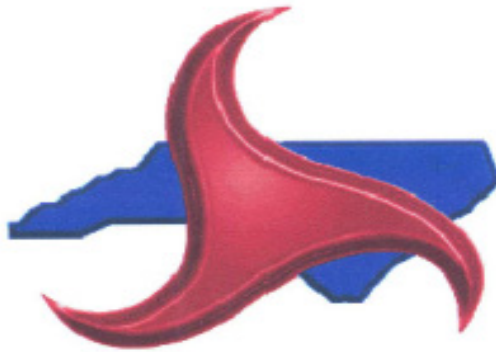


Bridge Design Speed Investigation

Bridge #314 on SR 1332 (Culvin Creek Road) over Calvin Creek
Madison County



Document Prepared By:

Mattern & Craig, Inc.
Consulting Engineers - Surveyors
12 Broad Street
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Commission No: 3241

May 15, 2012



Investigating Engineer


James Voso, PE

Bridge and Approach Investigation Checklist

Project 17BP.13.R.9
Description Replace Bridge #314 on SR 1332 (Culvin Creek Road) over Calvin Creek
Route SR 1332 (Culvin Creek Road)
Division 13
County Madison

Existing Speed Limit 55 mph ☐ Posted ☒ Statutory

Reasonable & Comfortable
Passenger Car Speed 30 mph

Speed Data N/A

Ball Bank Speed Study Curve just south of Bridge #314 had a ball bank indication of 12 at 20 mph.

Warning Signs at Bridge 4 Bridge End Delineators

Roadside Development Residential area in the northwest quadrant of bridge and wooded in all other quadrants. See comment below regarding driveway.

ADT History No ADT data available

Pedestrian/Bicycle Traffic Low

Bridge and Approach
Digital Photos (attached)

Approach Lane Width 9'

Approach Shoulder Width: 3'
Shoulder Type Grass

Lane Width (existing bridge) 15' one lane

Shoulder width (existing bridge) 2'

Strategic Corridor / Thoroughfare
Designation and Recommended
Cross Section Not a Strategic Corridor/Thoroughfare. Two lane cross section at 30 mph based on 3R guidelines.

Crash History and
Safety Considerations Two crashes ("Fixed Object" type) on the bridge. Struck bridge rail end. (1/1/2002 - 12/31/2011, 10 years)

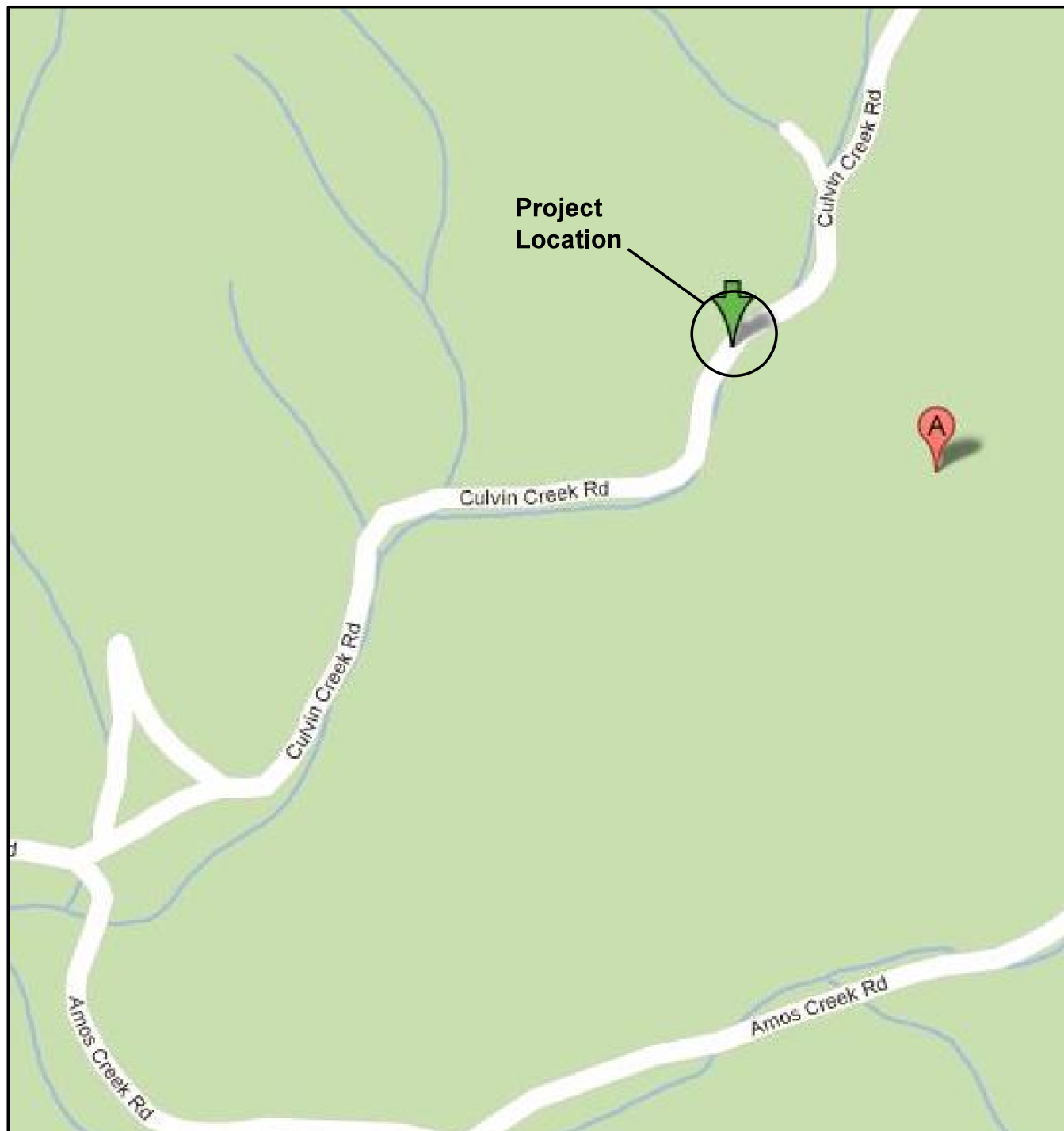
Comments Residential driveway adjacent to the southwest corner of the bridge.

Reasonable Bridge Speed 30 mph

Investigated by: Tom Mulloy Reviewed by: James Voso

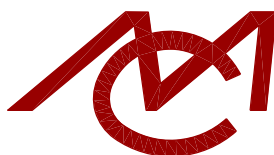


Bridge #314
Madison County
Division 13



VICINITY MAP

Bridge #314 on SR 1332
(Culvin Creek Road)
over Calvin Creek



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Comm. No. 3241

Bridge Approach Speed Crash Analysis Request

Order # 41000017913

500 feet on Both Sides of Bridge Number 314 on Secondary Route 1332 (Culvin Creek Road) over Calvin Creek in Madison County

Document Prepared By:

Safety Planning Group
Traffic Safety Systems Management Unit
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Note: The crash statistics have been generated and are available through North Carolina's Crash Database. This database provides an inventory of **reported** crashes on record that have occurred at this location. Please note that many traffic crashes go unreported for a variety of reasons, and this report simply provides a listing of all crashes on record that occurred within 0 feet of the section described above.

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Study Criteria Summary

County: MADISON **City:** All and Rural
Date: 01/01/2002 to 12/31/2011 **Study:** 41000017913
Location: 500 feet on Both Sides of Bridge Number 314 on Secondary Route 1332 (Culvin Creek Road) over Calvin Creek

Report Details

Acc No	Crash ID	Milepost	Date	Accident Type	Total Damage	Injuries				Condition			Road		Trfc Ctl	
						F	A	B	C	R	L	W	Ch	Ci	Dv	Op
1	102160667	1.250	10/10/2007 00:45	FIXED OBJECT	\$ 1500	0	0	0	0	2	5	2	7	0	13	1
Unit 1 : 1 Alchl/Drgs: 0 Speed: 55 MPH Dir: N Veh Mnvr/Ped Actn: 4 Obj Strk: 59																

**Legend for
Report Details:**

Acc No - Accident Number
Injuries: F - Fatal, A - Class A, B - Class B, C - Class C
Condition: R - Road Surface, L - Ambient Light, W - Weather
Rd Ch - Road Character
Rd Ci - Roadway Contributing Circumstances
Trfc Ctl - Traffic Control: Dv - Device, Op - Operating
Alchl/Drgs - Alcohol Drugs Suspected
Veh Mnvr/Ped Actn - Vehicle Maneuver/Pedestrian Action
Obj Strk - Object Struck

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Summary Statistics

High Level Crash Summary

Crash Type	Number of Crashes	Percent of Total
Total Crashes	1	100.00
Fatal Crashes	0	0.00
Non-Fatal Injury Crashes	0	0.00
Total Injury Crashes	0	0.00
Property Damage Only Crashes	1	100.00
Night Crashes	1	100.00
Wet Crashes	1	100.00
Alcohol/Drugs Involvement Crashes	0	0.00

Crash Severity Summary

Crash Type	Number of Crashes	Percent of Total
Total Crashes	1	100.00
Fatal Crashes	0	0.00
Class A Crashes	0	0.00
Class B Crashes	0	0.00
Class C Crashes	0	0.00
Property Damage Only Crashes	1	100.00

Vehicle Exposure Statistics

Annual ADT = 380

Total Length = 0.194 (Miles)

0.312 (Kilometers)

Total Vehicle Exposure = 0.27 (MVMT)

0.43 (MVKMT)

Crash Rate	Crashes Per 100 Million Vehicle Miles	Crashes Per 100 Million Vehicle Kilometers
Total Crash Rate	371.44	230.80
Fatal Crash Rate	0.00	0.00
Non Fatal Crash Rate	0.00	0.00
Night Crash Rate	371.44	230.80
Wet Crash Rate	371.44	230.80
EPDO Rate	371.44	230.80

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Miscellaneous Statistics

Severity Index =	1.00
EPDO Crash Index =	1.00
Estimated Property Damage Total = \$	1500.00

Accident Type Summary

Accident Type	Number of Crashes	Percent of Total
FIXED OBJECT	1	100.00

Injury Summary

Injury Type	Number of Injuries	Percent of Total
Fatal Injuries	0	0.00
Class A Injuries	0	0.00
Class B Injuries	0	0.00
Class C Injuries	0	0.00
Total Non-Fatal Injuries	0	0.00
Total Injuries	0	0.00

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Monthly Summary

Month	Number of Crashes	Percent of Total
Jan	0	0.00
Feb	0	0.00
Mar	0	0.00
Apr	0	0.00
May	0	0.00
Jun	0	0.00
Jul	0	0.00
Aug	0	0.00
Sep	0	0.00
Oct	1	100.00
Nov	0	0.00
Dec	0	0.00

Daily Summary

Day	Number of Crashes	Percent of Total
Mon	0	0.00
Tue	0	0.00
Wed	1	100.00
Thu	0	0.00
Fri	0	0.00
Sat	0	0.00
Sun	0	0.00

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Hourly Summary

Hour	Number of Crashes	Percent of Total
0000-0059	1	100.00
0100-0159	0	0.00
0200-0259	0	0.00
0300-0359	0	0.00
0400-0459	0	0.00
0500-0559	0	0.00
0600-0659	0	0.00
0700-0759	0	0.00
0800-0859	0	0.00
0900-0959	0	0.00
1000-1059	0	0.00
1100-1159	0	0.00
1200-1259	0	0.00
1300-1359	0	0.00
1400-1459	0	0.00
1500-1559	0	0.00
1600-1659	0	0.00
1700-1759	0	0.00
1800-1859	0	0.00
1900-1959	0	0.00
2000-2059	0	0.00
2100-2159	0	0.00
2200-2259	0	0.00
2300-2359	0	0.00

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Light and Road Conditions Summary

Condition	Dry	Wet	Other	Total
Day	0	0	0	0
Dark	0	1	0	1
Other	0	0	0	0
Total	0	1	0	1

Object Struck Summary

Object Type	Times Struck	Percent of Total
EMBANKMENT	1	100.00

Vehicle Type Summary

Vehicle Type	Number Involved	Percent of Total
PASSENGER CAR	1	100.00

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Yearly Totals Summary

Accident Totals

Year	Total Accidents	Fatal Accidents	Injury Accidents	Property Damage Only Accidents
2002	0	0	0	0
2003	0	0	0	0
2004	0	0	0	0
2005	0	0	0	0
2006	0	0	0	0
2007	1	0	0	1
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
Total	1	0	0	1

Injury Totals

Year	Fatal Injuries	Class A, B, or C Injuries
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
2008	0	0
2009	0	0
2010	0	0
2011	0	0
Total	0	0

Miscellaneous Totals

Year	Property Damage	EPDO Index
2002	\$ 0	0.00
2003	\$ 0	0.00
2004	\$ 0	0.00
2005	\$ 0	0.00
2006	\$ 0	0.00

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Year	Property Damage	EPDO Index
2007	\$ 1500	1.00
2008	\$ 0	0.00
2009	\$ 0	0.00
2010	\$ 0	0.00
2011	\$ 0	0.00
Total	\$ 1500	1.00

Type of Accident Totals

Year	Left Turn	Right Turn	Rear End	Run Off Road & Fixed Object	Angle	Side Swipe	Other
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0
2007	0	0	0	1	0	0	0
2008	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0
Total	0	0	0	1	0	0	0

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Strip Diagram

Features	Milepost	Crash IDs
Structure:560314	1.170	
	1.180	
	1.190	
	1.200	
	1.210	
	1.220	
	1.230	
	1.240	
	1.250	102160667
	1.260	
	1.270	
	1.280	
	1.290	
	1.300	
	1.310	
	1.320	
	1.330	
	1.340	
	1.350	
	1.360	

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Study Criteria

Study Name	Log No.	PH No.	TIP No.	K/A Cf.	B/C Cf.	ADT	ADT Route
41000017913	41000017913			76.8	8.4	380	40001332

Request Date	Courier Service	Phone No.	Ext.	Fax No.
02/15/2012				

County			Municipality					
Name	Code	Div.	Name	Code	Y-Line Ft.	Begin Date	End Date	Years
MADISON	56	13	All and Rural		0	01/01/2002	12/31/2011	10.00

Location Text	Requestor
500 feet on Both Sides of Bridge Number 314 on Secondary Route 1332 (Culvin Creek Road) over Calvin Creek	D.D. (Bucky) Galloway, P.E. Blue Ridge Mountains Region

Included Accidents	Old MP	New MP	Type
102160667	999.999	1.25	I

Fiche Roads	
Name	Code
SR 1332	40001332

Strip Road					
Name	Code	Begin MP	End MP	Miles	Kilometers
SR 1332	40001332	1.168	1.362	0.194	0.312

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Fiche, Intersection, and Strip Reports Code Index**

T - Type of Accident Codes

0 = UNKNOWN
1 = RAN OFF ROAD - RIGHT
2 = RAN OFF ROAD - LEFT
3 = RAN OFF ROAD - STRAIGHT
4 = JACKKNIFE
5 = OVERTURN/ROLLOVER
13 = OTHER NON-COLLISION
14 = PEDESTRIAN
15 = PEDALCYCLIST
16 = RR TRAIN, ENGINE
17 = ANIMAL
18 = MOVABLE OBJECT
19 = FIXED OBJECT
20 = PARKED MOTOR VEHICLE
21 = REAR END, SLOW OR STOP
22 = REAR END, TURN
23 = LEFT TURN, SAME ROADWAY
24 = LEFT TURN, DIFFERENT ROADWAYS
25 = RIGHT TURN, SAME ROADWAY
26 = RIGHT TURN, DIFFERENT ROADWAYS
27 = HEAD ON
28 = SIDESWIPE, SAME DIRECTION
29 = SIDESWIPE, OPPOSITE DIRECTION
30 = ANGLE
31 = BACKING UP
32 = OTHER COLLISION WITH VEHICLE

F - Road Feature Codes

0 = NO SPECIAL FEATURE
1 = BRIDGE
2 = BRIDGE APPROACH
3 = UNDERPASS
4 = DRIVEWAY, PUBLIC
5 = DRIVEWAY, PRIVATE
6 = ALLEY INTERSECTION
7 = FOUR-WAY INTERSECTION
8 = T-INTERSECTION
9 = Y-INTERSECTION
10 = TRAFFIC CIRCLE/ROUNDBOUT
11 = FIVE-POINT, OR MORE
12 = RELATED TO INTERSECTION
13 = NON-INTERSECTION MEDIAN CROSSING
14 = END OR BEGINNING - DIVIDED HIGHWAY
15 = OFF RAMP ENTRY
16 = OFF RAMP PROPER
17 = OFF RAMP TERMINAL ON CROSSROAD
18 = MERGE LANE BETWEEN ON AND OFF RAMP
19 = ON RAMP ENTRY
20 = ON RAMP PROPER
21 = ON RAMP TERMINAL ON CROSSROAD
22 = RAILROAD CROSSING
23 = TUNNEL
24 = SHARED-USE PATHS OR TRAILS
25 = OTHER

R - Road Condition Codes

1 = DRY
2 = WET
3 = WATER (STANDING, MOVING)
4 = ICE
5 = SNOW
6 = SLUSH
7 = SAND, MUD, DIRT, GRAVEL
8 = FUEL, OIL
9 = OTHER
10 = UNKNOWN

L - Light Condition Codes

1 = DAYLIGHT
2 = DUSK
3 = DAWN
4 = DARK - LIGHTED ROADWAY
5 = DARK - ROADWAY NOT LIGHTED
6 = DARK - UNKNOWN LIGHTING
7 = OTHER
8 = UNKNOWN

W - Weather Condition Codes

1 = CLEAR
2 = CLOUDY
3 = RAIN
4 = SNOW
5 = FOG, SMOG, SMOKE
6 = SLEET, HAIL, FREEZING RAIN/DRIZZLE
7 = SEVERE CROSSWINDS
8 = BLOWING SAND, DIRT, SNOW
9 = OTHER

S - Accident Severity Codes

K = FATAL
A = A-LEVEL INJURY
B = B-LEVEL INJURY
C = C-LEVEL INJURY
O = PROPERTY DAMAGE ONLY

Ch - Road Character

1 = STRAIGHT, LEVEL
2 = STRAIGHT, HILLCREST
3 = STRAIGHT, GRADE
4 = STRAIGHT, BOTTOM (SAG)
5 = CURVE, LEVEL
6 = CURVE, HILLCREST
7 = CURVE, GRADE
8 = CURVE, BOTTOM (SAG)
9 = OTHER

Op - Traffic Control Operating

1 = YES
2 = NO
3 = UNKNOWN

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Fiche, Intersection, and Strip Reports Code Index**

Veh Mnvr - Vehicle Maneuver Codes

1 = STOPPED IN TRAVEL LANE
2 = PARKED OUT OF TRAVEL LANES
3 = PARKED IN TRAVEL LANES
4 = GOING STRAIGHT AHEAD
5 = CHANGING LANES OR MERGING
6 = PASSING
7 = MAKING RIGHT TURN
8 = MAKING LEFT TURN
9 = MAKING U-TURN
10 = BACKING
11 = SLOWING OR STOPPING
12 = STARTING IN ROADWAY
13 = PARKING
14 = LEAVING PARKED POSITION
15 = AVOIDING OBJECT IN ROAD

Dv - Traffic Control Device

0 = NO CONTROL PRESENT
1 = STOP SIGN
2 = YIELD SIGN
3 = STOP AND GO SIGNAL
4 = FLASHING SIGNAL WITH STOP SIGN
5 = FLASHING SIGNAL WITHOUT STOP SIGN
6 = RR GATE AND FLASHER
7 = RR FLASHER
8 = RR CROSSBUCKS ONLY
9 = HUMAN CONTROL
10 = WARNING SIGN
11 = SCHOOL ZONE SIGNS
12 = FLASHING STOP AND GO SIGNAL
13 = DOUBLE YELLOW LINE, NO PASSING ZONE
14 = OTHER

Alchl/Drugs - Driver Alcohol/Drugs Suspected Status Codes

0 = NO
1 = YES - ALCOHOL, IMPAIRMENT SUSPECTED
2 = YES - ALCOHOL, NO IMPAIRMENT DETECTED
3 = YES - OTHER DRUGS, IMPAIRMENT SUSPECTED
4 = YES - OTHER DRUGS, NO IMPAIRMENT DETECTED
5 = YES - ALCOHOL AND OTHER DRUGS, IMPAIRMENT SUSPECTED
6 = YES - ALCOHOL AND OTHER DRUGS, NO IMPAIRMENT DETECTED
7 = UNKNOWN

Ped Actn - Pedestrian Action Codes

1 = ENTERING OR CROSSING SPECIFIED LOCATION
2 = WALKING, RIDING, RUNNING/JOGGING WITH TRAFFIC
3 = WALKING, RIDING, RUNNING/JOGGING AGAINST TRAFFIC
4 = WORKING
5 = PUSHING VEHICLE
6 = APPROACHING OR LEAVING VEHICLE
7 = PLAYING
8 = STANDING
9 = OTHER

Ci - Roadway Contributing Circumstances

0 = NONE (NO UNUSUAL CONDITIONS)
1 = ROAD SURFACE CONDITION
2 = DEBRIS
3 = RUT, HOLES, BUMPS
4 = WORK ZONE (CONSTRUCTION, MAINTENANCE, UTILITY)
5 = WORN TRAVEL-POLISHED SURFACE
6 = OBSTRUCTION IN ROADWAY
7 = TRAFFIC CONTROL DEVICE INOPERATIVE, NOT VISIBLE OR MISSING
8 = SHOULDERS LOW, SOFT OR HIGH
9 = NO SHOULDERS
10 = NON-HIGHWAY WORK
11 = OTHER
12 = UNKNOWN

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Fiche, Intersection, and Strip Reports Code Index**

Obj Strk - Object Struck Codes

14 = PEDESTRIAN
15 = PEDALCYCLIST
17 = ANIMAL
18 = MOVABLE OBJECT
20 = PARKED MOTOR VEHICLE
33 = TREE
34 = UTILITY POLE
35 = LUMINAIRE POLE NON-BREAKAWAY
36 = LUMINAIRE POLE BREAKAWAY
37 = OFFICIAL HIGHWAY SIGN NON-BREAKAWAY
38 = OFFICIAL HIGHWAY SIGN BREAKAWAY
39 = OVERHEAD SIGN SUPPORT
40 = COMMERCIAL SIGN
41 = GUARDRAIL END ON SHOULDER
42 = GUARDRAIL FACE ON SHOULDER
43 = GUARDRAIL END IN MEDIAN
44 = GUARDRAIL FACE IN MEDIAN
45 = SHOULDER BARRIER END
46 = SHOULDER BARRIER FACE
47 = MEDIAN BARRIER END
48 = MEDIAN BARRIER FACE
49 = BRIDGE RAIL END
50 = BRIDGE RAIL FACE
51 = OVERHEAD PART UNDERPASS
52 = PIER ON SHOULDER OF UNDERPASS
53 = PIER IN MEDIAN OF UNDERPASS
54 = ABUTMENT OF UNDERPASS
55 = TRAFFIC ISLAND CURB OR MEDIAN
56 = CATCH BASIN OR CULVERT ON SHOULDER
57 = CATCH BASIN OR CULVERT ON MEDIAN
58 = DITCH
59 = EMBANKMENT
60 = MAILBOX
61 = FENCE OR FENCE POST
62 = CONTRUCTION BARRIER
63 = CRASH CUSHION
64 = OTHER FIXED OBJECT

Unit # - Vehicle Style Codes

1 = PASSENGER CAR
2 = PICKUP
3 = LIGHT TRUCK (MINI-VAN, PANEL)
4 = SPORT UTILITY
5 = VAN
6 = COMMERCIAL BUS
7 = SCHOOL BUS
8 = ACTIVITY BUS
9 = OTHER BUS
10 = SINGLE UNIT TRUCK (2-AXLE, 6-TIRE)
11 = SINGLE UNIT TRUCK (3 OR MORE AXLES)
12 = TRUCK/TRAILER
13 = TRUCK/TRACTOR
14 = TRACTOR/SEMI-TRAILER
15 = TRACTOR/DOULBES
16 = UNKNOWN HEAVY TRUCK
17 = TAXICAB
18 = FARM EQUIPMENT
19 = FARM TRACTOR
20 = MOTORCYCLE
21 = MOPED
22 = MOTOR SCOOTER OR MOTOR BIKE
23 = PEDALCYCLE
24 = PEDESTRIAN
25 = MOTOR HOME/RECREATIONAL VEHICLE
26 = OTHER
27 = ALL TERRAIN VEHICLE (ATV)
28 = FIRETRUCK
29 = EMS VEHICLE, AMBULANCE, RESCUE SQUAD
30 = MILITARY
31 = POLICE
32 = UNKNOWN

Bridge #314
Madison County
Division 13

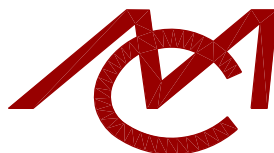


Northbound Approach



Northbound Approach at bridge

Bridge #314 on SR 1332
(Culvin Creek Road)
over Calvin Creek



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Bridge #314

Madison County

Division 13

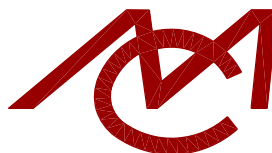


Southbound Approach



Southbound Approach at bridge

Bridge #314 on SR 1332
(Culvin Creek Road)
over Calvin Creek



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