V. CONCLUSION

Several roadway segments in the study area exceed the Statewide Average Crash Rates and/or Critical Crash Rates or are identified in the 2007 HSIP as meeting one or more safety warrants. These factors suggest there may be safety deficiencies in the study area.

However, it is not possible to correlate any future changes in crash rates to the Cape Fear Skyway. Therefore, safety will not be included in the purpose and need for the project. Specific safety concerns would need to be identified, investigated and addressed by others. For example, NCDOT may evaluate locations included in the HSIP under the Spot Safety Program or Hazard Elimination Program.

VI. REFERENCES

North Carolina Department of Transportation, *2007 North Carolina Highway Safety Improvement Program*, June 2007.

North Carolina Department of Transportation. *State Transportation Improvement Program 2009-2015*, June 2008.

North Carolina Department of Transportation, Traffic Engineering and Safety Systems Branch, Traffic Safety Systems Management Unit. *Guidelines for Utilizing North Carolina Statewide Crash Rates*.

North Carolina Department of Transportation, Traffic Engineering and Safety Systems Branch, Traffic Safety Systems Management Unit. *2005-2007 Three Year Statewide Crash Rates*.

North Carolina Department of Transportation, *Feasibility Study for the Wilmington Southern Bridge from US 17 Bypass near Bishop to US 421*, August 2003.

Wilmington Urban Area Metropolitan Planning Organization, *Wilmington Urban Area 2030 Long Range Transportation Plan*, March 30, 2005.

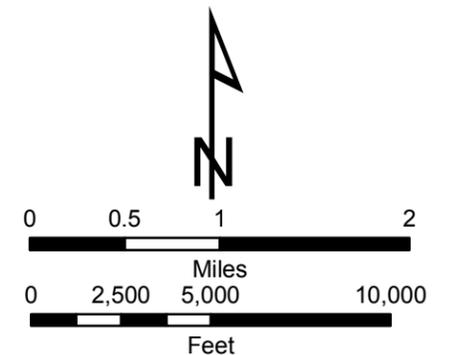
CAPE FEAR SKYWAY

State Transportation Improvement Program
Project No. U-4738



Legend

- Proposed Wilmington Bypass STIP No. R-2633 (I-140)
- Study Area
- Cape Fear Skyway - Feasibility Study Alignment
- Below Statewide Average Crash Rate (Total)
- Above Critical Crash Rate (Total)
- US Highways
- State Highways
- Local Roads
- Railroad
- Streams
- County Boundary
- NC State Ports Authority
- National Register Historic District
- Open Water
- Parks, Gamelands, Protected Lands
- Clarendon Plantation
- Municipal Boundary



Cape Fear Skyway

Figure 1
Crash Analysis Summary

Date: June 2009
This map is for reference only.
Sources: ESRI Inc., CGIA, NCDOT, and URS.

