

Feasibility Study

NC 107 Improvements

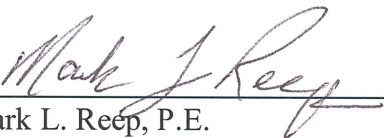
Jackson County

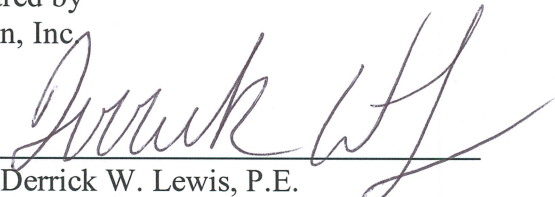
Division 14 FS-0814A




Feasibility Studies Unit Program Development Branch N.C. Department of Transportation

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NC 107 Improvements Jackson County

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I. Introduction

This feasibility study evaluates improvements to mitigate traffic congestion along NC 107 between Sylva and Western Carolina University (WCU) in Jackson County. The project study area begins north and west of the intersection with NC 107/ US 23 Business (Asheville Highway). It follows NC 107 through Sylva's commercial area and ends at Cullowhee Mountain Road (SR 1001) south of Western Carolina University.

NC 107 joins Sylva in the north with Cashiers in the south and passes through Webster, Cullowhee, and Tuckasegee in between (see Figure 1). There is dense commercial development with numerous driveways and intersections along US 23 Business and NC 107 between US 23-74 and NC 116. Under current peak traffic conditions, the major intersections between US 23 Business and NC 116 operate at an unacceptable level of service. Congestion and traffic delays will continue to worsen if no improvements are made.

Upgrades to NC 107 (and portions of US 23 Business) are proposed to reduce congestion and enable traffic to operate under acceptable conditions over the design life of the project. The required lane improvements on NC 107 have been considered with two conditions. One condition assumes a future connector road is built between NC 107 and US 23-74 east of Sylva. The other assumes the connector road is not built. The future NC 107 Connector (Project R-4745 in the State Transportation Improvement Program) is proposed to improve mobility along the NC 107 corridor in northern Jackson County. Project R-4745 is in the early environmental planning stages. A broad study area has been identified, but no specific route locations are currently available because the purpose and need has not been approved. Costs or impacts associated with the NC 107 Connector are not included in this evaluation because the connector is being developed under an independent project.

This study is the initial step in the planning and design process for this project and is not the product of exhaustive environmental or design investigations. Its purpose is to describe the proposed project, including costs, and to identify potential problems that may require consideration in the future planning and design phase.

II. Purpose and Need

The purpose of the project is to achieve an acceptable level of service to improve the traffic capacity and the north/ south transportation link between US 23-74 near Sylva and NC 107 near Cullowhee. NC 107 is the only major north/ south transportation corridor in Jackson County, and it collects traffic from numerous secondary roads. With no

reasonable transportation alternatives, traffic entering NC 107 from the secondary roads, businesses, and public institutions contributes to the overall traffic congestion.

Transportation related issues along NC 107 were first recognized in the 1980's. At the time, crash rates were among the highest in the state. The addition of a turning lane in the early 1990s along portions of the roadway helped improve the crash rates. To accommodate the turning lane, the 48-foot four lane undivided roadway was restriped as a five lane roadway. In the mid 1990's, as traffic conditions worsened, a "Southern Loop" was added to the local thoroughfare plan as a route for through traffic to bypass the central business districts of Sylva and Dillsboro. NCDOT completed a feasibility study in 2003 for the Southern Loop. This study recommended a multi-lane roadway on new alignment connecting US 23-441 south of Dillsboro to US 23-74 east of Sylva. The Southern Loop was added to the State Transportation Improvement Program (TIP) as Project R-4745. In 2008, NCDOT removed the western half of the Southern Loop (from US 23-441 south of Dillsboro to NC 107) from the TIP, and renamed the project as the NC 107 Connector.

NC 107 and US 23 Business (Asheville Highway) are classified as Other Principal Arterials on the Federal Functional Classification System. These routes are designated as boulevards in the Jackson County Comprehensive Transportation Plan (CTP) adopted in 2010. The CTP recommends 15 roadway improvements near the project study area (see Figure 6). Four of these focus on NC 107 and US 23 Business:

- NC 107 from US 23 Business to south of Lovedale Road (SR 1790)
- US 23 Business (Asheville Highway) from Hospital Road (SR 1437) to NC 107
- US 23 Business (West Main Street) from Chipper Curve Road (SR 1429) to Mill Street
- NC 107 Connector from US 23-74 to NC 107

The CTP proposes a four-lane boulevard with a median for NC 107 and US 23 Business (Asheville Highway) and three-lane upgrades to US 23 Business (West Main Street).

There are five adjacent roadway projects in the *2009-2015 State Transportation Improvement Program* (TIP). These include:

- R-4745 – Proposes a new route (NC 107 Connector) from NC 107 to US 23-74 east of Sylva (planning in progress, right of way acquisition in FY 2016).
- R-4753 – Proposes upgrades to existing NC 107 from Old Cullowhee Road (SR 1002) to NC 281 in Tuckasegee (4.1 miles) (right of way acquisition in FY 2014).
- R-5024 – Widened, realigned, and provided drainage improvements to Cope Creek Road (SR 1449) from NC 107 to East Cope Creek Road (SR 1710) (complete).
- R-5000 – Consists of a connector between NC 116 and NC 107 on new location (right of way acquisition in FY 2011).
- R-5206 – Proposes safety improvements and widening on Cope Creek Road (SR 1449) from East Cope Creek Road (SR 1710) to US 23-74 (preliminary engineering in progress).

NC 107 is a link in NCDOT's Strategic Highway Corridors Vision Plan. The primary purpose of this vision plan is to provide a network of high-speed, safe, reliable highways throughout North Carolina. These corridors are important routes for mobility, connectivity to activity centers and interstates, interstate relief, evacuation, and the national or statewide highway system. In the project study area, NC 107 is designated as a boulevard along Corridor 05 between Anderson, SC and Knoxville, TN. This 70-mile corridor follows NC 107, US 74, and US 441.

III. Existing Conditions

NC 107 is a five-lane, curb and gutter roadway with narrow 10-foot wide travel lanes from US 23 Business to approximately 1,000 feet south of Fairview Road (SR 1724). From there, NC 107 transitions to a four-lane, median-divided facility. The four-lane, median-divided typical section continues to approximately 1,000 feet south of North Country Club Drive/ Forest Hills Road (SR 1330) where it begins transitioning to a two-lane highway to the end of the project. Bicycle lanes are included from Fairview Road (SR 1724) to Old Cullowhee Mountain Road (SR 1002). Sidewalks are included from US 23 Business to NC 116 on one or both sides.

NC 107 transitions from a multi-lane facility in the north to a more rural two-lane facility in the south and traverses various land uses. From US 23 Business south to NC 116, NC 107 is mostly comprised of commercial development with a few educational facilities (Smoky Mountain High School, Fairview Elementary School, and Southwestern Community College) located near the intersection with NC 116. Approximately 95 driveways intersect this portion of US 23 Business and NC 107. The development south of Fairview Road (SR 1724) is sparse with residential and commercial units. Western Carolina University is located near the end of the project area. Fourteen signalized intersections are located along US 23 Business and NC 107 with posted speed limits ranging from 35 to 55 mph.

Table 1 presents typical section and land use information for different parts of the project area.

Table 1: Existing NC 107 Conditions

Section of NC 107	Typical Section	Speed Limit (mph) *	Land Uses
US 23 Business to NC 116	Five-lane curb and gutter (four lanes with center turn lane)	35	Commercial/education
NC 116	Transitions to four-lane divided with grass median and bicycle lanes	45	Commercial/industrial/education
1,000 feet south of Fairview Road (SR 1724) to Old Settlement Road (SR 1340)	Four-lane divided with grass median and bicycle lanes	55	Wooded/residential/education
Old Settlement Road (SR 1340) to Little Savannah Road (SR 1321)	Four-lane divided with grass median and bicycle lanes	55	Wooded/commercial/education
Little Savannah Road (SR 1321) to 1,000 feet south of North Country Club Drive/ Forest Hills Road (SR 1330)	Four-lane divided with grass median and bicycle lanes	45	Wooded/education
1,000 feet south of North Country Club Drive/Forest Hills Road (SR 1330) to Cullowhee Mountain Road (SR 1001)	Two lanes with bicycle lanes	45	Residential/education

** For some segments, the posted speed limit transitions from one speed to another – typically at signalized intersections. In these cases, the posted speed limit for the longest length of the segment is shown in the table.*

IV. Description of Alternatives

Four alternatives have been evaluated in detail for this Feasibility Study. The alternatives are comprised of roadway segments that were used in preparing and evaluating costs and potential effects on adjacent properties (see Figure 2). These segments and their lengths are described below and in Table 2.

Alternatives 1 and 2 propose 6.4 miles of widening and intersection upgrades. Both alternatives add turn lanes and auxiliary lanes at or between major intersections. Left turns will be allowed at intersections (see Figure 3). In some locations, Alternative 1 requires longer turn lanes and more lane improvements than Alternative 2 because the NC 107 Connector would not be in place to provide an alternate route during congested periods. Alternatives 1 and 2 are made up of seven segments designated A through G.

Alternatives 3 and 4 propose 7.5 miles of widening, intersection, and Superstreet improvements. These alternatives include access management techniques to promote a safer and more efficient corridor by limiting drivers' access between the highway and adjacent properties. Instead of turning left at intersections, drivers would be redirected to a median opening a short distance away and allowed to make a U-turn to continue in the desired direction (see Figure 4). Medians, driveways, and traffic signals will be designed

to keep traffic moving more efficiently. In some locations, Alternative 3 requires longer turn lanes and more lane improvements than Alternative 4 because the NC 107 Connector would not be in place. Alternatives 3 and 4 are made up of seven segments designated A through G.

Table 2: Alternative Segment Descriptions

	Segment	Description	Length (miles)
Alternatives 1 and 2	1A/ 2A	US 23 Business from 800 feet north of Hospital Road (SR 1437) to 800 feet north of NC 107	0.95
	1B/ 2B	US 23 Business from 400 feet west of Chipper Curve Road (SR 1429) to 800 feet north of NC 107 – Continues along NC 107 from US 23 Business to 2000 feet south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352)	1.52
	1C/ 2C	NC 107 from 2000 feet south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352) to 1600 feet north of NC 116	0.62
	1D/ 2D	NC 107 from 1600 feet north of NC 116 to 1200 feet south of NC 116	0.57
	1E/ 2E	NC 107 from 1200 feet south of NC 116 to 2000 feet north of Old Cullowhee Road (SR 1002)	0.45
	1F/ 2F	NC 107 from 2000 feet north of Old Cullowhee Road (SR 1002) to the Tuckasegee River	0.51
	1G/ 2G	NC 107 from 1000 feet north of SR 1550 to 1400 feet south of Cullowhee Mountain Road (SR 1001)	<u>1.80</u> 6.42
Alternative 3 and 4	3A/ 4A	US 23 Business from 800 feet north of Hospital Road (SR 1437) to 800 feet north of NC 107	0.95
	3B/ 4B	US 23 Business from 400 feet west of Chipper Curve Road (SR 1429) to 800 feet north of NC 107 - Continues along NC 107 from US 23 Business to 2000 feet south of Cope Creek Road (SR 1449)/ Walter Ashe Road (SR 1352)	1.52
	3C/ 4C	NC 107 from 2000 feet south of Cope Creek Road (SR 1449)/ Walter Ashe Road (SR 1352) to approximately 1600 feet north of NC 116	0.62
	3D/ 4D	NC 107 from 1600 feet north of NC 116 to 1200 feet south of NC 116	0.57
	3E/ 4E	NC 107 from 1200 feet south of NC 116 to 2000 feet north of Old Cullowhee Road (SR 1002)	0.45
	3F/ 4F	NC 107 from 2000 feet north of Old Cullowhee Road (SR 1002) to 1400 feet south of Old Settlement Road (SR 1340)	1.09
	3G/ 4G	NC 107 from 2700 feet north of SR 1550 to 2000 feet south of Cullowhee Mountain Road (SR 1001)	<u>2.34</u> 7.54

All alternatives include a four-lane divided roadway with turn lanes added or dropped at intersections. From north and west of US 23 Business (Asheville Highway) to south of Fairview Road (SR 1724), curb and gutter is proposed with a 30-foot raised median, requiring a minimum of approximately 110 feet of right of way. Wider outside lanes are included for shared bicycle use, and sidewalks would be included to replace existing sidewalks or complete desired portions of the Jackson County Pedestrian Plan.

From south of Fairview Road (SR 1724) to south of Old Settlement Road (SR 1340), shoulders are proposed with a 30-foot depressed median, requiring a minimum of approximately 120 feet of right of way. From north of Centennial Drive (SR 1325) to south of Cullowhee Mountain Road (SR 1001), shoulders are proposed with a 46-foot depressed median, requiring a minimum of approximately 140 feet of right of way. Bicycle accommodations include four-foot bicycle lanes or four-foot paved shoulders. The typical roadway cross sections considered for each alternative are described in Table 3. The proposed design speed varies from 40 mph in Sylva to 60 mph north of Cullowhee.

Table 3: Proposed Roadway Typical Sections

Location	Alternatives	Segments	Proposed Typical Section	Design Speed (mph)
North and west of US 23 Business to south of Fairview Road (SR 1724)	1 & 2 3 & 4	1A/2A, 1B/2B 1C/2C, 1D/2D 3A/4A, 3B/4B 3C/4C, 3D/4D	Four-lane divided roadway 2.5-foot curb and gutter 12-foot inside lanes 14-foot outside lanes 30-foot raised median 10-foot berm	40
South of Fairview Road (SR 1724) to the Tuckasegee River	1 & 2	1E/2E, 1F/2F	Four-lane divided roadway 12-foot lanes 4-foot bicycle lanes 8-foot unpaved shoulders 30-foot depressed median	60
South of Fairview Road (SR 1724) to south of Old Settlement Road (SR 1340)	3 & 4	3E/4E, 3F/4F	Four-lane divided roadway 12-foot inside lanes 14-foot outside lanes 8-foot shoulders 4-foot paved shoulders 30-foot depressed median	60
North of Centennial Drive (SR 1325) to south of Cullowhee Mountain Road (SR 1001)	1 & 2 3 & 4	1G/2G 3G/4G	Four-lane divided roadway 12-foot inside lanes 14-foot outside lanes 8-foot shoulders 4-foot paved shoulders 46-foot depressed median	50

V. Other Alternatives Considered

The Town of Sylva officials and many citizens are concerned about the project's impact to adjacent properties. They desire for NC 107 to remain a four-lane city street with little or no increase in width to avoid business impacts (see Appendix for Town of Sylva correspondence). Some asked for alternatives that would reconfigure the existing roadway width to more efficiently handle traffic. Suggestions included replacing the center turn lane with an island, adjusting traffic signal timings, eliminating the Sunset Park approach from the US 23 Business intersection, and constructing roundabouts. All the major NC 107 intersections in Sylva currently operate at or beyond their traffic carrying capacity during peak hours. Conditions will continue to worsen over time as the area grows. To meaningfully address congestion, wider travel lanes, a median, and additional turn lanes at intersections are needed. Other options may be considered in more detailed future studies to avoid and minimize impacts to properties, community resources, and environmental features. This level of detail is traditionally performed during the development of detailed environmental and design studies and not in a feasibility study. A more detailed design analysis may consider refining the design criteria, allowing narrower lanes or median widths, and locating the alignment so that it has the least disruption to properties and other sensitive resources.

Interim Improvements

Interim improvements were considered only in more congested areas or those that could benefit from geometric improvements. Alternatives 5 and 6 include widening and Superstreet upgrades in selected locations from west of the NC 107/ US 23 Business intersection to north of NC 116 and near the Tuckasegee River (see Figure 5). These alternatives include access management techniques to promote a safer and more efficient corridor by limiting drivers' access between the highway and adjacent properties. Alternatives 5 and 6 have a total length of 2.5 miles and are approximately one-third of the length of Alternatives 1 through 4. Alternative 5 assumes there is no NC 107 Connector. Alternative 6 assumes the NC 107 Connector is built. These interim alternatives would improve the levels of service at most major intersections from west of US 23 Business to north of Jones Street and near Old Cullowhee Road (SR 1002). Left turning NC 107 traffic and through movements from intersecting roads would be directed to designated U-turn locations. Extensive upgrades and new traffic signals were considered at the NC 107/ US 23 Business intersection for improved through traffic operations.

Alternatives 5 and 6 are estimated to cost \$13,400,000 for construction, \$1,100,000 for utility relocation, and \$64,900,000 for right of way acquisition. The total estimated cost is \$79,400,000. They would displace 20 residences and 93 businesses, for a total of 113 relocations. When compared to the same portions of Alternative 1, Alternatives 5 and 6 cost \$9,300,000 more and relocate 35 more homes or businesses. When compared to the same portions of Alternative 3, they cost \$6,000,000 more and relocate 24 more homes or businesses. The right of way costs and relocations are substantially higher because of the expanded limits of the NC 107/ US 23 Business intersection. These alternatives do not provide a continuous median boulevard facility to join with the existing four-lane divided

cross section south of Fairview Road as recommended in the Jackson County CTP. For these reasons, Alternatives 5 and 6 were eliminated from further consideration.

Roundabout Concept

A roundabout was considered for the NC 107/ US 23 Business intersection but not pursued in detail because the traffic volumes were determined to be too great for a roundabout to function properly. A three-way roundabout with two lanes in each direction was evaluated for this intersection. A proposed flyover (or directional ramp) was also considered to allow the high volume of traffic to flow continuously from southbound US 23 Business to eastbound NC 107. Without a flyover, the roundabout is considerably over capacity (see traffic results in Section VII). With a flyover, a roundabout could function acceptably but would require a considerable amount of construction and property impacts to elevate a directional ramp above the intersection. For these reasons, a roundabout is not recommended.

Connecting Street Plan

Area citizens also suggested extending and connecting existing streets in the Sylva area to alleviate congestion and provide alternative routes to NC 107. A Sylva Street Plan was developed several years ago by Town Planners to address this idea. This Street Plan was never adopted by the Town of Sylva and most of its components were not reflected in the Comprehensive Transportation Plan. In feasibility studies, NCDOT typically considers options that are consistent with an area's long range or comprehensive transportation plan. In this project study area, the County's Comprehensive Transportation Plan proposes improvements for NC 107, US 23 Business, Skyland Drive, Cope Creek Road, Webster Road, and other routes south of Sylva. For these reasons, the concepts described in the Sylva Street Plan were not studied in detail with this project.

VI. Traffic and Safety

Traffic Study Results

Traffic forecasts for this study were prepared using assumptions from the Jackson County Comprehensive Transportation Plan. Growth estimates were developed by NCDOT in coordination with the Southwestern Rural Planning Organization, Jackson County, and the Jackson County Transportation Task Force. Traffic forecasts for the year 2035 included programmed highway projects, the Western Carolina University Millennial Initiative Program, and historic average daily traffic counts (see the Appendix for traffic forecast diagrams).

The existing average daily traffic volumes (ADT's) for NC 107 are estimated to reach 34,200 vehicles per day (vpd) near the US 23 Business intersection and 11,500 vpd south of North Country Club Drive/ Forest Hills Road (SR 1330). If the NC 107 Connector is not built by the year 2035, future traffic volumes are estimated to reach 42,200 vpd and 16,400 vpd at these same locations. If the NC 107 Connector is in place by the year 2035, future traffic volumes are estimated to reach 36,200 vpd and 16,400 vpd at these

same locations. The NC 107 Connector is estimated to reduce future NC 107 traffic in Sylva by approximately 15% but have little effect on traffic in the Cullowhee area.

Highway capacity analyses were performed for the years 2008 and 2035 to evaluate existing and future traffic operations along existing NC 107 and along Alternatives 1 through 6. Traffic operating conditions are measured using levels of service (LOS) represented by a letter designation from A to F. LOS A represents the best operating conditions and LOS F the worst. LOS D is generally considered to be acceptable in urban areas. LOS E designates conditions in which a facility reaches its traffic carrying capacity, and LOS F represents a breakdown in traffic flow.

When signalized intersections are spaced at less than two-mile intervals, a facility is classified as an arterial. The signalized intersections generally control the LOS for the facility. Intersection LOS is defined as the average controlled delay of all approaches. Table 4 describes the traffic conditions for intersections generally associated with each LOS designation. The methodologies and procedures documented in the Highway Capacity Manual, Special Report 209, Third Edition, 2000, were used to calculate levels of service.

Table 4: Levels of Service Definitions for Signalized Intersections

A	Very low delay (≤ 10 sec. per vehicle). Most vehicles do not have to stop at all.	Free flow. Individuals are unaffected by others in traffic stream. Freedom to select speed and maneuver is extremely high.
B	> 10 & ≤ 20 sec. per vehicle delay. Good progression and short cycle length.	Free flow, but the present of other vehicles begins to be noticeable. Slight decline in freedom to maneuver.
C	> 20 & ≤ 35 sec. per vehicle delay. Fair progression and/or longer cycles. The number of vehicles stopping is significant.	Stable flow, but the beginning of the range in which the influence of traffic density on operations becomes marked. Maneuvering requires substantial vigilance. Average travel speed may begin to show some reduction.
D	> 35 & ≤ 55 sec. per vehicle delay. Many vehicles stop. Individual cycle failures noticeable.	High density flow in which ability to maneuver is severely restricted by increasing volumes. Only minor traffic disruptions can be absorbed without effect.
E	> 55 & ≤ 80 sec. per vehicle delay. The limit of acceptable delay.	Flow at or near capacity. Unstable. Most traffic disruptions will cause queues to form and service to deteriorate.
F	> 80 sec. per vehicle of delay. Considered unacceptable to most drivers.	Breakdown flow. Traffic exceeds capacity. Queues form behind such locations, which are characterized by extremely unstable stop and go waves.

Source: Highway Capacity Manual, Special Report 209, Third Edition, 2000.

Table 5 summarizes the operational effects (in terms of delay times and LOS) to intersections along existing NC 107 as a result of each Alternative for the year 2035 No-Build. The 2035 No-Build data represents conditions along NC 107 if none of the Alternatives are in place. Table 5 also summarizes 2035 delay times and LOS to intersections along or near each alternative under build conditions. Data for each alternative assumes the proposed NC 107 improvements are in place.

Table 5: Intersection Level of Service and Delay (Seconds per Vehicle)

	Level of Service & Delay for Overall Intersection Traffic (seconds/vehicles)					
	2008	2035	2035 Proposed Improvements			
	Existing	No Build	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	LOS/ Delay	LOS/ Delay	LOS/ Delay	LOS/ Delay	LOS/ Delay	LOS/ Delay
US 23 Business Intersections						
Hospital Road	B / 10	C / 23	B / 19	B / 13	U	U
U-Turn S. of Hospital Road	n / a	n / a	n / a	n / a	U	U
Skyland Drive (SR 1432)	B / 15	C / 30	C / 28	C / 23	C / 23	C / 21
U-Turn S. of Skyland Drive	n / a	n / a	n / a	n / a	A / 9	A* / 8
N. of US 23 Business	n / a	n / a	n / a	n / a	n / a	n / a
NC 107 Intersections						
US 23 Business	F / 259	F / >500	C / 29	C / 30	n / a	n / a
US 23 WB and ramp to NC 107 NB	n / a	n / a	n / a	n / a	n / a	n / a
US 23 Business Westbound	n / a	n / a	n / a	n / a	B / 15	B / 17
US 23 Business Eastbound	n / a	n / a	n / a	n / a	D* / 44	C* / 30
Chipper Curve - Municipal Road	n / a	n / a	D / 55	D / 55	D / 52	D / 55
Chipper Curve - US 23 Business	n / a	n / a	D / 45	D* / 51	D / 42	D / 45
U-Turn W. of Cherry Road (SR 1354)	n / a	n / a	n / a	n / a	A* / 6	A* / 7
Cherry Road (SR 1354)	n / a	n / a	U	U	B / 13	B / 12
U-Turn E. of Cherry Road (SR 1354)	n / a	n / a	B / 11	U	A / 5	A / 4
U-Turn W. of Cope Creek Road (SR 1449)	n / a	n / a	n / a	n / a	A* / 8	A* / 2
Walter Ashe Road (SR 1352) / Cope Creek Road (SR 1449)	F / 87	F* / 129	C* / 29	B / 16	n / a	n / a
Cope Creek Road (SR 1449)	n / a	n / a	n / a	n / a	C / 26	A / 4
Walter Ashe Road (SR 1352)	n / a	n / a	n / a	n / a	B* / 12	A* / 4
U-Turn E. of Cope Creek Road (SR 1354)	n / a	n / a	n / a	n / a	B / 11	A* / 2
U-Turn N. of Walmart	n / a	n / a	n / a	n / a	A* / 5	A / 7
Walmart North Drive	n / a	n / a	n / a	n / a	n / a	n / a
Walmart/Ford Drive	F* / 91	F* / 102	D* / 52	E* / 66	n / a	n / a
Ford Dealership	n / a	n / a	n / a	n / a	B / 15	B / 11
Walmart	n / a	n / a	n / a	n / a	C* / 30	C* / 22
U-Turn S. of Walmart	n / a	n / a	n / a	n / a	C / 31	B / 18
U-Turn N. of Jones Street (SR 1723)	n / a	n / a	n / a	n / a	A* / 10	B* / 11
Jones Street (SR 1723)	E / 78	E / 59	C* / 22	C / 23	B / 18	B / 15
U-Turn S. of Jones Street (SR 1723)	n / a	n / a	n / a	n / a	B* / 11	A* / 9
NC 116/Smoky Mtn. High School Dr.	E / 75	F / 190	D* / 40	D / 37	n / a	n / a
Smokey Mtn. High School Dr.	n / a	n / a	n / a	n / a	B / 11	A / 9
NC 116	n / a	n / a	n / a	n / a	B / 18	B / 14
Fairview Road (SR 1724)	C / 24	C / 33	U	U	B / 19	B / 15
U-Turn S. of Fairview Road (SR 1724)	n / a	n / a	n / a	n / a	B / 17	B / 13
U-Turn N. of NC 107 Connector	n / a	n / a	n / a	n / a	n / a	D* / 38
R-5000 Connector	n / a	C* / 30	C* / 30	C* / 29	B* / 15	B* / 15
U-Turn S. of R-5000 Connector	n / a	n / a	U	n / a	A / 7	A / 4

Table 5: Intersection Level of Service and Delay (Seconds per Vehicle)

	Level of Service & Delay for Overall Intersection Traffic (seconds/vehicles)					
	2008	2035	2035 Proposed Improvements			
	Existing	No Build	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	LOS/ Delay	LOS/ Delay	LOS/ Delay	LOS/ Delay	LOS/ Delay	LOS/ Delay
NC 107 Connector	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	B* / 19	<i>n / a</i>	C / 23
U-Turn N. of South River Road (SR 1345)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	U	U
South River Road (SR 1345)	<i>n / a</i>	<i>n / a</i>	U	U	A* / 6	A* / 7
Old Cullowhee Road (SR 1002)	E / 60	F / 88	B / 20	C / 24	C / 25	C / 23
U-Turn S. of Old Cullowhee Road (SR 1002)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	U	U
Old Settlement Road (SR 1340)	B* / 13	C / 26	B / 19	C* / 21	B* / 14	C* / 25
U-Turn S. of Old Settlement Road (SR 1340)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	U	U
U-Turn N. of Centennial Drive (SR 1325)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	B / 14	B* / 20
Centennial Drive (SR 1325)/ Proposed Millennial Campus Drive	E / 62	F / 145	D* / 51	D* / 52	<i>n / a</i>	<i>n / a</i>
Centennial Drive (SR 1325)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	C / 20	C* / 22
Proposed Millennial Campus Drive	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	B / 18	B / 17
U-Turn N. of Little Savannah Road (SR 1367)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	B* / 17	B / 16
Little Savannah Road (SR 1367)	C* / 21	C* / 33	B* / 14	B* / 13	B* / 11	B* / 12
U-Turn S. of Little Savannah Road (SR 1367)	<i>n / a</i>	<i>n / a</i>	B* / 12	B* / 13	A* / 8	B* / 20
U-Turn N. of Forest Hills Road (SR 1330)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	A / 4	A* / 5
North Country Club Drive/ Forest Hills Road (SR 1330)	C / 26	E* / 62	C* / 32	C* / 32	<i>n / a</i>	<i>n / a</i>
Forest Hills Road (SR 1330)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	B* / 14	C* / 24
North Country Club Drive	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	B / 10	B* / 15
U-Turn S. of North Country Club Drive	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	U	U
U-Turn N. of Speedwell Road	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	A / 5	A / 4
Cullowhee Mountain Road (SR 1001)/ Speedwell Road	C* / 24	D* / 43	C / 30	C / 30	<i>n / a</i>	<i>n / a</i>
Speedwell Road	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	U	U
Cullowhee Mountain Road (SR 1001)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	A* / 10	B* / 11
U-Turn S. of Cullowhee Mountain Road (SR 1001)	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	<i>n / a</i>	U	U
Old Cullowhee Road (SR 1002)/ NC 107	<i>n / a</i>	<i>n / a</i>	U	U	U	U

U - Unsignalized Intersection

n / a - Intersections Not Analyzed

** These LOS correspond to the AM peak time - all others correspond to the PM peak time.*

Intersection Analysis

Under current (2008) conditions, the five-lane section is at or over its traffic carrying capacity during peak traveling hours (see Table 5). If no improvements are made by the year 2035, eight of the 15 intersections analyzed will operate at LOS E or F conditions. These include every intersection (five) from US 23 Business to NC 116.

Every intersection but one for each of the Alternatives is expected to operate at LOS D or better in the year 2035. The exception is the intersection of NC 107 and Walmart/ Ford Drive under Alternative 2. It was analyzed to be at capacity (LOS E) for the AM peak hours.

Roundabout Analysis

A roundabout was considered at the NC 107/ US 23 Business intersection. The effectiveness of a roundabout is measured using a volume to capacity (v/c) ratio. Conventional guidelines and research suggest a roundabout will function effectively until its volume to capacity ratio reaches 0.85 (or 85% of its capacity). According to FHWA's document entitled Roundabouts: an Informational Guide, roundabouts should be designed so that no approach operates with a v/c ratio that exceeds 0.85. A two-lane roundabout with three approaches was evaluated for this intersection with and without the NC 107 Connector being in place. A proposed flyover (or directional ramp) was also considered to allow the high volume of traffic to flow continuously from southbound US 23 Business to eastbound NC 107. This would require the ramp to be elevated above the intersection. Results are described in Table 6.

Table 6: Roundabout Analysis – Volume to Capacity Ratios

	Volume to Capacity (v/c) Ratio Without NC 107 Connector		Volume to Capacity (v/c) Ratio With NC 107 Connector	
	2035 AM Peak	2035 PM Peak	2035 AM Peak	2035 PM Peak
No flyover	2.61	1.96	2.27	1.7
Flyover	0.82	0.82	0.76	0.73

Without the flyover from north US 23/NC 107 to east NC 107, the roundabout is considerably over capacity. With the flyover option, the highest v/c ratio is 0.86 in the morning peak with the NC 107 Connector in place. This is for the westbound right-turns which are free-flowing. The 0.82 ratio is for the eastbound through movement. This could become a continuous flowing movement since there are no conflicting southbound left-turns; however, it would prevent westbound U-turn movements from occurring. A roundabout is not recommended because it would require a considerable amount of construction and property impacts to elevate a directional ramp above the intersection.

Constructability Issues

Traffic control and work zone safety will be important considerations during project construction. Many intersections have reached their traffic carrying capacity, and traffic operations will worsen during the construction period due to work zone traffic control requirements. During construction, two-way traffic will need to be maintained safely on

site; however, there may be times when construction phasing may require temporary lane closures or require traffic to be diverted to other nearby existing routes. A detailed constructability analysis may be required during future planning and design studies to evaluate the most feasible and economical traffic maintenance and detour options. An NC 107 Connector would be a beneficial link to have in place to divert NC 107 through traffic away from the commercial district during certain construction phases.

Crash Analysis

Table 7 shows the accident rate per 100 million vehicle miles of travel (MVM) on US 23 Business from north of Hospital Road (SR 1437) to NC 107 at Cullowhee Mountain Road (SR 1001). The total crash rate on US 23 Business was 330.44 crashes per 100 MVM in the three year period (from June 1, 2005 to May 31, 2008). During the same period, the total crash rate on NC 107 was 244.77 crashes per 100 MVM. Both of these rates are lower than the statewide averages of 769.47 for similar US routes and 443.05 for similar NC routes. There were no reported fatal accidents during this three year period. A total of 98 crashes were reported for US 23 Business, and 341 crashes were reported for NC 107. While the total accident rates are lower than the statewide average rates, the number of accidents increased by 17 percent the second year and 6 percent the third year. Approximately 70% of the accidents along NC 107 occurred between US 23 Business and Fairview Road (SR 1724), and the primary crash patterns were rear end, left turn, and angle collisions.

Table 7: Crash Statistics

Rate	Crashes	Crashes per 100 Million Vehicle Miles (MVM)	Statewide Rate ¹	Critical Rate ²
US 23 Business from North of Hospital Road (SR 1437) to NC 107				
Total	98	330.44	769.47	854.95
Fatal	0	0.00	1.81	7.56
Non-Fatal	42	141.62	236.90	285.08
Night	17	57.32	164.56	205.00
Wet	22	74.18	115.74	149.92
NC 107 from US 23 Business to Cullowhee Mountain Road (SR 1001)				
Total	341	244.77	443.05	472.74
Fatal	0	0.00	1.48	3.53
Non-Fatal	117	83.98	142.08	159.05
Night	75	53.84	94.79	108.72
Wet	73	52.40	69.85	81.86

¹ 2005 – 2007 Statewide Crash rates are for 2-Lane with Continuous Left Turn Lane, Urban United States (US) Route and 4-Lane Divided with No Control Access, Urban North Carolina (NC) Route.

² Based on the statewide crash rate (95% level of confidence). The **critical crash rate** is a statistically derived number that can be used as a tool to identify or screen for high accident locations.

The critical crash rate can be used as a tool to identify or screen for high accident locations. Locations with a crash rate higher than the critical rate may have safety and

operational deficiencies. The crash rates within the project area are lower than the critical rates.

VII. Evaluation of Alternatives

A detailed discussion of the alternatives, including costs and potential property effects, follows and is summarized in Table 8 and Table A-1 of the Appendix.

Table 8: Summary of Costs and Relocations

	Length (miles)	Construc- tion Costs	Utility Relocation Costs	Right of Way Costs	Total Costs	Relocations			
						Resi- dences	Busi- nesses	Other	Total
Alt. 1	6.4	\$36,200,000	\$2,500,000	\$76,500,000	\$115,200,000	16	93	1	110
Alt. 2	6.4	\$34,200,000	\$2,500,000	\$76,500,000	\$113,200,000	16	93	1	110
Alt. 3	7.5	\$39,600,000	\$2,800,000	\$79,800,000	\$122,200,000	27	95	1	123
Alt. 4	7.5	\$39,500,000	\$2,900,000	\$79,800,000	\$122,200,000	27	95	1	123

Alternatives 1 and 2 address congestion to achieve an acceptable level of service for traffic at all major intersections. These alternatives upgrade the narrow travel lanes and roadways with a four-lane divided boulevard from north and west of US 23 Business to south of Fairview Road (SR 1724). Minor upgrades and intersection improvements are included along the four-lane divided portion of NC 107 from south of Fairview Road to Old Cullowhee Road (SR 1002). Near Cullowhee, Alternatives 1 and 2 include median upgrades and lane improvements at intersections from north of Centennial Drive (SR 1325) to south of Cullowhee Mountain Road (SR 1001). Turning traffic movements at major intersections will be maintained, and some new traffic signals are proposed.

Alternative 1 is estimated to cost \$36,200,000 for construction, \$2,500,000 for utility relocation, and \$76,500,000 for right of way acquisition. The total estimated cost is \$115,200,000. Alternative 2 is estimated to cost \$34,200,000 for construction, \$2,500,000 for utility relocation, and \$76,500,000 for right of way acquisition. The total estimated cost is \$113,200,000. These alternatives displace 16 residences, 93 businesses and one cemetery for a total of approximately 110 relocations.

Construction costs are highest from west of Chipper Curve Road (SR 1429) to south of Cope Creek Road (SR 1449)/ Walter Ashe Road (SR 1352) (Segments 1B/ 2B). This is due to upgrading three-lane portions of US 23 Business as well as replacing the bridge over Scotts Creek. Impacts to commercial properties are also highest in this segment due to the extensive right of way acquisition and relocation costs of numerous businesses in these areas.

The northern 4.1-mile portion of the roadway (Segments 1A/2A, 1B/2B, 1C/2C, 1D/2D, and 1E/2E) is the most beneficial to upgrade with Alternatives 1 and 2. These segments would address the NC 107 and US 23 Business improvements recommended in the Jackson County CTP. This portion of Alternative 1 is estimated to cost \$102,900,000 and would displace 109 residences, businesses and a cemetery. This portion of Alternative 2 is estimated to cost \$101,500,000, and would displace 109 residences, businesses and a cemetery.

A road user benefit analysis (described in detail in Section X) was performed to estimate cost savings for drivers in terms of reduced travel time, lower accident rates, and lower operating costs. Alternatives 1 and 2 would have a benefit that is at least 4.8 times greater than the cost for upgrading NC 107 and US 23 Business.

Other benefits include:

- Reducing the traffic bottlenecks on the three-lane portion of US 23 Business between Mill Street in Sylva and NC 107.
- Widening the bridge over Scotts Creek to four lanes as endorsed by the Town of Sylva.
- Maintaining traditional left-turn movements at major intersections for driver convenience (particularly for heavy trucks from industries and commercial centers).
- Having the NC 107 connector in place with Alternative 2 to alleviate work zone congestion on the existing route during construction.

A disadvantage to these alternatives is the extent of land acquisition and relocation of businesses in the Sylva commercial district. Town of Sylva officials and citizens desire for NC 107 to remain as a four-lane City street with little or no increase in width. They do not want the planned improvements to have a negative impact on business and growth in Sylva. NC 107/ US 23 Business improvements from Downtown Sylva to NC 116 are at the top of the Town's list of transportation priorities, but the NC 107 Connector is not included in their list.

Alternatives 3 and 4 include access management techniques that address congestion and achieve an acceptable level of service for traffic at all major intersections. More extensive upgrades are needed at some intersecting roads and in between intersections to accommodate U-turns. Alternatives 3 and 4 extend south of the Tuckasegee River and Old Settlement Road (SR 1340) and from north of Centennial Drive (SR 1325) to south of Cullowhee Mountain Road (SR 1001). NC 107 left turning traffic and through movements from intersecting roads will be directed to designated U-turn locations. Some new traffic signals are proposed.

Alternative 3 is estimated to cost \$39,600,000 for construction, \$2,800,000 for utility relocation, and \$79,800,000 for right of way acquisition. The total estimated cost is \$122,200,000. Alternative 4 is estimated to cost \$39,500,000 for construction, \$2,900,000 for utility relocation, and \$79,800,000 for right of way acquisition. The total estimated cost is \$122,200,000. These alternatives displace 27 residences, 95 businesses and one cemetery for a total of 123 relocations.

Construction costs are highest from west of Chipper Curve Road (SR 1429) to south of Cope Creek Road (SR 1449)/ Walter Ashe Road (SR 1352) (Segments 3B/ 4B). This is due to upgrading three-lane portions of US 23 Business as well as replacing the bridge over Scotts Creek. Impacts to commercial properties are also highest in this segment due to the extensive right of way acquisition and relocation costs of numerous businesses in these areas.

The northern 4.1-mile portion of the roadway (Segments 3A/4A, 3B/4B, 3C/4C, 3D/4D, and 3E/4E) is the most beneficial to upgrade with Alternatives 3 and 4. These segments would address the NC 107 and US 23 Business improvements recommended in the Jackson County CTP. This portion of Alternative 3 is estimated to cost \$103,400,000 and would displace 111 residences, businesses and a cemetery. This portion of Alternative 4 is estimated to cost \$102,800,000, and would displace 111 residences, businesses and a cemetery.

Results of the road user benefit analysis show that Alternatives 3 and 4 would have a benefit that is at least 5.2 times greater than the cost for upgrading NC 107 and US 23 Business. Other benefits include:

- Reducing the traffic bottlenecks on the three-lane portion of US 23 Business between Mill Street in Sylva and NC 107.
- Widening the bridge over Scotts Creek to four lanes as endorsed by the Town of Sylva.
- Providing a more efficient progression of through traffic with the use of the Superstreet configuration and other access management techniques.
- Enhancing safety at intersections by limiting the number turning movements that conflict with each other.
- Having the NC 107 connector in place with Alternative 4 to alleviate work zone congestion on the existing route during construction.

Alternatives 3 and 4 cost at least \$7,000,000 more than Alternatives 1 and 2. This is because Alternatives 3 and 4 include an additional 1.1 miles of widening and intersection improvements south of the Tuckasegee River. With left-turning traffic restricted to designated U-turn locations, some drivers will be inconvenienced (particularly heavy trucks from industries and commercial centers).

A disadvantage to these alternatives is the extent of land acquisition and relocation of businesses in the Sylva commercial district. Town of Sylva officials and many citizens are concerned about negative impacts on business and growth in Sylva. NC 107/ US 23 Business improvements from Downtown Sylva to NC 116 are at the top of the Town's list of transportation priorities, but the NC 107 Connector is not included in their list.

VIII. Public Involvement

Citizens Informational Workshop

A Citizens Informational Workshop was held on November 9, 2010 from 5:00 pm to 7:00 pm at Southwestern Community College in Sylva. The NCDOT project team presented the proposed improvements, answered questions, and received comments about the

project. The format of the workshop was informal with handouts provided and aerial maps on display. Before the workshop began, a meeting was held to brief local officials on the project. Approximately 110 people attended the workshop, and 30 people attended the officials meeting.

During the workshop, many citizens commented on issues such as:

- Considering other design concepts with fewer property impacts
- Including traffic calming, other intersection designs, or roundabouts
- Evaluating changes in traffic operations
- Adding bicycle and pedestrian uses in the designs
- Supporting or opposing the NC 107 Connector

Other concerns and suggestions brought up by citizens after the workshop include:

- The desires of the community for other means of easing traffic congestion on NC 107 (roundabouts, rerouting traffic onto other roads, incorporating pedestrian and bicycle friendly facilities, etc.) are not being heard by NCDOT
- The results of the Goals and Objective survey conducted as part of the Jackson County Comprehensive Transportation Plan were not considered in the design concepts displayed at the workshop
- Preserve the natural environment
- Develop alternative modes of transportation through public transit and greenways
- Pedestrian safety
- Better land use planning
- Issues regarding tractor trailers and buses maneuvering through the superstreet intersection at US 23 Business and NC 107 proposed under Alternatives 3 and 4
- The perception there is a true traffic problem on NC 107

Following the workshop, the mayor of Sylva, writing on behalf of the Board of Commissioners, sent a letter to NCDOT endorsing the NC 107 Connector if adequate improvements to NC 107 could not be made within the existing footprint. They requested NC 107 to remain a four-lane roadway with little or no increase in width to prevent impacting businesses. In early 2011, the Sylva Town Board and the Jackson County Board of Commissioners selected transportation priorities from the projects in the Jackson County CTP. NC 107 and US 23 Business improvements were among the top of their lists. The NC 107 Connector was not included in the Sylva Town Board's list. However, it was ranked number seven by the Jackson County Commissioners but was not included in their official priority list.

Related Public Involvement Efforts from the Jackson County Comprehensive Transportation Plan

As part of the Comprehensive Transportation Plan (CTP) process, a Goals and Objective survey was conducted in early 2008. Based upon the results of this survey, the citizens of Jackson County, and those who commute there, take an active interest in the transportation system. By examining the results of the Goals and Objectives survey, it is

evident that the participants want to preserve the rural character and natural beauty of the mountains and town areas. Citizens of Jackson County would like the town of Sylva to be more bicycle and pedestrian friendly. In addition, safety, environmental protection, and increased transportation options are important.

IX. Human and Natural Environment Issues

Due to dense development along NC 107 in the areas in which traffic congestion is the worse, each of the alternatives studied in this document is likely to directly or indirectly impact the community. The following are community issues that could be encountered by the alternatives. See Figure 7 for the locations of community facilities in the project study area.

- Harris Regional Hospital is located on the west side of US 23 Business and could be affected by Alternatives 1 through 4.
- A Wal-Mart store is located along NC 107 north of NC 116 and could be affected by all of the alternatives.
- Smoky Mountain High School, Fairview Elementary School, and the Fairview Youth Complex (a 10-acre joint-use school/ county park located next to Smoky Mountain High School) are located on the northeast corner of NC 107 and Fairview Road. These community facilities could be affected by Alternatives 1 through 4.
- Southwest Community College is located on the south side of NC 116 west of NC 107 and could indirectly be affected by Alternatives 1 through 4.
- A six-acre cemetery is located on the east side of NC 107 between Fairview Road and Love Dale Road and could be affected by Alternatives 1 through 4.
- Western Carolina University, in Cullowhee, is located in the southern end of the study area and could be affected by Alternatives 1 through 4.
- Cullowhee Valley School – a Jackson County public school for grades kindergarten through eighth grade, is located on the west side of NC 107 just north of Cullowhee Mountain Road. This school could be affected by Alternatives 1 through 4.
- Jackson County Recreation Complex, a community center with indoor and outdoor athletic facilities, is adjacent to Cullowhee Valley School along Cullowhee Mountain Road. This facility could be indirectly affected by Alternatives 1 through 4.
- There are various restaurants and businesses along NC 107 located in strip shopping centers. Two main grocers along the study area include Ingle's and Food Lion. Three major Drug Stores are located on or near intersecting roads with NC 107 from Main Street to Cullowhee. One manufacturing plant, Jackson Paper Manufacturing, is located on Main Street near the intersection of Asheville Highway.
- Many churches are located in the area; seven are located just off the NC 107 and Asheville Highway from Cullowhee to Sylva.

A detailed environmental study was not conducted for this feasibility study, however an environmental screening did find the following items which may need further evaluation in later planning and design stages (see Figure 8):

- *Protected Species* – As of September 22, 2010 (USFWS 2010), the USFWS lists seven federally protected species for Jackson County. Table 9 lists these species,

their federal and state status, and notes whether potential habitat exists in the vicinity of the project study area for each species.

Table 9: Federally Protected Species Listed for Jackson County

Scientific Name	Common Name	Federal Status ¹	State Status ¹	Potential Habitat
Appalachian elktoe	<i>Alasmodonta raveneliana</i>	E	E	Yes
Bog turtle	<i>Clemmys (Glyptemys) muhlenbergii</i>	T (S/A)	T	No
Carolina northern flying squirrel	<i>Glaucomys sabrinus coloratus</i>	E	E	No
Indiana bat	<i>Myotis sodalis</i>	E	E	Yes
Rock gnome lichen	<i>Gymnoderma lineare</i>	E	E	No
Small whorled pogonia	<i>Isotria medeoloides</i>	T	T	Yes
Swamp pink	<i>Helonias bullata</i>	T	T-SC	No

¹ E – Endangered

T – Threatened

T(S/A) – Threatened due to Similarity of Appearance

T-SC – Threatened – Special Concern

- *Wetlands* – Based on a search of the National Wetland Inventory (NWI) using geographical information systems (GIS), the preliminary alignments do not appear to impact any NWI wetlands.
- *Streams* –According to the North Carolina Division of Water Quality’s 2010 Final 303(d) list of impaired waters, there are two 303 (d) water bodies near the propose project: Scott Creek and an unnamed tributary (UT) to the Tuckasegee River. No anadromous fish areas or fish nursery areas are in effect for any of the project study area water resources. No streams designated as High Quality Waters (HQW), Outstanding Resource Waters (ORW), or water supply watersheds WS-I or WS-II occur within the study area or within one mile downstream (NCDWQ 2010a).
- *Hazardous Materials Sites, Superfund Sites, and Underground Storage Tanks* – Based on a search performed by Environmental Data Resources, Inc., there are numerous hazardous materials sites and underground storage tanks along or in close proximity to the alternatives. No superfund sites or brownfields are located in the project area. See the Appendix for a table listing the hazardous materials sites and underground storage tanks.

X. User Benefits

A user benefit analysis was performed using methods described in the AASHTO – User Benefit Analysis for Highway (Redbook – 2003) and updated Redbook Wizard created by NCDOT. This analysis is used to compare cost savings benefits for drivers with the capital and operation costs to the highway agency. The benefits are estimated in terms of reduced travel time, lower accident rates, and lower operating costs.

User benefits were analyzed for two design concepts. Alternatives 1 and 2 represent the traditional widening concept. Alternatives 3 and 4 represent the widening and superstreet concept. User benefits consider the value of time, operating costs, and accident reduction

benefits. These benefits were compared using interest (or discount) rates of 7%, 3%, and 0% to account for the effect of time costs of money. The total benefits were calculated using a base year of 2011, an opening year of 2013 and the design year of 2035. A benefit cost ratio was calculated to compare the total benefits to the cost of the project.

Alternatives 1 and 2 have a benefit cost ratio of 4.8 (7%), 8.3 (3%), and 12.9 (0%). Alternatives 3 and 4 have a benefit cost ratio of 5.2 (7%), 8.9 (3%), and 14.0 (0%). The benefits are comparable for both concepts. These results are shown in Table 10.

Table 10: User Benefit Analysis

Alternative		7% Discount Rate*	3% Discount Rate**	0% Discount Rate***
1 and 2	User Value of Time Benefit	\$513M	\$887M	\$1,404M
	User Operating Costs Benefit	\$16M	\$23M	\$32M
	User Accident Reduction Benefits	\$28M	\$39M	\$53M
	Total Benefits	\$557M	\$949M	\$1,489M
	Cost	\$115M	\$115M	\$115M
	Benefit Cost Ratio***	4.8	8.3	12.9
3 and 4	User Value of Time Benefit	\$592M	\$1,023M	\$1,620M
	User Operating Costs Benefit	\$21M	\$29M	\$40M
	User Accident Reduction Benefits	\$28M	\$39M	\$54M
	Total Benefits	\$640M	\$1,092M	\$1,714M
	Cost	\$122M	\$122M	\$122M
	Benefit Cost Ratio***	5.2	8.9	14.0

Note: * Baseline using values indicated in the Appendix and a recommended 7% discount rate.

** Same as Baseline above except this option tests the sensitivity to a 3% discount rate.

*** Total Benefits divided by Cost and no discount rate or inflation added.

XI. Recommendations

If no improvements are made to NC 107, congestion will continue to get worse in the future. If the NC 107 Connector is built but no improvements are made to the existing route, traffic problems will temporarily improve along NC 107; however, similar traffic conditions will return before the year 2035. To ultimately solve NC 107 traffic congestion, substantial upgrades are needed.

The improvements evaluated in this study are long-term solutions that would allow traffic to operate under acceptable levels of service through the year 2035. Town of Sylva officials and many citizens are concerned about negative impacts on business and growth in Sylva. NC 107/ US 23 Business improvements are at the top of the Town's and County's lists of transportation priorities, but the NC 107 Connector is not included in their official priority lists. It is possible to incrementally phase the upgrades to first address the most congested intersection areas and later implement second and third order improvements to reach the ultimate traffic operation goals. Access management techniques can be included to promote a safer and more efficient corridor by limiting drivers' access between the highway and adjacent properties. Future environmental and design studies should address options to avoid and minimize impacts to properties, community resources, and environmental features. Detailed design analysis may

consider refining the design criteria, allowing narrower lanes or median widths, and locating the alignment so that it has the least disruption to properties and other sensitive resources.

The more traditional median and intersection upgrades with Alternatives 1 and 2 would alleviate traffic bottlenecks and congestion at major intersections through the Sylva commercial district and maintain left-turn movements at major intersections for driver convenience. The total cost of Alternative 1 is \$115,200,000 and the total cost of Alternative 2 is \$113,200,000. They require a total of 110 relocations. Alternatives 3 and 4 also alleviate traffic bottlenecks and congestion through the Sylva commercial district and provide a more efficient progression of through traffic with the use of the Superstreet configuration. These alternatives have a total cost of \$122,200,000 and require 123 relocations.

Between all the alternatives, there is less than a 2% difference in costs and property impacts for the 4.1-mile portion of NC 107 from north and west of US 23 Business to north of Old Cullowhee Road (SR 1002). Improvements in this area would address the NC 107 and US 23 Business recommendations from the Jackson County CTP. The portions of Alternatives 3 and 4 north of Old Cullowhee Road (Segments 3A-E and 4A-E) would promote access management solutions for the most efficient traffic progression and to reduce the turning conflicts at intersections. Segments 3A-E are estimated to cost \$28,100,000 for construction, \$2,100,000 for utility relocation, and \$73,200,000 for right of way acquisition. The total estimated cost is \$103,400,000, and 111 relocations are required. Segments 4A-E cost \$600,000 less but have the same number of relocations. These are the highest priorities recommended for improvement (see Table 11).

South of Old Cullowhee Road, traditional widening improvements (Segments 1F-G and 2F-G) cost at least \$7,000,000 less than the Superstreet improvements and have 13 less relocations. This is due to an additional 1.1 miles of widening and intersection work needed for the Superstreet improvements. Only three of the six intersections from Old Cullowhee Road to Cullowhee Mountain Road are expected to reach or exceed their traffic carrying capacity in the design year. Congestion is not as pronounced in this area, and NC 107 exists as a four-lane divided roadway with limited control of access. For these reasons, traditional widening improvements from north of Old Cullowhee Road to south of Cullowhee Mountain Road (Segments 1F-G and 2F-G) are recommended to improve traffic operations. Segments 1F-G are estimated to cost \$8,300,000 for construction, \$700,000 for utility relocation, and \$3,300,000 for right of way acquisition. The total estimated cost is \$12,300,000, and one relocation is required. Segments 2F-G cost \$600,000 less but have the same number of relocations. These are the secondary priorities recommended for improvement.

The grand total of all recommended improvements is \$115,700,000. This includes \$36,400,000 for construction, \$2,800,000 for utility relocation, and \$76,500,000 for right of way acquisition. A total of 112 relocations are required.

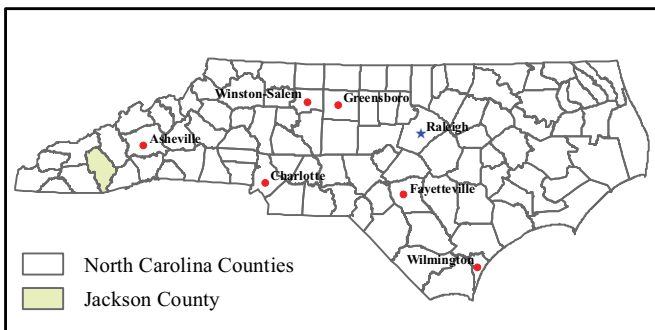
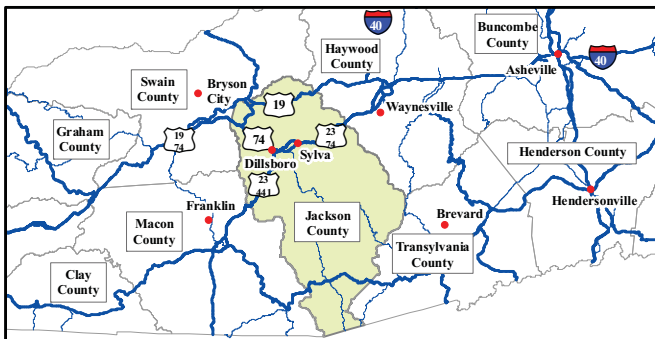
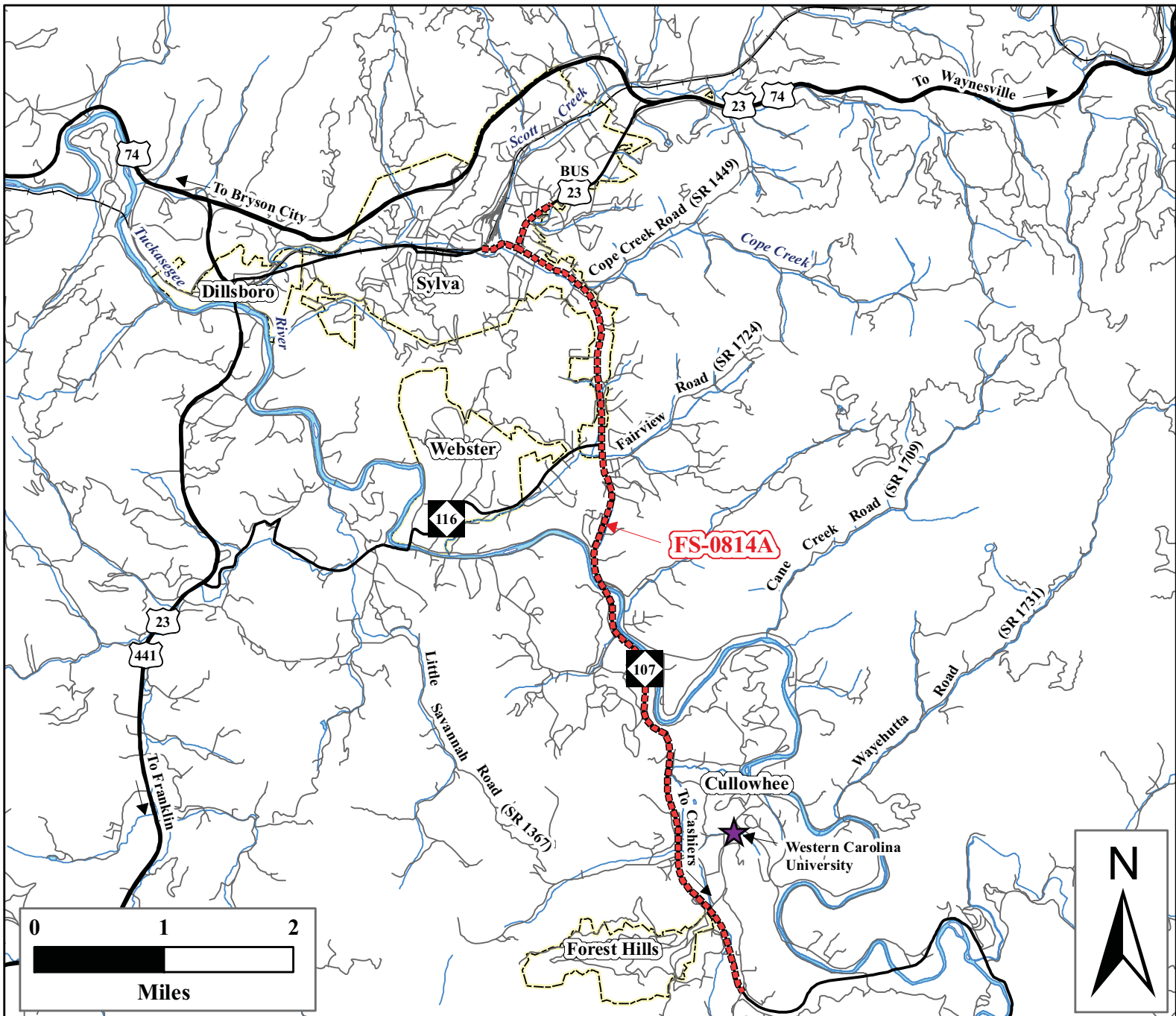
Table 11: Recommended Improvement Priorities

	Length (miles)	Description	Construction Costs	Utility Relocation Costs	Right of Way Costs	Total Costs	Total Reloca- tions
Segment	Highest Priorities						
3A/ 4A	0.95	US 23 Business from north of Hospital Road (SR 1437) to north of NC 107	\$5,900,000	\$ 200,000	\$6,300,000	\$12,400,000	15
3B/ 4B	1.52	US 23 Business from west of Chipper Curve Road (SR 1429) to NC 107 south of Cope Creek Road (SR 1449)/ Walter Ashe Road (SR 1352)	\$10,200,000	\$ 800,000	\$32,100,000	\$43,100,000	62
3C/ 4C	0.62	NC 107 from south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352) to north of NC 116	\$4,600,000	\$ 500,000	\$16,000,000	\$21,100,000	15
3D/ 4D	0.57	NC 107 from north of NC 116 to south of NC 116	\$3,900,000	\$ 300,000	\$15,200,000	\$19,400,000	13
3E/ 4E	0.45	NC 107 from south of NC 116 to north of Old Cullowhee Road (SR 1002)	\$3,500,000	\$ 300,000	\$3,600,000	\$7,400,000	6
Subtotal	4.11	North and west of US 23 Business to north of Old Cullowhee Road (SR 1002)	\$28,100,000	\$2,100,000	\$73,200,000	\$103,400,000	111
	Secondary Priorities						
1F/ 2F	0.51	NC 107 from north of Old Cullowhee Road (SR 1002) to the Tuckasegee River	\$3,600,000	\$ 100,000	\$1,500,000	\$5,200,000	1
1G/ 2G	1.80	NC 107 from north of SR 1550 to south of Cullowhee Mountain Road (SR 1001)	\$4,700,000	\$ 600,000	\$1,800,000	\$7,100,000	0
Subtotal	2.31	North of Old Cullowhee Road (SR 1002) to south of Cullowhee Mountain Road (SR 1001)	\$8,300,000	\$ 700,000	\$3,300,000	\$12,300,000	1
	Grand Total						
Grand Total	6.42	NC 107 from north and west of US 23 Business to south of Cullowhee Mountain Road (SR 1001)	\$36,400,000	\$2,800,000	\$76,500,000	\$115,700,000	112

Note: Detailed segment costs are included in Table A1 of the Appendix. Costs and relocations are based on Alternatives 1 and 3.

If the NC 107 Connector is built, it would help NC 107 traffic operations by diverting approximately 15% of the traffic from existing NC 107. With the NC 107 Connector in place, work zone congestion on existing NC 107 during construction could also be alleviated.

FIGURES



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
 PROGRAM DEVELOPMENT BRANCH
 FEASIBILITY STUDIES UNIT

Project Vicinity Map

FS-0814A

Upgrade NC 107 from US 23 Business
 to Western Carolina University
 Jackson County

Figure 1

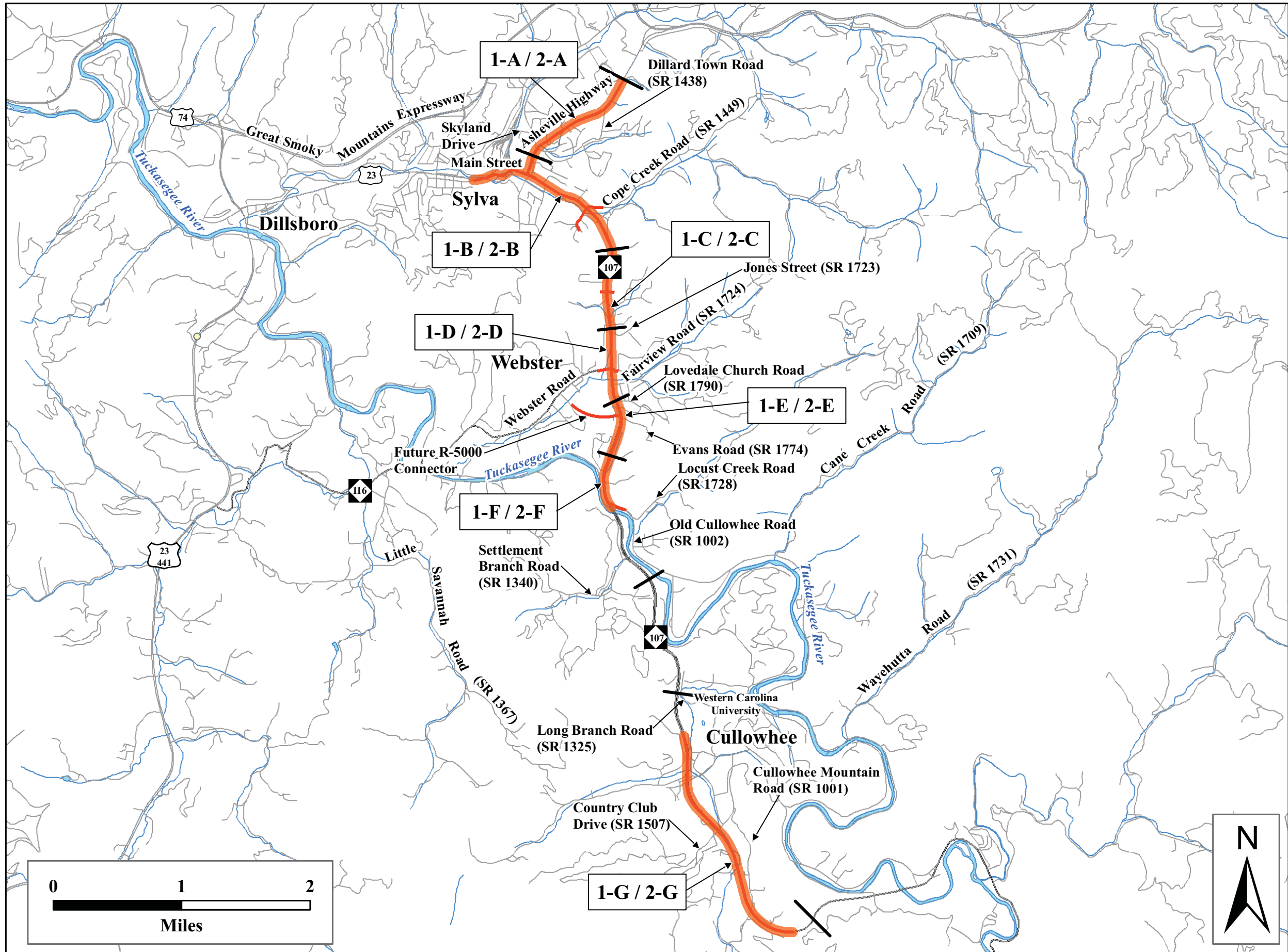


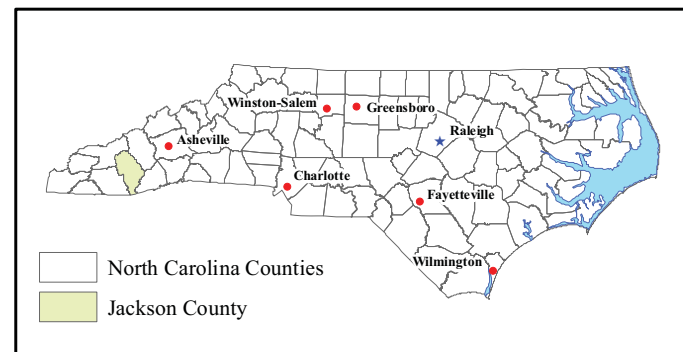
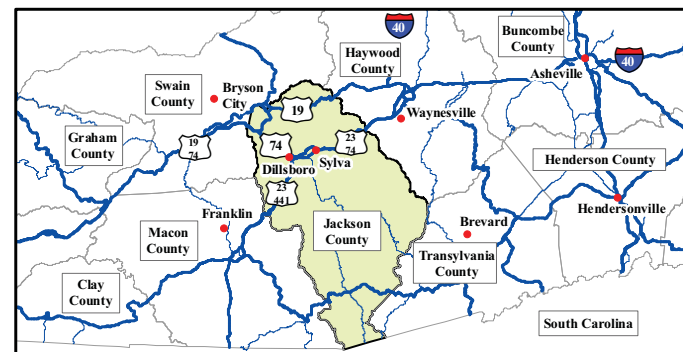
Figure 2 - Sheet 1 of 3
Alternatives 1 & 2
Widening & Intersection Upgrades

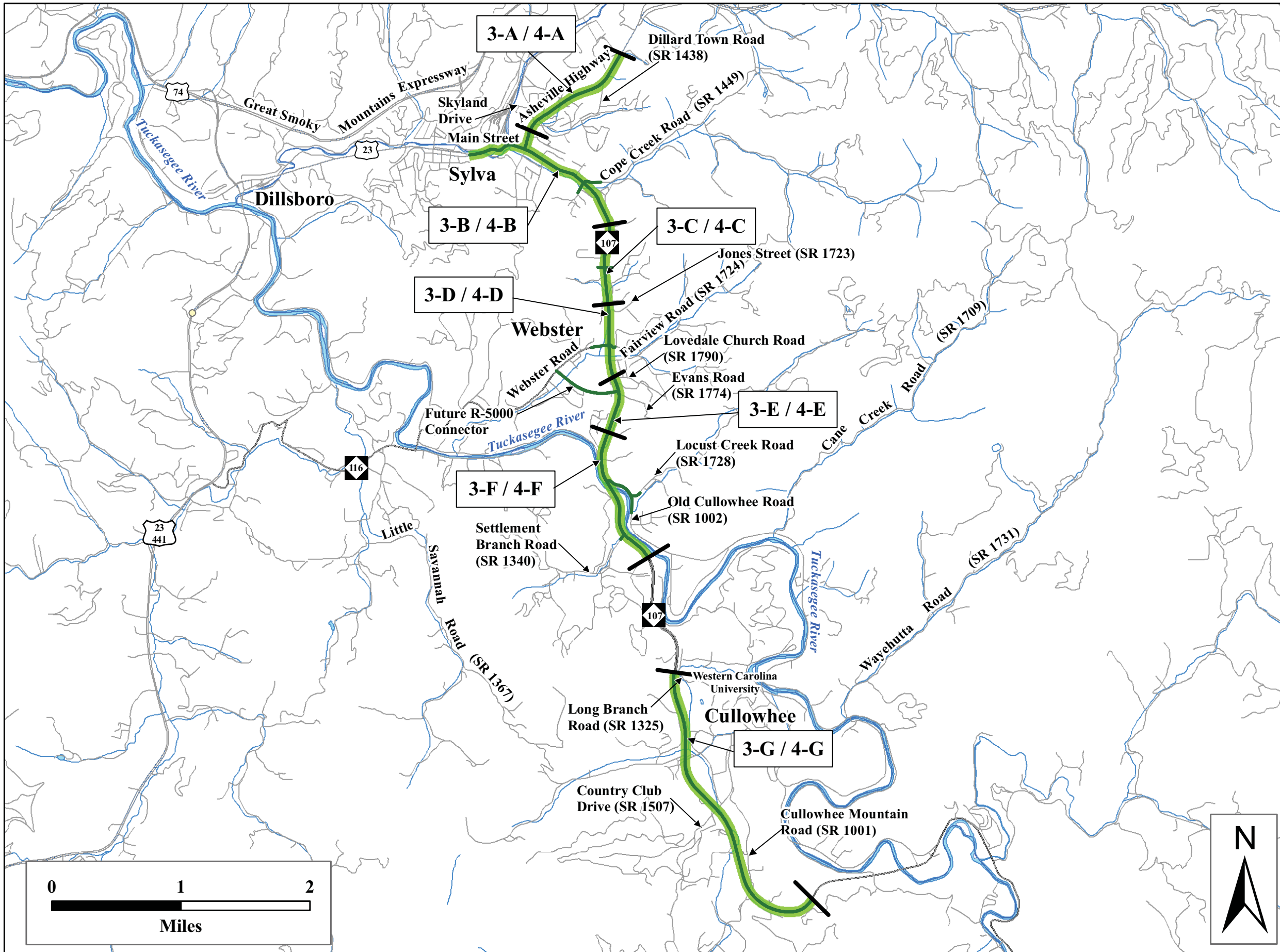
Alternative Segments

1-A / 2-A

- Alternative 1 & 2 Improvements
- Interstates
- US Highways
- NC Highways
- Roads
- County Boundary
- Rivers, Creeks, & Streams
- Water Bodies

Map Sources:
North Carolina Department of Transportation
Ko / Florence & Hutcheson



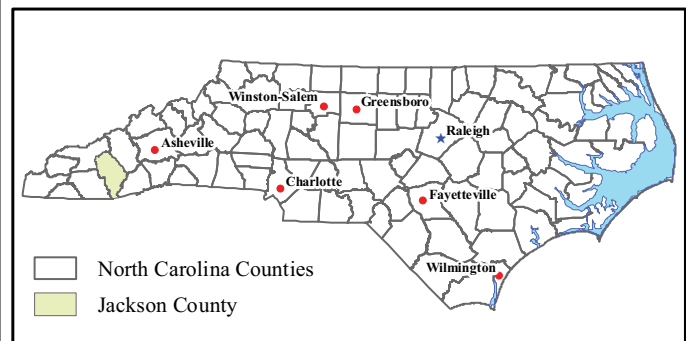
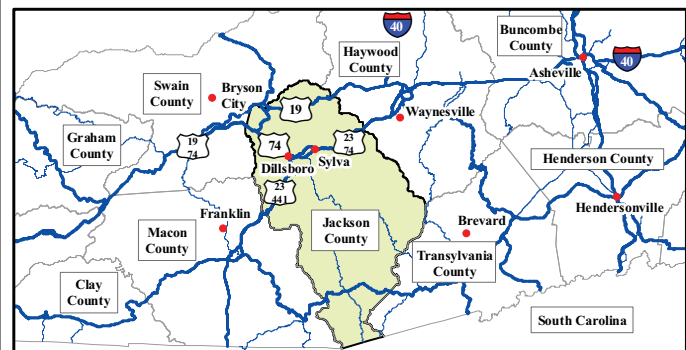


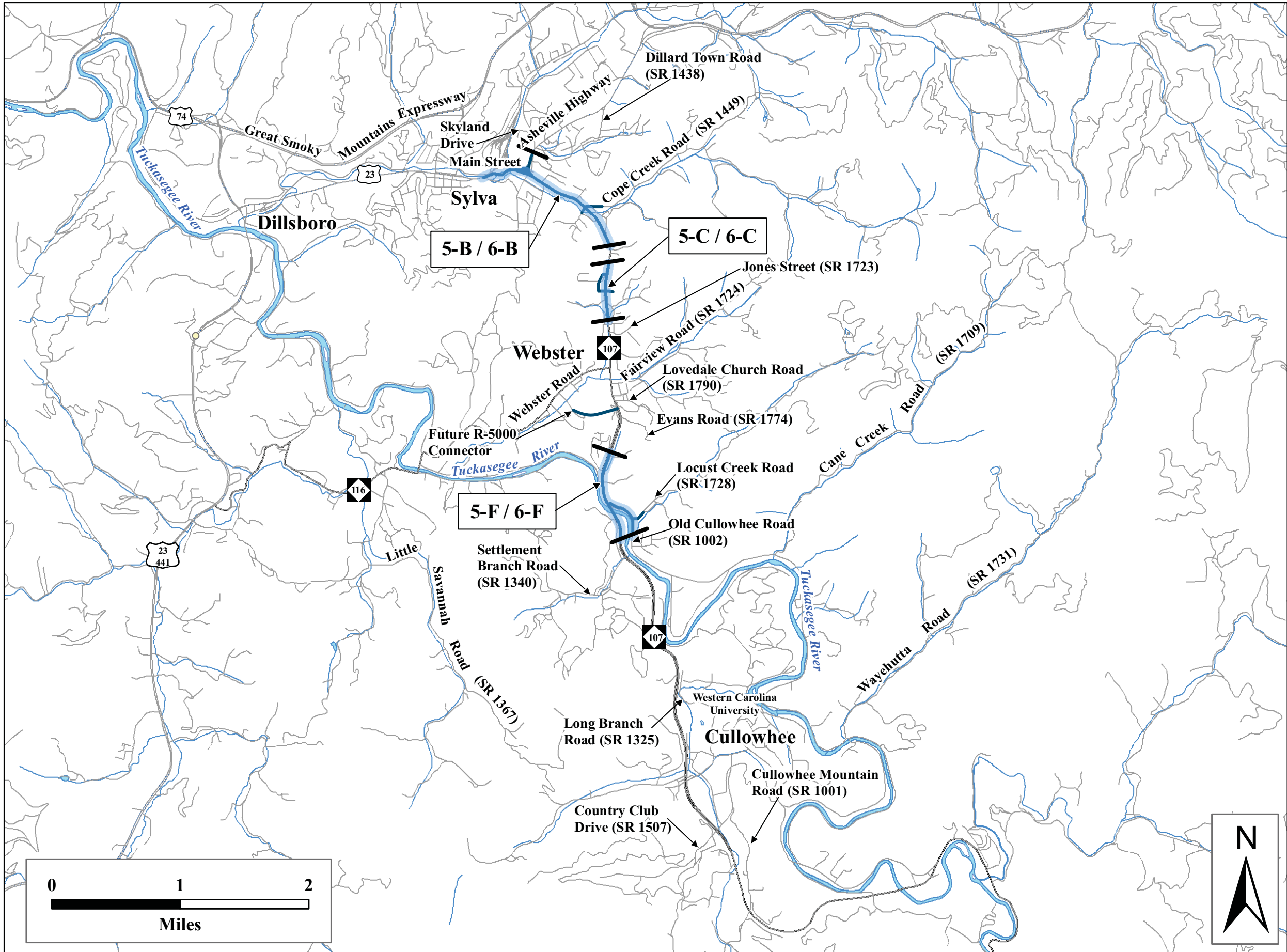
**Figure 2 - Sheet 2 of 3
Alternatives 3 & 4
Widening & Super Street**

Alternative Segments

- 3-A / 4-A
- Alternative 3 & 4 Improvements
- Interstates
- US Highways
- NC Highways
- Roads
- County Boundary
- Rivers, Creeks, & Streams
- Water Bodies

Map Sources:
North Carolina Department of Transportation
Ko / Florence & Hutcheson



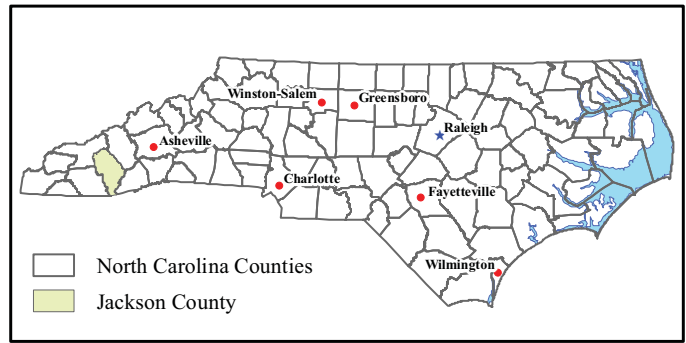
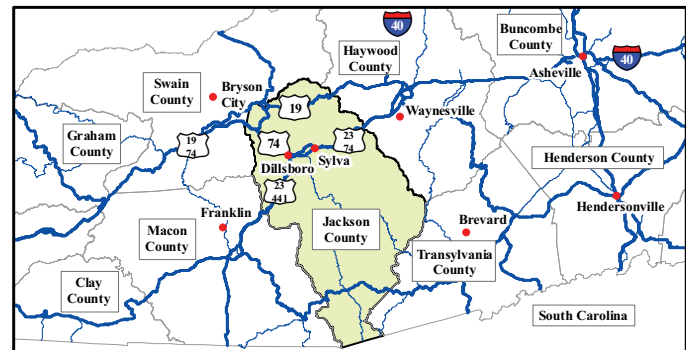


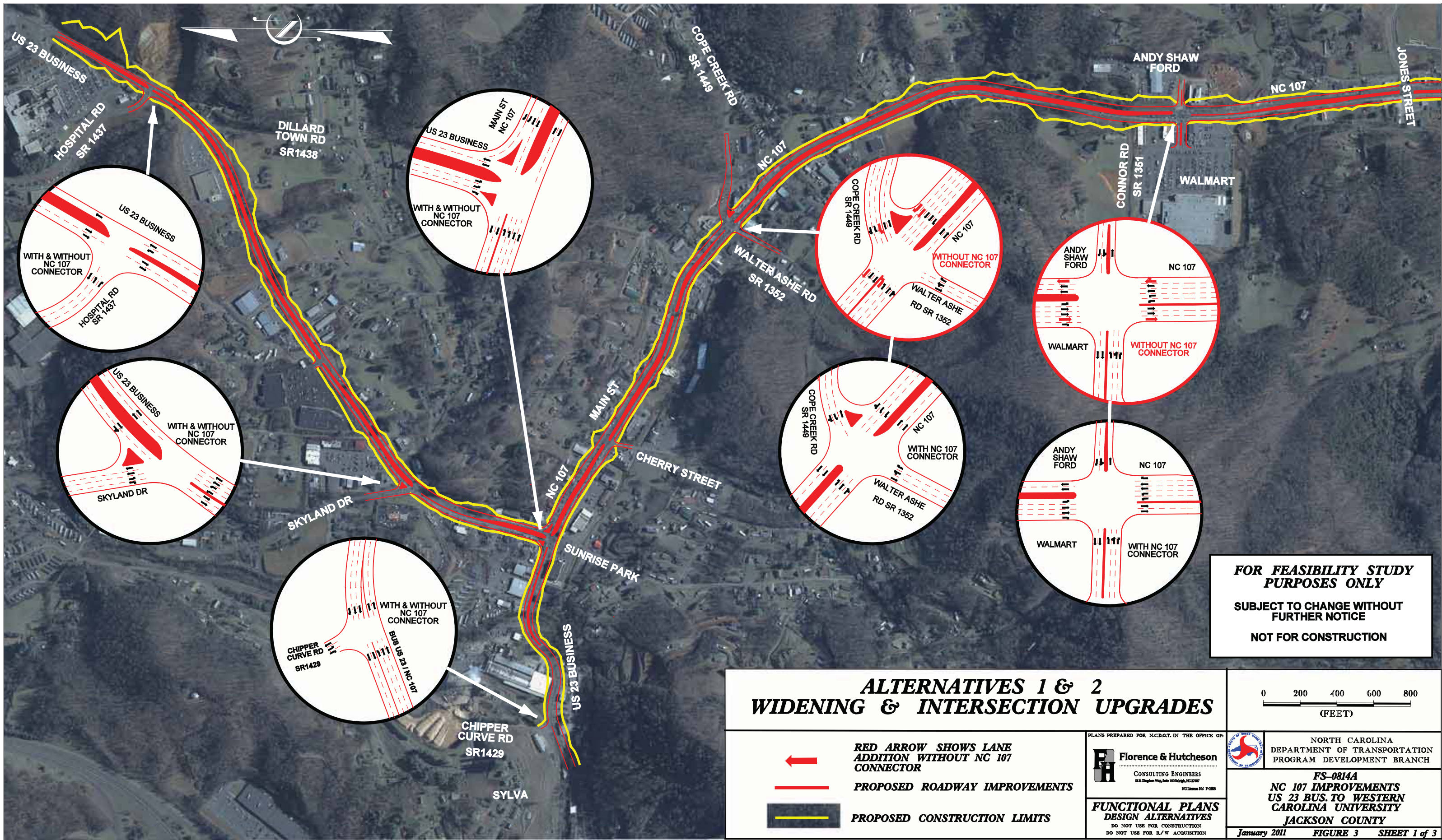
**Figure 2 - Sheet 3 of 3
Alternatives 5 & 6
Widening & Super Street**

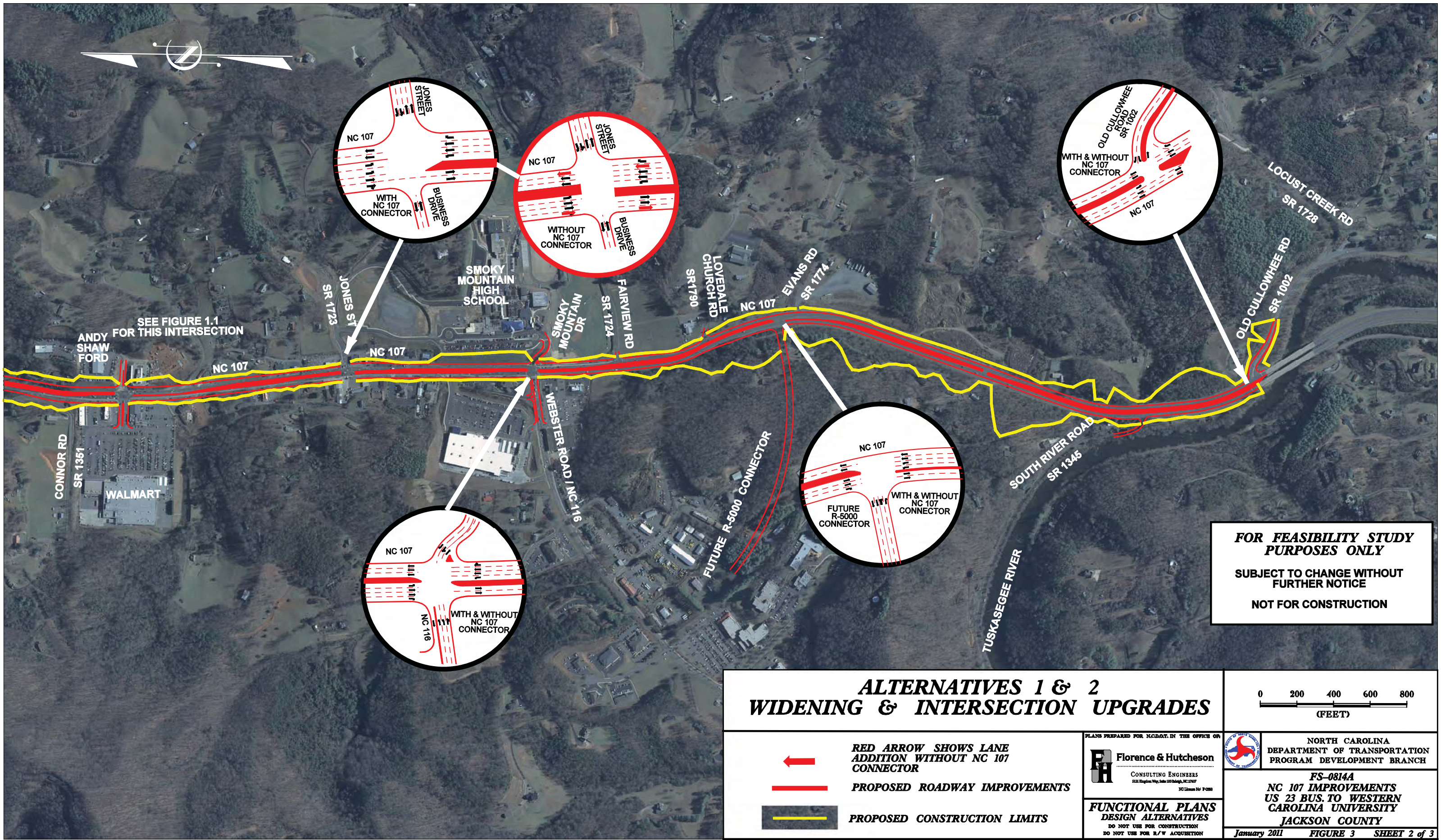
5-A / 6-A

- Alternative 5 & 6 Improvements
- Interstates
- US Highways
- NC Highways
- Roads
- County Boundary
- Rivers, Creeks, & Streams
- Water Bodies

Map Sources:
North Carolina Department of Transportation
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ALTERNATIVES 1 & 2 WIDENING & INTERSECTION UPGRADES

- RED ARROW SHOWS LANE ADDITION WITHOUT NC 107 CONNECTOR
- PROPOSED ROADWAY IMPROVEMENTS
- PROPOSED CONSTRUCTION LIMITS

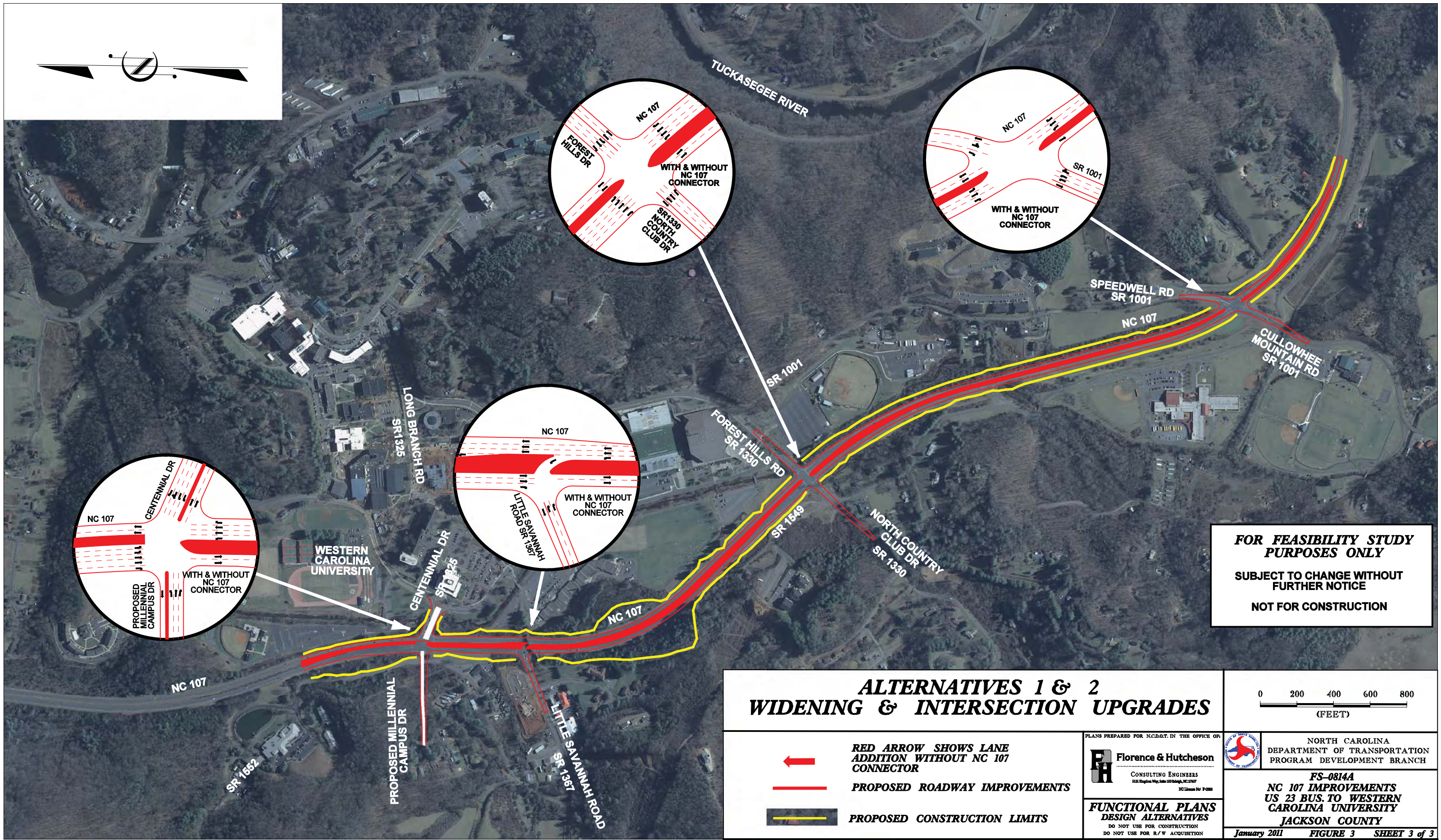
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NC 107 IMPROVEMENTS
US 23 BUS. TO WESTERN
CAROLINA UNIVERSITY
JACKSON COUNTY

January 2011 **FIGURE 3** **SHEET 2 of 3**

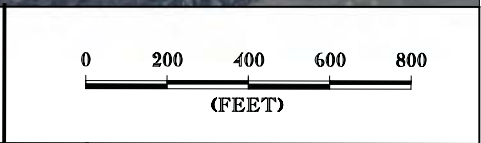


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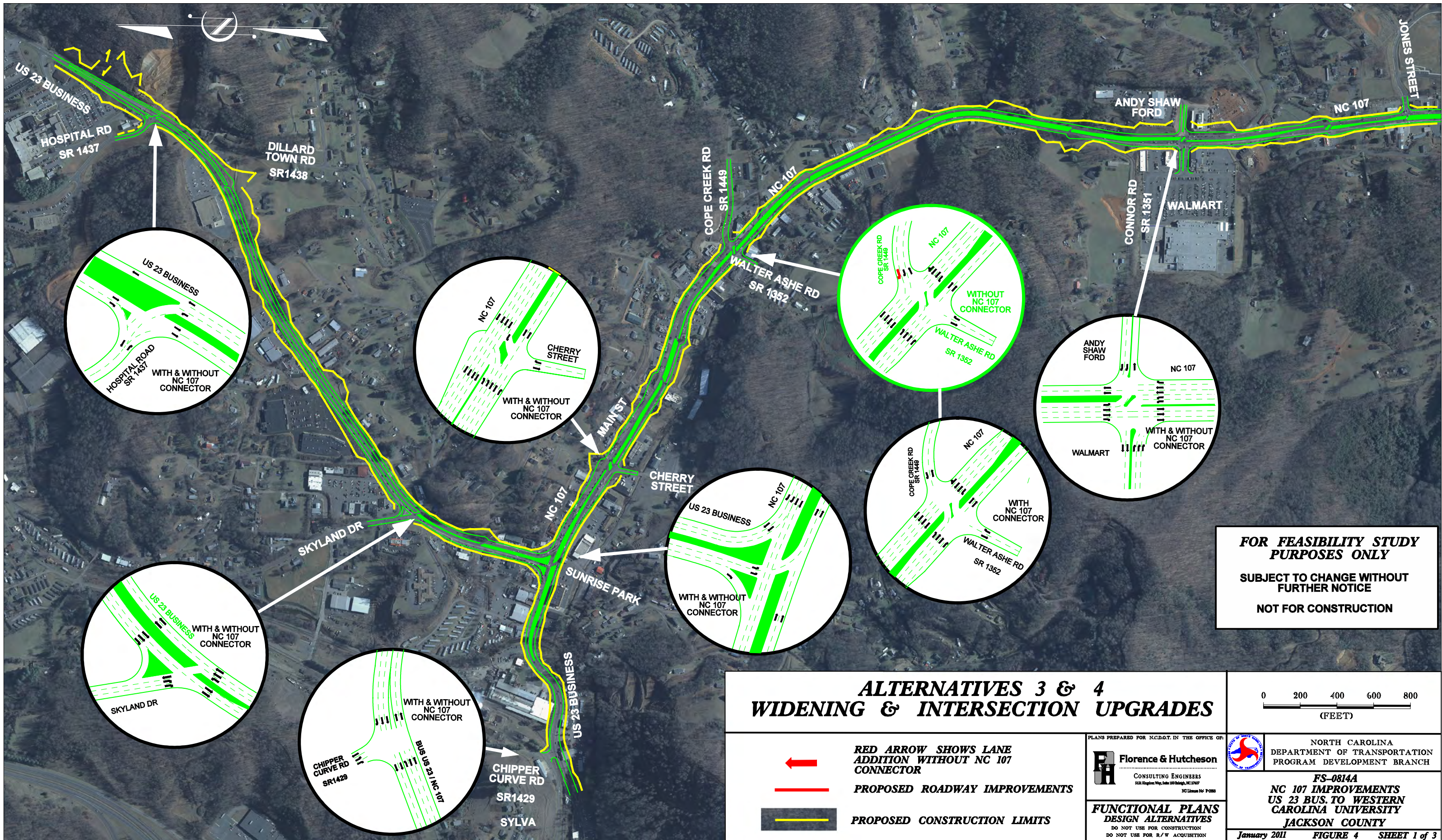
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ALTERNATIVES 3 & 4 WIDENING & INTERSECTION UPGRADES



RED ARROW SHOWS LANE
ADDITION WITHOUT NC 107
CONNECTOR



PROPOSED ROADWAY IMPROVEMENTS


PROPOSED CONSTRUCTION LIMITS

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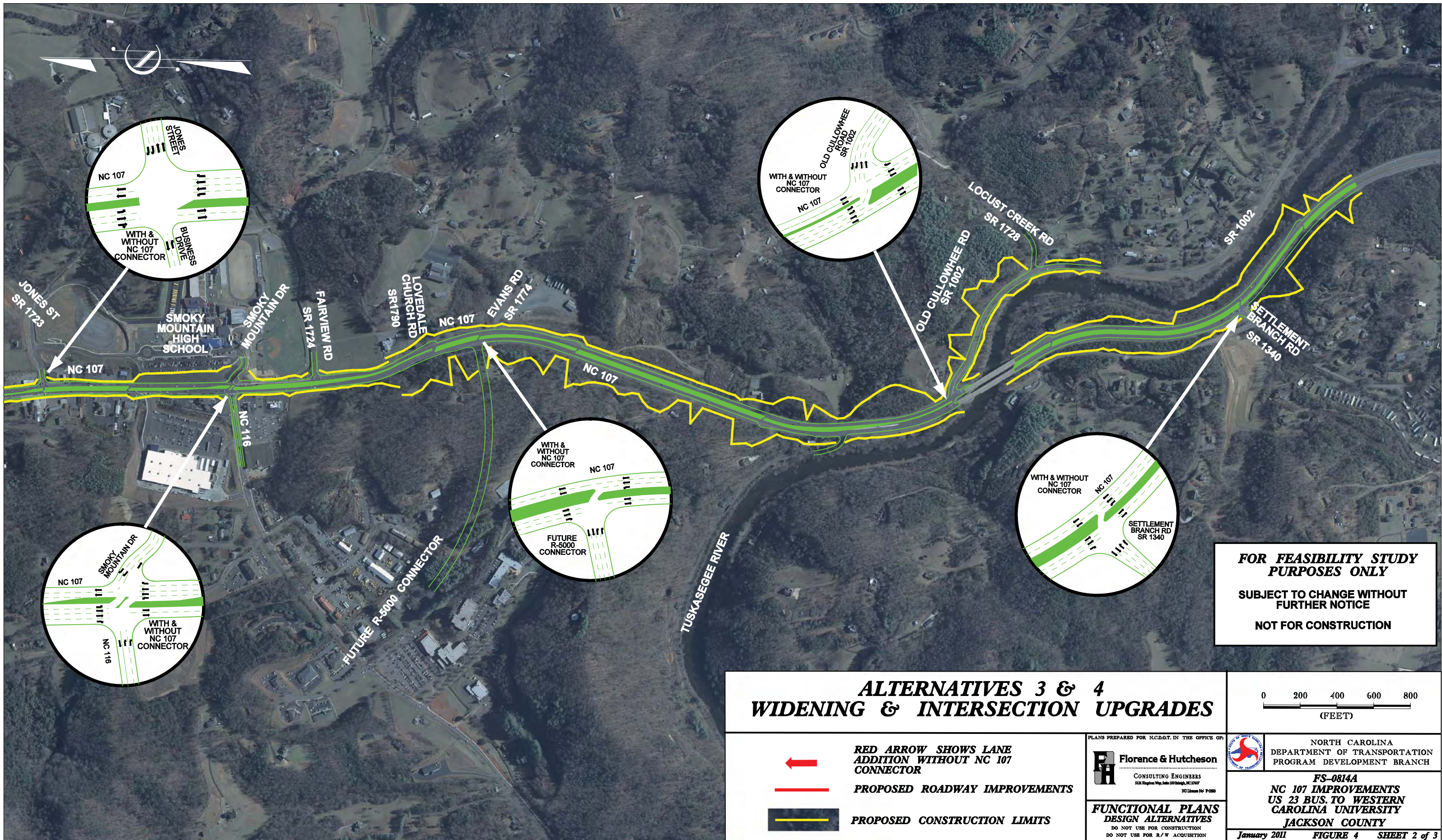




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FS-0814A
**NC 107 IMPROVEMENTS
US 23 BUS. TO WESTERN
CAROLINA UNIVERSITY
JACKSON COUNTY**

January 2011 **FIGURE 4** **SHEET 1 of 3**






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ALTERNATIVES 3 & 4


WIDENING & INTERSECTION UPGRADES

-  **RED ARROW SHOWS LANE
ADDITION WITHOUT NC 107
CONNECTOR**
-  **PROPOSED ROADWAY IMPROVEMENTS**
-  **PROPOSED CONSTRUCTION LIMITS**

PLANS PREPARED FOR N.C.D.O.T. IN THE OFFICE OF:

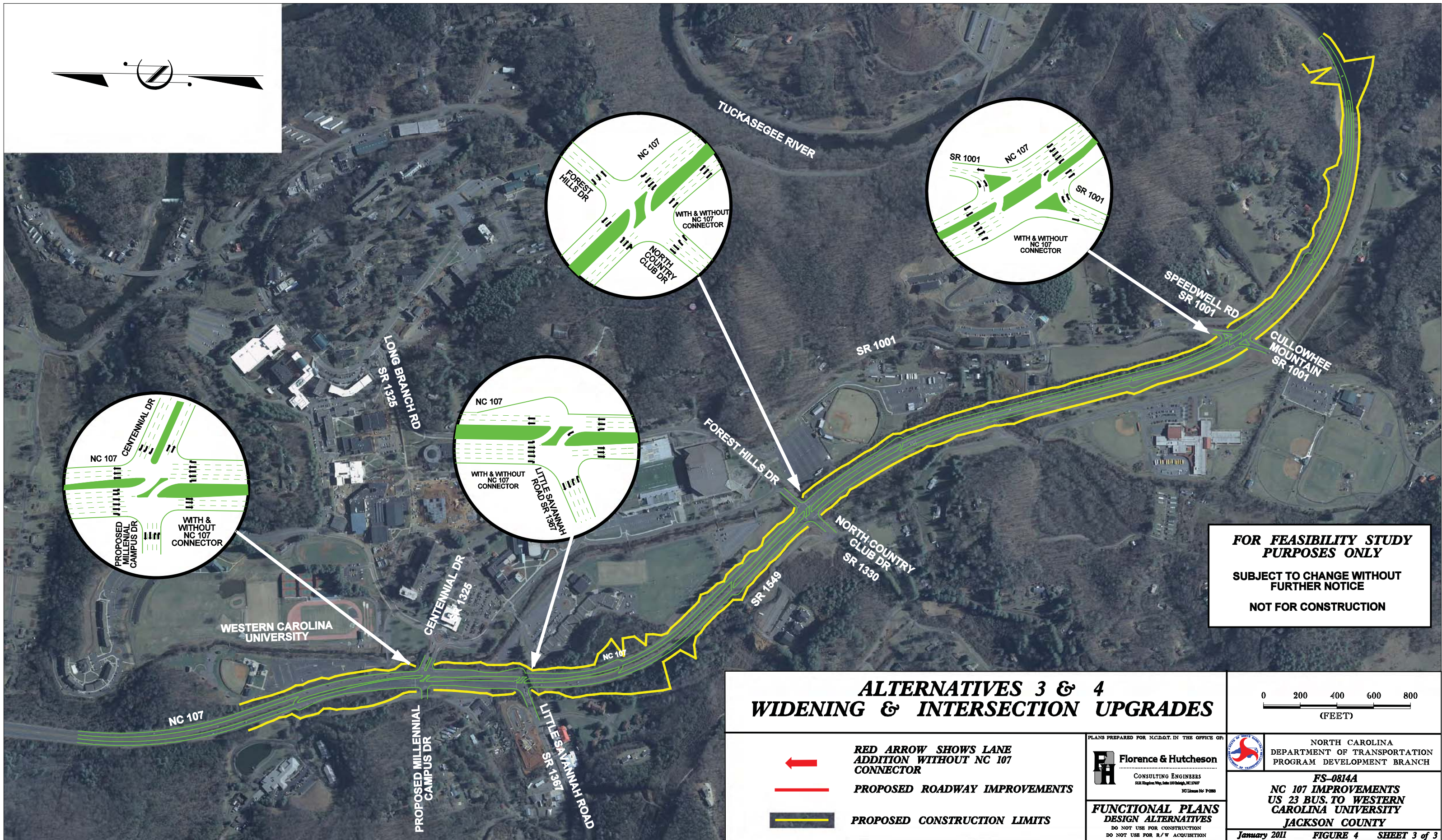
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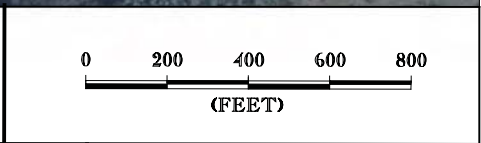
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January 2011 **FIGURE 4** **SHEET 2 of 3**



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WIDENING & INTERSECTION UPGRADES



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- PROPOSED CONSTRUCTION LIMITS

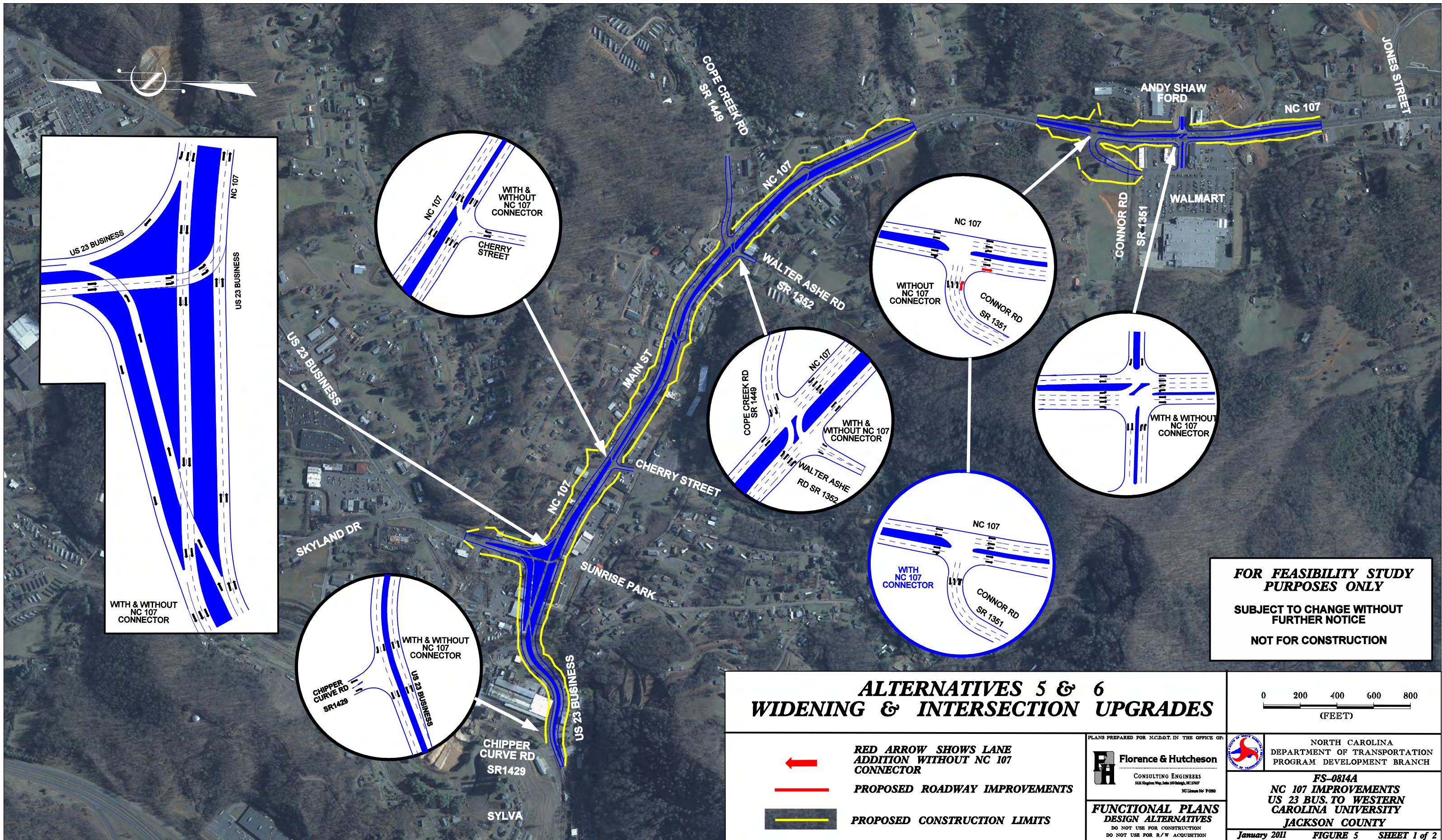
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**NC 107 IMPROVEMENTS
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JACKSON COUNTY**

January 2011 **FIGURE 4** **SHEET 3 of 3**

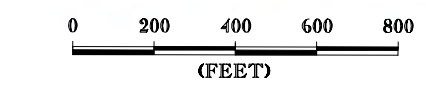


**ALTERNATIVES 5 & 6
WIDENING & INTERSECTION UPGRADES**

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- PROPOSED ROADWAY IMPROVEMENTS
- PROPOSED CONSTRUCTION LIMITS

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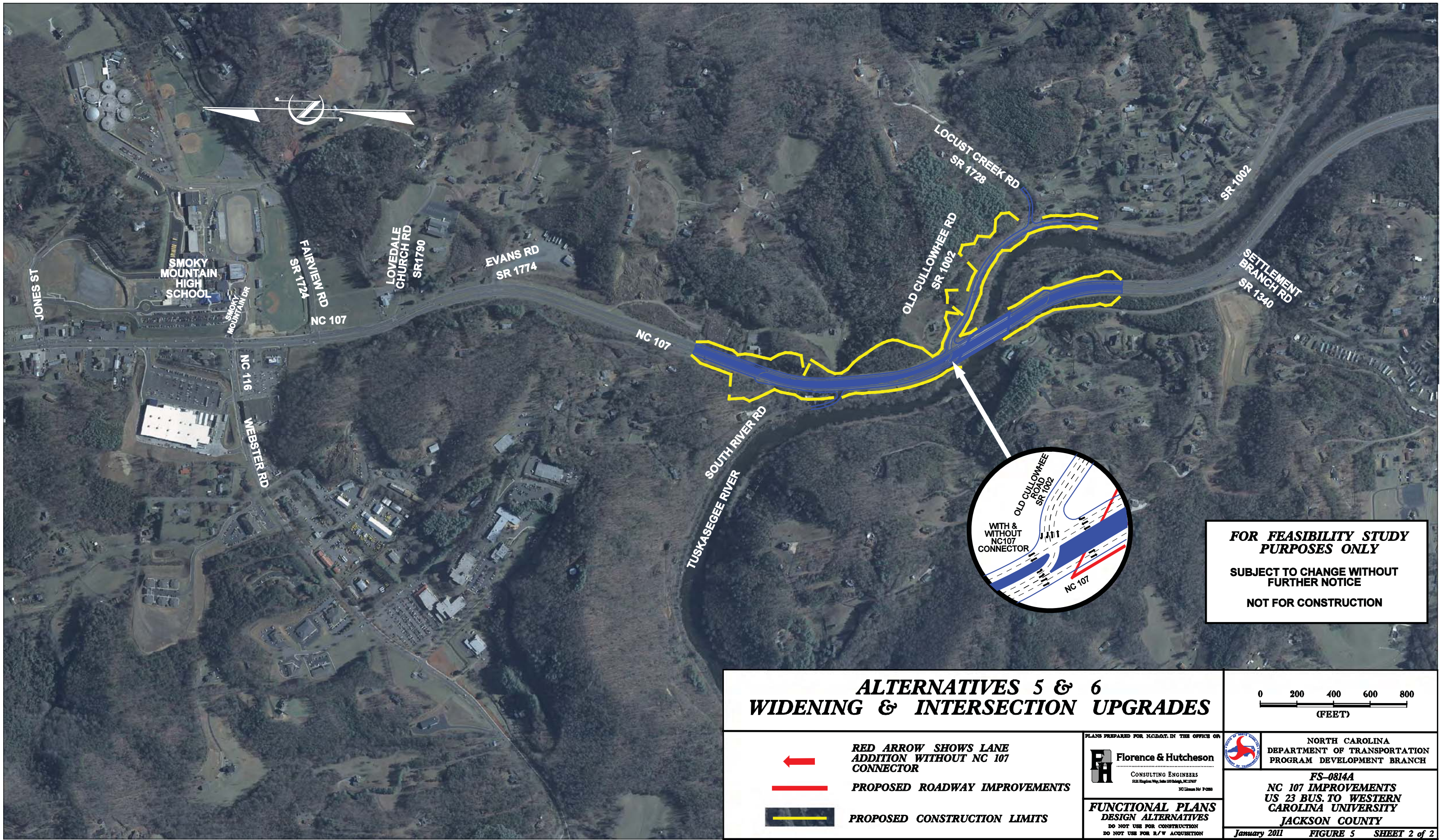
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JACKSON COUNTY**

January 2011 **FIGURE 5** **SHEET 1 of 2**




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**ALTERNATIVES 5 & 6
WIDENING & INTERSECTION UPGRADES**



**RED ARROW SHOWS LANE
ADDITION WITHOUT NC 107
CONNECTOR**




PROPOSED ROADWAY IMPROVEMENTS



PROPOSED CONSTRUCTION LIMITS

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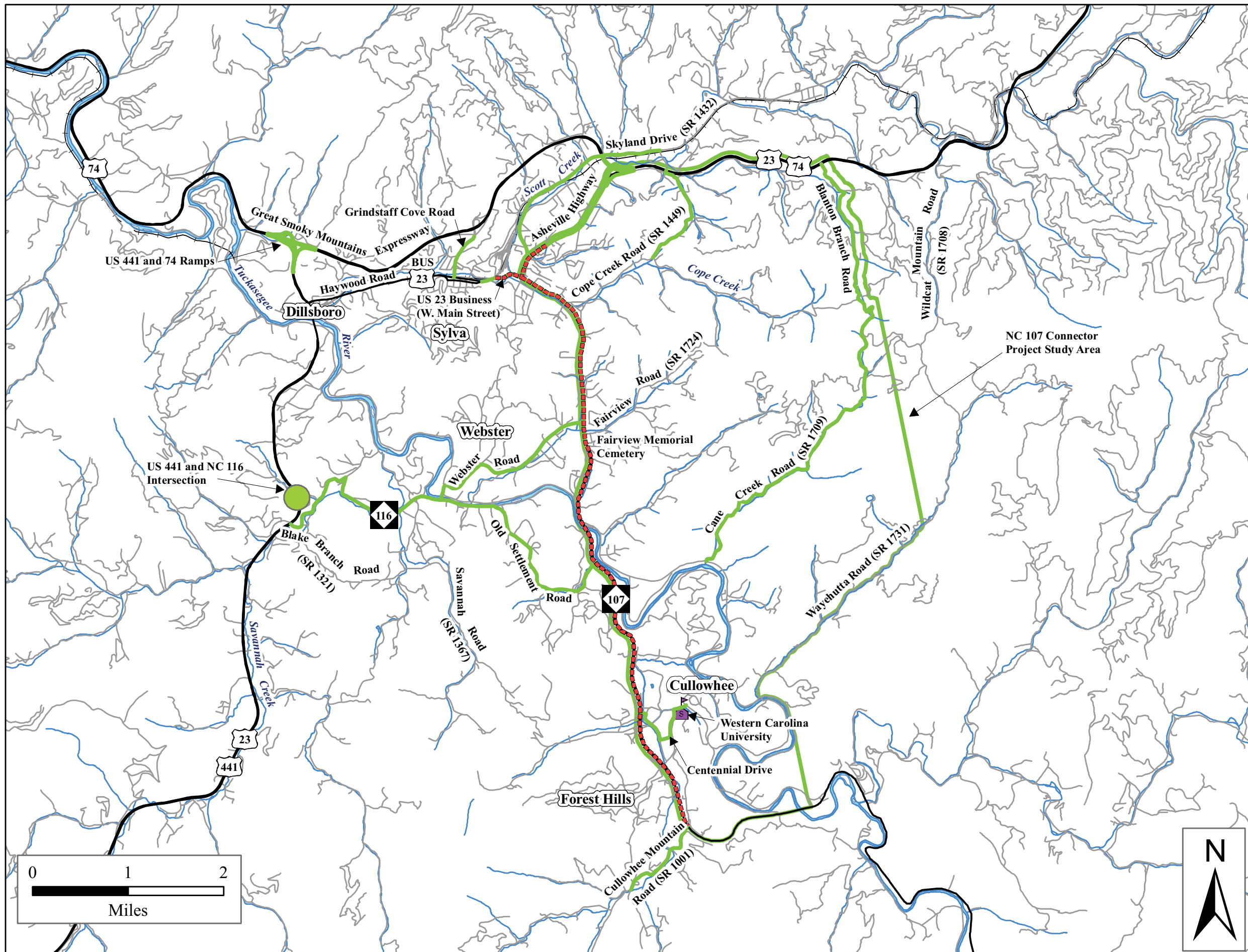
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US 23 BUS. TO WESTERN
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JACKSON COUNTY**

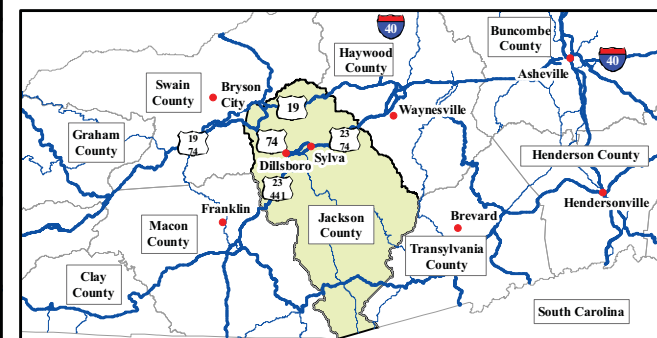
January 2011 **FIGURE 5** **SHEET 2 of 2**



**Figure 6 - Jackson County
CTP Projects**

- NC 107 Feasibility Study Corridor
- Jackson County CTP Projects
- Major Roads
- Roads
- Railroads
- Rivers, Creeks, & Streams
- Water Bodies
- Western Carolina University

Map Sources:
North Carolina Department of Transportation
Ko / Florence & Hutcheson



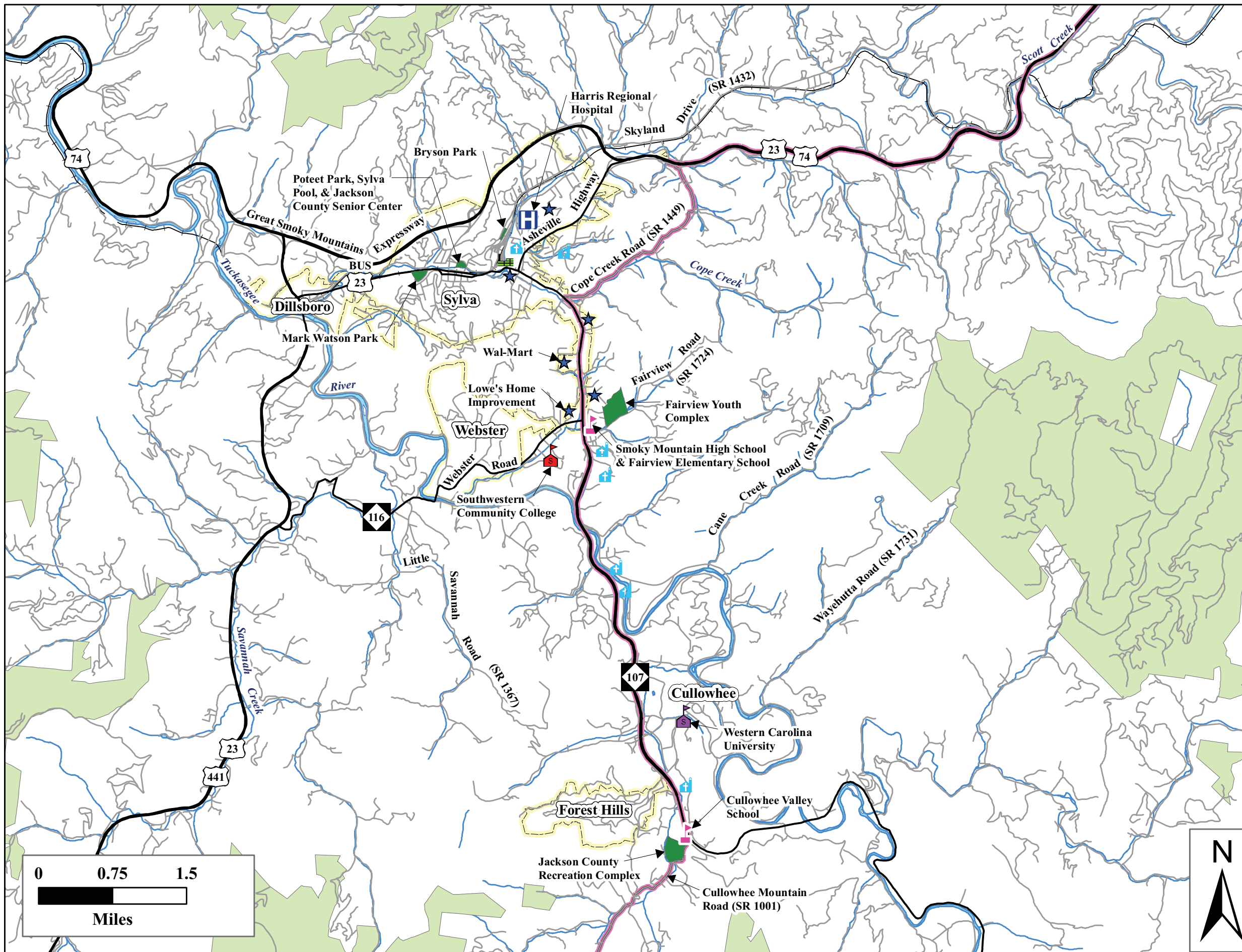
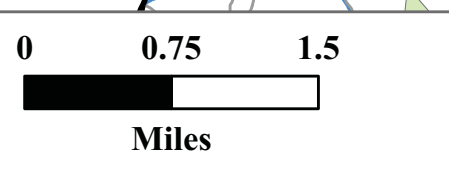
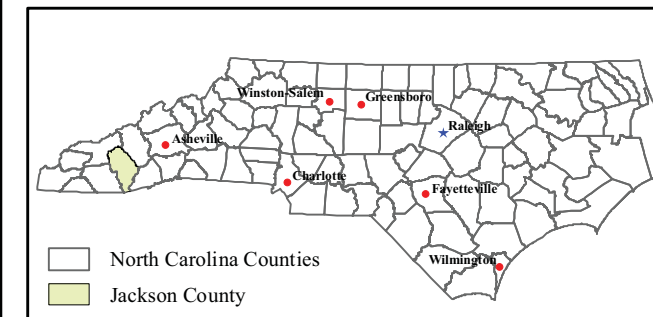
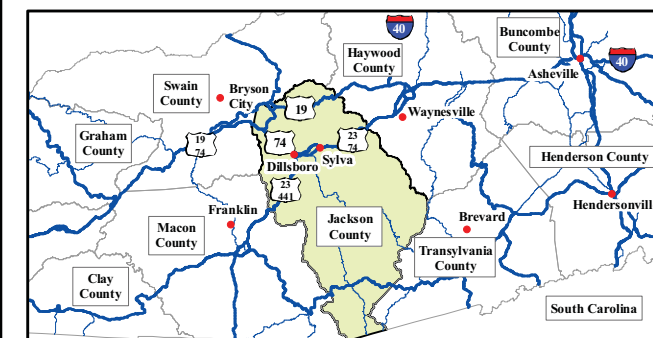
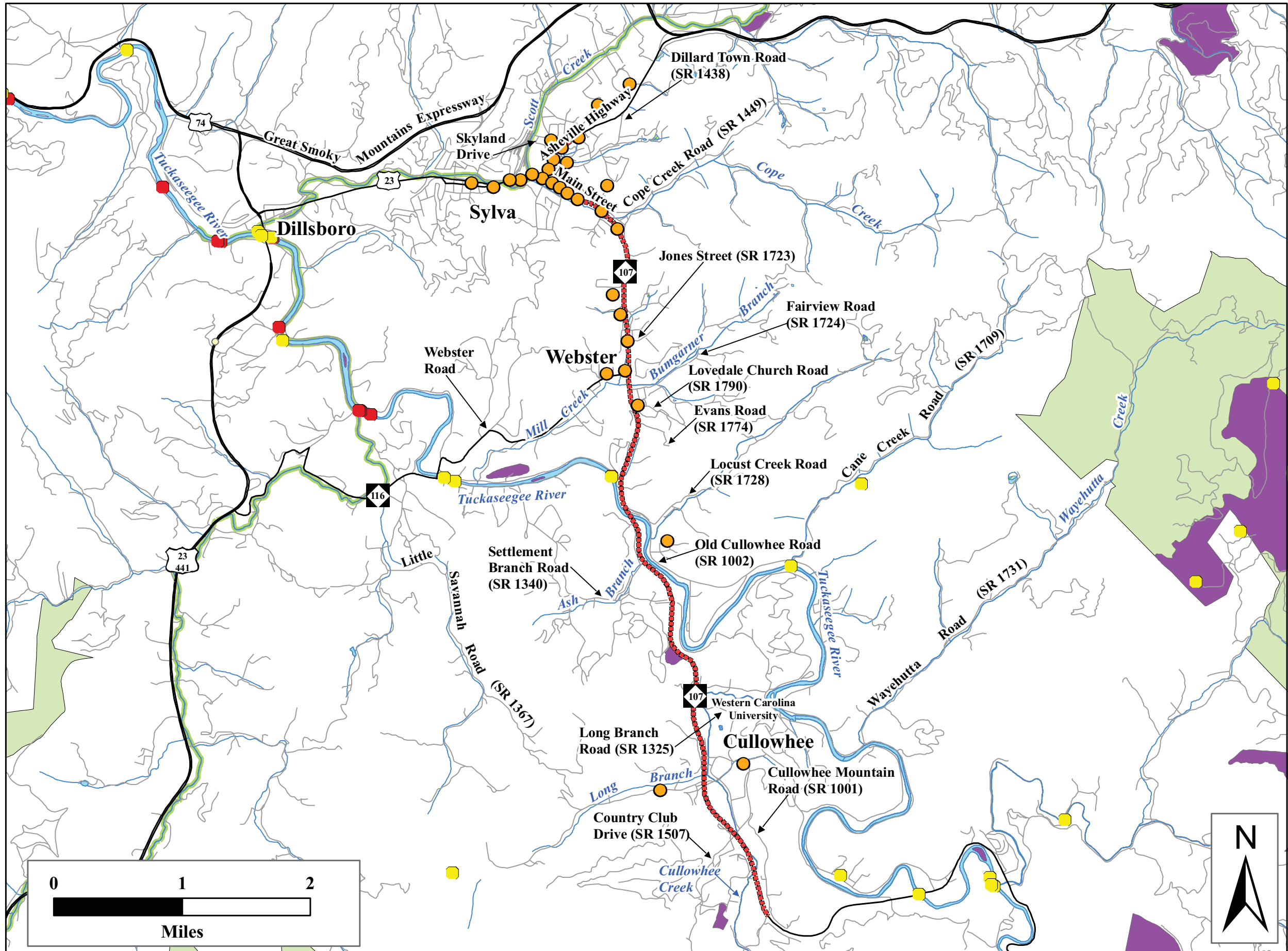


Figure 7 - Community Resources & Facilities

- Major Roads
- Roads
- Mountains To Sea Bike Route
- Railroads
- Rivers, Creeks, & Streams
- Water Bodies
- Municipal Boundaries
- Parks & Recreational Areas
- Nantahala National Forest-Ranger Districts
- Churches
- Western Carolina University
- Southwestern Community College
- Jackson County Public Schools
- Health Care Facilities
- Manufacturing Plant
- Retail Centers

Map Sources:
North Carolina Department of Transportation
Ko / Florence & Hutcheson

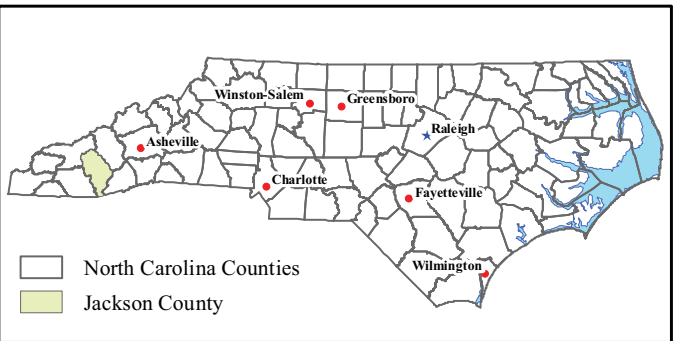
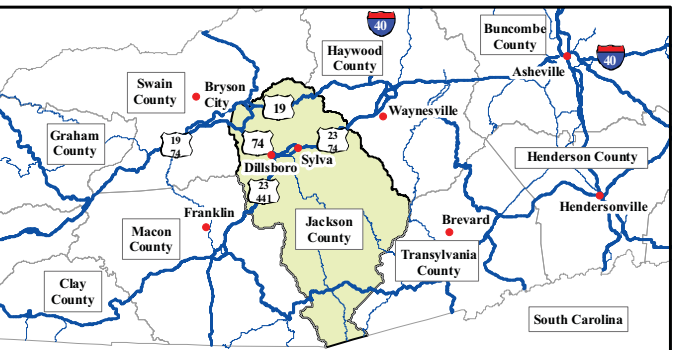




**Figure 8 - Hazardous Material Sites
& Natural Environmental Resources**

- NC 107 Feasibility Study Corridor
- Major Roads
- Roads
- Rivers, Creeks, & Streams
- Water Bodies
- 303(d) Impaired Streams
- Wetlands (NWI)
- Significant Natural Heritage Areas
- Nantahala National Forest-Ranger Districts
- Endangered Species
- Candidate Species
- Federal Species of Concern
- Hazardous Material Site
- May represent more than one site in some locations.

Map Sources:
North Carolina Department of Transportation
Ko / Florence & Hutcheson



APPENDIX



Derrick W. Lewis
Feasibility Studies Unit Head
NCDOT – Program Development Branch
1534 Mil Service Center
Raleigh, NC 27699-1534

Dear Mr. Lewis,

In response to the NC 107 Improvements Feasibility Study presented at the November 9th Citizen's Information Workshop, the Sylva Board of Commissioners submit the following comments.

The terrain in Jackson County is mountains, ridges, narrow valleys and streams. This terrain is extremely important in the development of Sylva and Jackson County. NC 107 in Sylva runs through a narrow valley between two ridges. Between Sylva and Cullowhee the highway is either sandwiched between ridges, or between a ridge and the river. With this in mind, we would like for NC 107 to remain a four (4) lane city street with little or no increase in width. Increasing NC 107 to six (6) or seven (7) lanes would have a negative impact to business and the growth of Sylva. We have faith in NC DOT's ability to forecast traffic and determine future needs or highway requirements. Therefore, if the current or improved four lane highway will not carry the forecasted traffic, we would endorse the connector concept, in conjunction with the improvements to NC 107.

We would also recommend that NC DOT consider increasing the width of the bridge across Scotts Creek at Jackson Paper to four lanes.

Your consideration for our concerns and for the growth of Sylva is greatly appreciated.

Sincerely,

Maurice Moody
Mayor of Sylva
83 Allen Street
Sylva, NC 28779

cc: Mark L. Reep, P.E.
Joel Setzer

TOWN OF SYLVA

NC

1889

83 ALLEN STREET

SYLVA, N.C. 28779

828-586-2719 Fax 828-586-8134

April 29, 2011

F. Rasay Abadilla Jr., MSCE, P.E.
Feasibility Studies Engineer
NCDOT – Program Development Branch
1534 Mail Service Center
Raleigh, NC 27699 – 1534

Dear Mr. Abadilla,

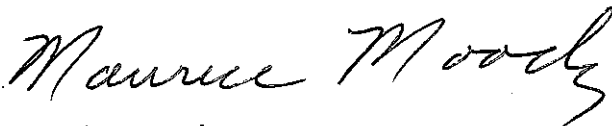
This letter is in response to DOT's Feasibility Study for NC 107 improvements and your letter dated March 31, 2011 to Mr. Conrad Burrell.

I would like to reiterate the Sylva Board of Commissioner's desire to maintain NC 107 as a city street with little or no increase in width as stated in my letter to Derrick Lewis (included in the Feasibility Study).

NC 107 is the commercial growth area in Sylva. Increasing the width of NC 107 would have a negative impact to business and growth in Sylva.

The Sylva Board of Commissioners also established transportation priorities in a March 10th work session with Sarah Graham and Ryan Sherby of the Southwestern Commission RPO. A copy of these priorities was distributed to DOT.

Sincerely,



Maurice Moody
Mayor of Sylva
83 Allen Street
Sylva, NC 28779

Cc:

Mr. Joel Setzer, P.E., Division Engineer – Highway Division 14

Town of Sylva Transportation Priorities Workshop

March 10, 2011

Attended by Mayor Maurice Moody, Commissioners Chris Matheson, Stacy Knotts, Ray Lewis, Danny Allen, and Harold Hensley, manager Adrienne Isenhower.

Facilitated by Ryan Sherby and Sarah Graham from the Southwestern Commission.

After individually ranking the projects in the Jackson County Comprehensive Transportation Plan (CTP), the Sylva Town Board agreed by consensus on the following list of transportation priorities:

1. **CTP project #0003: US 23 Business/ West Main Street** (Widen and improve the section from the Mill and Main split to the intersection of NC 107 with Business 23 at Rite Aid).

The board would like for these road improvements to correspond with the replacement of or improvements to the bridge next to the parking lot of Jackson Paper (bridge #490077).

2. **Project #0009: NC 107 from Business 23 to NC 116** (Upgrades and improvements).

The board has asked the Southwestern Commission to assist in the creation of a NC 107 Corridor Plan.

3. **Project #0006: US 74 and Business 23** (Construction of a westward bound ramp onto US 74)

4. **Project #0013: Cope Creek Road from NC 107 to US 74** (Upgrade to 10' lanes consistent with improvements already made)

The board feels that the completion of the improvements to Cope Creek is important. If this project is already funded and scheduled, it should be removed from this priority list.

5. **Project #0008/0014: NC 116/US 441 Intersection and Ashe Settlement (SR 1340) from NC 107 to NC 116** (Widen Ashe Settlement and replace intersection of 116/441 with an interchange).

The board did not feel that one of these projects would be effective without the other, and therefore combined them into one project.

6. **Project #0002: Business 23/Asheville Highway** (Road improvements from NC 107 to Hospital Road)

7. **Project #0015: Skyland Drive (SR 1432) from Business 23 to Steeple Road** (Upgrades, widening, sidewalks)

Summary:

During the Town Board's discussion about the projects on the Jackson County CTP, it became clear that making improvements to existing roads is of higher priority to the town than the construction of new facilities. They view congestion on NC 107 as an important transportation issue to the town and the county, and discussed ways in which some of the commuter traffic could be detoured away from the commercial corridor. Additionally, they have strategies in mind for addressing the problem areas on NC 107, the improvement of which will ease the flow of traffic.

The top priority of the town board is widening the section of West Main Street from Mill and Main to the intersection of NC 107 with Business 23. As the primary route through downtown Sylva, this facility is currently operating over capacity at peak hours, causing traffic to back up in both directions. The board's second priority is **the stretch of NC 107 from its intersection with Business 23 to the 4-lane divided cross-section north of Lovedale Road (in front of Ingles).** Although the board is not in complete agreement on what improvements should be made, they agree that upgrades to their commercial corridor are of primary importance, stressing that upgrades should be made *within the existing footprint of the road*. The town views this stretch of NC 107 as their main "city street", and want it to maintain the character of such. They have asked the Southwestern Commission for assistance in the creation of a NC 107 Corridor Plan that will address transportation and land use issues along the NC 107 corridor.

The town board is also interested in projects that improve routes for through traffic, or commuters, as alternatives to NC 107. The board's third priority is the construction of a westward bound ramp onto US 74 from Business 23. Priority four widens Cope Creek Road (from NC 107 to US 74), and five improves Ashe Settlement/NC 116, (from NC 107 to US 441). All of these projects create safe, direct routes away from Sylva for travellers whose ultimate destination is not within the town limits.

The final two projects prioritized by the town board pertain to the Asheville Highway and Skyland Drive. Both of these roads are lined with commercial development, with room for growth. The board expressed that the town's future growth will occur not only on NC 107 but also on these two roads, and therefore they should be of high priority for upgrades.

When asked about the 107 Connector, the board reiterated its response to a recent DOT feasibility study of NC 107 in which the town defers to the DOT's expertise in determining the need for the connector. Because the feasibility study did not show the connector as significantly relieving congestion on NC 107, they do not view it as a priority. Whether there is another purpose or need for the connector isn't something the Town of Sylva wishes to take a position on.

Table A1 - Construction and Right of Way Costs By Segment

	Segment	Description	Length (miles)	Construction Costs	Utility Relocation Costs	Relocations				Relocation Costs	Acquisition Costs	Land & Damage Costs	Right of Way Costs	Total Costs
						Residences	Businesses	Other	Total					
Alternative 1	1A	US 23 Business from north of Hospital Road (SR 1437) to north of NC 107	0.95	\$5,300,000	\$170,000	4	11	0	15	\$360,000	\$210,000	\$5,120,000	\$5,700,000	\$11,200,000
	1B	US 23 Business from west of Chipper Curve Road (SR 1429) to NC 107 south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352)	1.52	\$9,700,000	\$710,000	5	56	0	61	\$1,500,000	\$430,000	\$29,270,000	\$31,200,000	\$41,600,000
	1C	NC 107 from south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352) to north of NC 116	0.62	\$5,200,000	\$410,000	2	14	0	16	\$390,000	\$190,000	\$17,080,000	\$17,700,000	\$23,300,000
	1D	NC 107 from north of NC 116 to south of NC 116	0.57	\$4,200,000	\$230,000	0	11	1	12	\$780,000	\$120,000	\$14,800,000	\$15,700,000	\$20,100,000
	1E	NC 107 from south of NC 116 to north of Old Cullowhee Road (SR 1002)	0.45	\$3,500,000	\$250,000	5	0	0	5	\$100,000	\$60,000	\$2,770,000	\$2,900,000	\$6,700,000
	1F	NC 107 from north of Old Cullowhee Road (SR 1002) to the Tuckasegee River	0.51	\$3,600,000	\$100,000	0	1	0	1	\$30,000	\$40,000	\$1,400,000	\$1,500,000	\$5,200,000
	1G	NC 107 from north of SR 1550 to south of Cullowhee Mountain Road (SR 1001)	1.80	\$4,700,000	\$600,000	0	0	0	0	\$0	\$60,000	\$1,750,000	\$1,800,000	\$7,100,000
	1A-1G	US 23 Business from north of Hospital Road (SR 1437) to south of Cullowhee Mountain Road (SR 1001)	6.42	\$36,200,000	\$2,500,000	16	93	1	110	\$3,200,000	\$1,100,000	\$72,200,000	\$76,500,000	\$115,200,000
Alternative 2	2A	US 23 Business from north of Hospital Road (SR 1437) to north of NC 107	0.95	\$5,400,000	\$170,000	4	11	0	15	\$360,000	\$210,000	\$5,120,000	\$5,700,000	\$11,300,000
	2B	US 23 Business from west of Chipper Curve Road (SR 1429) to NC 107 south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352)	1.52	\$8,900,000	\$720,000	5	56	0	61	\$1,500,000	\$430,000	\$29,270,000	\$31,200,000	\$40,800,000
	2C	NC 107 from south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352) to north of NC 116	0.62	\$4,600,000	\$410,000	2	14	0	16	\$390,000	\$190,000	\$17,080,000	\$17,700,000	\$22,700,000
	2D	NC 107 from north of NC 116 to south of NC 116	0.57	\$4,100,000	\$230,000	0	11	1	12	\$780,000	\$120,000	\$14,790,000	\$15,700,000	\$20,000,000
	2E	NC 107 from south of NC 116 to north of Old Cullowhee Road (SR 1002)	0.45	\$3,500,000	\$250,000	5	0	0	5	\$100,000	\$60,000	\$2,770,000	\$2,900,000	\$6,700,000
	2F	NC 107 from north of Old Cullowhee Road (SR 1002) to the Tuckasegee River	0.51	\$3,600,000	\$100,000	0	1	0	1	\$30,000	\$40,000	\$1,400,000	\$1,500,000	\$5,200,000
	2G	NC 107 from north of SR 1550 to south of Cullowhee Mountain Road (SR 1001)	1.80	\$4,100,000	\$600,000	0	0	0	0	\$0	\$60,000	\$1,750,000	\$1,800,000	\$6,500,000
	2A-2G	US 23 Business from north of Hospital Road (SR 1437) to south of Cullowhee Mountain Road (SR 1001)	6.42	\$34,200,000	\$2,500,000	16	93	1	110	\$3,200,000	\$1,100,000	\$72,200,000	\$76,500,000	\$113,200,000
Alternative 3	3A	US 23 Business from north of Hospital Road (SR 1437) to north of NC 107	0.95	\$5,900,000	\$200,000	4	11	0	15	\$360,000	\$210,000	\$5,760,000	\$6,300,000	\$12,400,000
	3B	US 23 Business from west of Chipper Curve Road (SR 1429) to NC 107 south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352)	1.52	\$10,200,000	\$800,000	5	57	0	62	\$1,530,000	\$420,000	\$30,120,000	\$32,100,000	\$43,100,000
	3C	NC 107 from south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352) to north of NC 116	0.62	\$4,600,000	\$500,000	2	13	0	15	\$370,000	\$190,000	\$15,470,000	\$16,000,000	\$21,100,000
	3D	NC 107 from north of NC 116 to south of NC 116	0.57	\$3,900,000	\$300,000	0	12	1	13	\$800,000	\$120,000	\$14,300,000	\$15,200,000	\$19,400,000
	3E	NC 107 from south of NC 116 to north of Old Cullowhee Road (SR 1002)	0.45	\$3,500,000	\$250,000	6	0	0	6	\$120,000	\$60,000	\$3,430,000	\$3,600,000	\$7,400,000
	3F	NC 107 from north of Old Cullowhee Road (SR 1002) to south of Old Settlement Road (SR 1340)	1.09	\$4,700,000	\$100,000	10	2	0	12	\$250,000	\$90,000	\$4,020,000	\$4,400,000	\$9,200,000
	3G	NC 107 from north of SR 1550 to south of Cullowhee Mountain Road (SR 1001)	2.34	\$6,800,000	\$600,000	0	0	0	0	\$0	\$40,000	\$2,200,000	\$2,200,000	\$9,600,000
	3A-3G	US 23 Business from north of Hospital Road (SR 1437) to south of Cullowhee Mountain Road (SR 1001)	7.54	\$39,600,000	\$2,800,000	27	95	1	123	\$3,400,000	\$1,100,000	\$75,300,000	\$79,800,000	\$122,200,000

Table A1 - Construction and Right of Way Costs By Segment

	Segment	Description	Length (miles)	Construction Costs	Utility Relocation Costs	Relocations				Relocation Costs	Acquisition Costs	Land & Damage Costs	Right of Way Costs	Total Costs
						Residences	Businesses	Other	Total					
Alternative 4	4A	US 23 Business from north of Hospital Road (SR 1437) to north of NC 107	0.95	\$5,900,000	\$300,000	4	11	0	15	\$360,000	\$210,000	\$5,760,000	\$6,300,000	\$12,500,000
	4B	US 23 Business from west of Chipper Curve Road (SR 1429) to NC 107 south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352)	1.52	\$9,800,000	\$810,000	5	57	0	62	\$1,530,000	\$420,000	\$30,120,000	\$32,100,000	\$42,700,000
	4C	NC 107 from south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352) to north of NC 116	0.62	\$4,600,000	\$500,000	2	13	0	15	\$370,000	\$190,000	\$15,470,000	\$16,000,000	\$21,100,000
	4D	NC 107 from north of NC 116 to south of NC 116	0.57	\$3,700,000	\$250,000	0	12	1	13	\$800,000	\$120,000	\$14,300,000	\$15,200,000	\$19,200,000
	4E	NC 107 from south of NC 116 to north of Old Cullowhee Road (SR 1002)	0.45	\$3,400,000	\$250,000	6	0	0	6	\$120,000	\$60,000	\$3,430,000	\$3,600,000	\$7,300,000
	4F	NC 107 from north of Old Cullowhee Road (SR 1002) to south of Old Settlement Road (SR 1340)	1.09	\$5,300,000	\$100,000	10	2	0	12	\$250,000	\$70,000	\$4,020,000	\$4,400,000	\$9,800,000
	4G	NC 107 from north of SR 1550 to south of Cullowhee Mountain Road (SR 1001)	2.34	\$6,800,000	\$600,000	0	0	0	0	\$0	\$40,000	\$2,200,000	\$2,200,000	\$9,600,000
	4A-4G	US 23 Business from north of Hospital Road (SR 1437) to south of Cullowhee Mountain Road (SR 1001)	7.54	\$39,500,000	\$2,900,000	27	95	1	123	\$3,400,000	\$1,100,000	\$75,300,000	\$79,800,000	\$122,200,000
Alternatives 5 & 6	5B/6B	US 23 Business from west of Chipper Curve Road (SR 1429) to NC 107 south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352)	1.42	\$7,200,000	\$880,000	7	74	0	81	\$1,990,000	\$460,000	\$42,190,000	\$44,700,000	\$52,800,000
	5C/6C	NC 107 from south of Cope Creek Road (SR 1449)/Walter Ashe Road (SR 1352) to north of NC 116	0.41	\$2,700,000	\$70,000	3	17	0	20	\$490,000	\$130,000	\$16,050,000	\$16,700,000	\$19,500,000
	5F/6F	NC 107 from north of Old Cullowhee Road (SR 1002) to north of Old Settlement Road (SR 1340)	0.64	\$3,500,000	\$110,000	10	2	0	12	\$250,000	\$80,000	\$3,110,000	\$3,500,000	\$7,100,000
	5B-5F/ 6B-6F	US 23 Business from west of Chipper Curve Road (SR 1429) to NC 107 north of Old Settlement Road (SR 1340)	2.47	\$13,400,000	\$1,100,000	20	93	0	113	\$2,800,000	\$700,000	\$61,400,000	\$64,900,000	\$79,400,000

Table A2 - User Benefits for Alternatives 1 and 2

	Present Day Dollars discounted 7%			
Year	User Value of Time Benefits	User Operating Cost Benefits	User Accident Reduction Benefits	Total Redbook User Benefits
2013	10,336,967	1,235,269	2,306,400	13,878,637
2014	11,000,705	1,166,002	2,156,698	14,323,405
2015	11,707,061	1,100,619	2,016,734	14,824,414
2016	12,458,773	1,038,902	1,885,870	15,383,544
2017	13,258,751	980,645	1,763,517	16,002,914
2018	14,110,097	925,656	1,649,119	16,684,872
2019	15,016,107	873,750	1,542,159	17,432,017
2020	15,980,293	824,755	1,442,151	18,247,199
2021	17,006,389	778,507	1,348,644	19,133,540
2022	18,098,371	734,852	1,261,214	20,094,437
2023	19,260,468	693,646	1,179,466	21,133,580
2024	20,497,185	654,750	1,103,030	22,254,964
2025	21,813,311	618,035	1,031,560	23,462,905
2026	23,213,945	583,378	964,733	24,762,057
2027	24,704,515	550,666	902,248	26,157,428
2028	26,290,794	519,787	843,819	27,654,400
2029	27,978,928	490,640	789,186	29,258,754
2030	29,775,457	463,128	738,101	30,976,686
2031	31,687,342	437,158	690,330	32,814,830
2032	33,721,989	412,644	645,663	34,780,296
2033	35,887,280	389,505	603,893	36,880,679
2034	38,191,606	367,664	564,835	39,124,105
2035	40,643,892	347,047	528,310	41,519,249
TOTAL	512,640,225	16,187,005	27,957,321	556,784,550
TOTAL ROUNDED	\$513,000,000	\$16,000,000	\$28,000,000	\$557,000,000

Present Day Dollars discounted 3%			
User Value of Time Benefits	User Operating Cost Benefits	User Accident Reduction Benefits	Total Redbook User Benefits
10,336,967	1,235,269	2,306,400	13,878,637
11,427,917	1,211,283	2,240,454	14,879,654
12,634,004	1,187,763	2,176,415	15,998,182
13,967,379	1,164,700	2,114,226	17,246,305
15,441,477	1,142,085	2,053,837	18,637,399
17,071,149	1,119,908	1,995,193	20,186,250
18,872,815	1,098,162	1,938,243	21,909,220
20,864,626	1,076,839	1,882,941	23,824,406
23,066,650	1,055,929	1,829,236	25,951,816
25,501,073	1,035,426	1,777,083	28,313,582
28,192,421	1,015,320	1,726,439	30,934,181
31,167,811	995,605	1,677,256	33,840,672
34,457,219	976,273	1,629,496	37,062,988
38,093,787	957,317	1,583,114	40,634,217
42,114,153	938,728	1,538,073	44,590,954
46,558,823	920,500	1,494,335	48,973,658
51,472,577	902,626	1,451,858	53,827,062
56,904,923	885,100	1,410,609	59,200,631
62,910,590	867,913	1,370,550	65,149,053
69,550,088	851,061	1,331,649	71,732,797
76,890,309	834,535	1,293,871	79,018,715
85,005,207	818,331	1,257,185	87,080,722
93,976,540	802,441	1,221,556	96,000,537
886,478,505	23,093,115	39,300,021	948,871,641
\$887,000,000	\$23,000,000	\$39,000,000	\$949,000,000

Present Day Dollars No Discount			
User Value of Time Benefits	User Operating Cost Benefits	User Accident Reduction Benefits	Total Redbook User Benefits
10,336,967	1,235,269	2,306,400	13,878,637
11,770,754	1,247,622	2,307,668	15,326,044
13,403,414	1,260,098	2,308,959	16,972,472
15,262,532	1,272,699	2,310,273	18,845,504
17,379,518	1,285,426	2,311,611	20,976,556
19,790,141	1,298,280	2,312,976	23,401,397
22,535,128	1,311,263	2,314,364	26,160,755
25,660,858	1,324,376	2,315,780	29,301,014
29,220,142	1,337,620	2,317,223	32,874,985
33,273,116	1,350,996	2,318,691	36,942,803
37,888,257	1,364,506	2,320,190	41,572,953
43,143,539	1,378,151	2,321,716	46,843,406
49,127,755	1,391,932	2,323,272	52,842,959
55,942,010	1,405,852	2,324,858	59,672,720
63,701,435	1,419,910	2,326,475	67,447,820
72,537,129	1,434,109	2,328,124	76,299,362
82,598,376	1,448,450	2,329,806	86,376,632
94,055,167	1,462,935	2,331,521	97,849,622
107,101,069	1,477,564	2,333,270	110,911,903
121,956,500	1,492,340	2,935,053	126,383,893
138,872,451	1,507,263	2,936,874	143,316,588
158,134,725	1,522,336	2,938,731	162,595,792
180,068,769	1,537,559	2,940,628	184,546,956
1,403,759,753	31,766,558	53,414,462	1,488,940,773
\$1,404,000,000	\$32,000,000	\$53,000,000	\$1,489,000,000

Table A3 - User Benefits for Alternatives 3 and 4

	Present Day Dollars discounted 7%			
Year	User Value of Time Benefits	User Operating Cost Benefits	User Accident Reduction Benefits	Total Redbook User Benefits
2013	11,932,276	1,568,842	2,306,400	15,807,518
2014	12,698,449	1,480,869	2,156,698	16,336,016
2015	13,513,818	1,397,830	2,016,734	16,928,382
2016	14,381,541	1,319,447	1,885,870	17,586,858
2017	15,304,982	1,245,459	1,763,517	18,313,958
2018	16,287,716	1,175,621	1,649,119	19,112,456
2019	17,333,553	1,109,698	1,542,159	19,985,409
2020	18,446,542	1,047,472	1,442,151	20,936,165
2021	19,630,997	988,735	1,348,644	21,968,376
2022	20,891,505	933,292	1,261,214	23,086,011
2023	22,232,951	880,958	1,179,466	24,293,375
2024	23,660,531	831,558	1,103,030	25,595,120
2025	25,179,777	784,929	1,031,560	26,996,266
2026	26,796,573	740,914	964,733	28,502,220
2027	28,517,184	699,368	902,248	30,118,800
2028	30,348,276	660,151	843,819	31,852,246
2029	32,296,942	623,133	789,186	33,709,261
2030	34,370,733	588,191	738,101	35,697,025
2031	36,577,681	555,208	690,330	37,823,220
2032	38,926,338	524,075	645,663	40,096,077
2033	41,425,803	494,688	603,893	42,524,384
2034	44,085,759	466,948	564,835	45,117,542
2035	46,916,510	440,764	528,310	47,885,585
TOTAL	591,756,438	20,558,150	27,957,681	640,272,269
TOTAL ROUNDED	\$592,000,000	\$21,000,000	\$28,000,000	\$640,000,000

Present Day Dollars discounted 3%			
User Value of Time Benefits	User Operating Cost Benefits	User Accident Reduction Benefits	Total Redbook User Benefits
11,932,276	1,568,842	2,306,400	15,807,518
13,191,592	1,538,379	2,240,454	16,970,425
14,583,815	1,508,507	2,176,415	18,268,738
16,122,972	1,479,216	2,114,226	19,716,414
17,824,569	1,450,493	2,053,837	21,328,899
19,705,750	1,422,329	1,995,193	23,123,271
21,785,468	1,394,710	1,938,243	25,118,422
24,084,678	1,367,629	1,882,941	27,335,247
26,626,542	1,341,073	1,829,236	29,796,851
29,436,672	1,315,033	1,777,083	32,528,787
32,543,379	1,289,498	1,726,439	35,559,316
35,977,964	1,264,459	1,677,256	38,919,679
39,775,030	1,239,907	1,629,496	42,644,432
43,972,833	1,215,831	1,583,114	46,771,778
48,613,667	1,192,222	1,538,073	51,343,963
53,744,289	1,169,072	1,494,335	56,407,696
59,416,389	1,146,372	1,451,858	62,014,619
65,687,115	1,124,112	1,410,609	68,221,837
72,619,646	1,102,285	1,370,550	75,092,481
80,283,826	1,080,881	1,331,649	82,696,356
88,756,874	1,059,893	1,293,871	91,110,638
98,124,156	1,039,313	1,257,185	100,420,653
108,480,048	1,019,132	1,221,556	110,720,736
1,023,289,548	29,329,189	39,300,021	1,091,918,758
\$1,023,000,000	\$29,000,000	\$39,000,000	\$1,092,000,000

Present Day Dollars No Discount			
User Value of Time Benefits	User Operating Cost Benefits	User Accident Reduction Benefits	Total Redbook User Benefits
11,932,276	1,568,842	2,306,400	15,807,518
13,587,340	1,584,530	2,307,668	17,479,538
15,471,970	1,600,376	2,308,959	19,381,304
17,618,007	1,616,379	2,310,273	21,544,659
20,061,709	1,632,543	2,311,611	24,005,863
22,844,365	1,648,869	2,312,976	26,806,209
26,012,988	1,665,357	2,314,364	29,992,710
29,621,115	1,682,011	2,315,780	33,618,906
33,729,707	1,698,831	2,317,223	37,745,761
38,408,180	1,715,819	2,318,691	42,442,690
43,735,580	1,732,977	2,320,190	47,788,747
49,801,916	1,750,307	2,321,716	53,873,939
56,709,682	1,767,810	2,323,272	60,800,764
64,575,588	1,785,488	2,324,858	68,685,934
73,532,533	1,803,343	2,326,475	77,662,352
83,731,851	1,821,377	2,328,124	87,881,351
95,345,862	1,839,590	2,329,806	99,515,259
108,570,793	1,857,986	2,331,521	112,760,300
123,630,086	1,876,566	2,333,270	127,839,922
140,778,175	1,895,332	2,335,053	145,008,560
160,304,787	1,914,285	2,336,874	164,555,946
182,539,834	1,933,428	2,338,731	186,811,993
207,858,989	1,952,762	2,940,628	212,752,380
1,620,403,332	40,344,811	53,414,462	1,714,162,605
\$1,620,000,000	\$40,000,000	\$54,000,000	\$1,714,000,000

Table A4 - User Benefit Analysis Data Entry Values

Input	Value or Function	Source
<i>User Class / Economic / Vehicle Operating Cost Data</i>		
Vehicle Occupancy for Automobiles (persons/vehicle)	1.6	Current National Household Travel Survey
Vehicle Occupancy for Trucks (persons/vehicle)	1.08	NCDOT O&D Surveys
Value of Time of Automobiles (\$/hr)	\$20.15	Census data/Guidance see notes
Value of Time of Trucks (\$/hr)	\$25.28	Bureau of Labor Statistics see notes
Fuel Cost (\$/gallon)	\$3.33	Corporate Average Fuel Economy for MY 2011 Passenger Cars and Light Trucks, NHTSA, March 2009
Fuel Cost (% of Operating Cost)	69%	Bureau of Transportation Statistics
Average Truck Load Value	\$14,500	Bureau of Transportation Statistics
Market Interest Rate (%/year)	3.25%	United States Federal Reserve
<i>Economic Data</i>		
Real Discount Rate (%/year)	3 and 7%	Tiger Discretionary Grant & Circular A-4. Real Discount rate of 7%/year with sensitivity analysis of 3%/year.
Inflation Rate (%/year)	3%	Per ARRA guidance no inflation but if inflation is desired, then use 3% as recommended by Redbook research project.
Financing Rate (%/year)	0%	Standard Definition
Financing Term (years)	0	Standard Definition (assuming standard payment without bonds)
Issuance Cost (% of amount financed)	0%	Standard Definition
General Traffic Growth Rate (%/year)	1%	Reverse Engineered from the traffic forecast model data
Annual Growth of Value of Time (%/year)	3.3%	20 year head of household median household income
Property Damage Only Accident Cost (\$/crash)	\$4,800	NCDOT Traffic Engineering and Safety Systems Branch

Table A4 (Continued) - User Benefit Analysis Data Entry Values

Input	Value or Function	Source
<i>Economic Data</i>		
Injury Accident Cost (\$/crash)	\$51,000	Treatment of the Economic Value of a Statistical life in Department Analysis and NCDOT Traffic Engineering and Safety Systems Branch
Fatal Accident Cost (\$/crash)	\$4,200,000	Treatment of the Economic Value of a Statistical life in Department Analysis and NCDOT Traffic Engineering and Safety Systems Branch
<i>Traffic Conversion Factors</i>		
K Factor	10-11%	NCDOT, Transportation Planning Branch-Traffic Counts
D Factor	55%	NCDOT, Transportation Planning Branch-Traffic Counts
Weekday-to-Week Expansion Factor	6.0	24hour counts over a two week test period
Week-to-Month Expansion Factor	4.35	Redbook Wizard User Manual
Seasonality Factor	1.1	Weekday to week expansion factor used to determine benefits based on 356 days per year.
<i>Traffic Volume Data</i>		
2011 AADT	34,200	Transportation Planning Branch-Projected traffic
2035 AADT	40,500	Transportation Planning Branch-Projected traffic
2013 AADT	34,800	Calculated value based on base and design year forecast.
% trucks (Dual +TTST) AADT	6%	Transportation Planning Branch-Projected traffic use AADT Truck percentage if using ADT entry in Redbook
% Trucks Peak hour	3%	xx%/2 per established Capacity analysis guidelines NCDOT Use yy% if calculating PCE equivalent based on available data.
Passenger Car Equivalent (PCE) factor	2.5%	Highway Capacity Manual (Rolling Terrain) & Redbook
2011 Peak Hour Peak Direction	2,009 vph	$=(AADT * K * D * \{1 - \% \text{ trucks in the Peak Hour} \}) + (AADT * K * D * \% \text{ trucks in the Peak Hour} * PCE \text{ Factor})$ This is not necessary because revised Redbook NCDOT Wizard attached can utilize
2013 PCE Peak Hour Peak Direction	2,044 vph	$= (AADT * K * D * \{1 - \% \text{ trucks in the Peak Hour} \}) + (AADT * K * D * \% \text{ trucks in the Peak Hour} * PCE \text{ Factor})$
Max Capacity of Existing Facility	pcphpl	Highway Capacity Manual/software (HCS 2000) Freeway
Max Capacity of Improved facility	pcphpl	Highway Capacity Manual/software (HCS 2000) Freeway

Table A5 - Hazardous Material Sites

Name	Address	Site ID
Andy Shaw Ford	1231 East Main Street	NA
Allisons, Inc.	116 West Main Street	NA
Belk 195	36 West Main Street	NA
Bill Lewis Exxon Service	Corner Main & Mill Street	NA
Carolina Tire Company (former location)	91 West Main Street	NA
Catamount Travel Center	4776 Little Savannah Rd	NA
Chasam Inc.	38 Scotts Creek Road	NA
Chasam Inc. (Former facility location)	330 Scotts Creek Road	NA
Central Admin. Office	398 Hospital Road	NA
Charter Food Store #06 (former location)	301 East Main Street	NA
Classic Cleaners	251 East Main Street	NA
Classic Cleaners	437 East Main Street	NA
Cody's Express, Inc.	551 East Main Street	NA
Cody's Food Mart	261 East Main Street	NA
Convenience King #2	200 East Main Street	NA
Contel	#6 Allen Street	NA
Contel	124 West Main Street	NA
Continental Tele Company	124 West Main Street	NA
Coward's Grocery	476 East Main Street	NA
Cullowhee Quik Stop	4186 Little Savannah Rd	NA
Dillard Excavating Company 1	52 Asheville Highway	NA
Eblen Short Stop #3	4685 Little Savannah Rd	NA
Enmark 835	716 East Main Street	NA
Express #549	30 Asheville Highway	NA
Exxon Company USA (Sylva Blk Plant)	150 Skyland Drive	NA
First Citizens Parking Lot	5 West Main Street	NA
Gary's Body Shop	470 Asheville Highway	NA
Gas and Groceries #12	719 East Main Street	NA
Green's Automotive Service	125 Asheville Highway	NA
GTE Sylva – business office	124 West Main Street	NA
Harris Regional Hospital	68 Hospital Road	NA
HI Express Exxon	280 Ashville Hwy	NA
Highland Cleaners	51 Grindstaff Cove Rd.	NA
Highland Cleaners – Solvent Tank	5 Grindstaff Cove Rd.	NA
Independent Paint and Body Shop	193 East Main Street	NA
Irby Chevrolet	Eastgate Center	NA
J & W Shell	302 West Main Street	NA
Jackson County Maint. Garage	School Circle	NA
Jackson County Scott Creek TRA	401 Grindstaff Cove Road	NA
Jackson Paper Manufacturing Company	152 West Main Street	NA
Jay Vee Apartments	1 East Main Street	NA

Table A5 - Hazardous Material Sites Continued

[illegible]

Table A6 - Endangered Species, Threatened Species, and Federal Species of Concern

Common Name	Scientific Name	Federal Status
Appalachian Bewick's wren	<i>Thryomanes bewickii altus</i>	FSC
Bog turtle	<i>Clemmys muhlenbergii</i>	T/SA
Carolina northern flying squirrel	<i>Glaucomys sabrinus coloratus</i>	E
Eastern small-footed bat	<i>Myotis leibii</i>	FSC
Green salamander	<i>Aneides aeneus</i>	FSC
Hellbender	<i>Cryptobranchus alleganiensis</i>	FSC
Indiana bat	<i>Myotis sodalis</i>	E
Northern pine snake	<i>Pituophis melanoleucus melanoleucus</i>	FSC
Northern saw-whet owl (Southern Appalachian population)	<i>Aegolius acadicus pop. 1</i>	FSC
Olive darter	<i>Percina squamata</i>	FSC
Pygmy salamander	<i>Desmognathus wrighti</i>	FSC
Red crossbill (Southern Appalachian)	<i>Loxia curvirostra</i>	FSC
Smoky dace	<i>Clinostomus funduloides ssp.</i>	FSC
Southern Appalachian black-capped chickadee	<i>Poecile atricapillus praticus</i>	FSC
Southern Appalachian eastern woodrat	<i>Neotoma floridana haematoreia</i>	FSC
Southern rock vole	<i>Microtus chrotorrhinus carolinensis</i>	FSC
Yellow-bellied sapsucker (Southern Appalachian population)	<i>Sphyrapicus varius appalachiensis</i>	FSC
Wounded darter	<i>Etheostoma vulneratum</i>	FSC
Appalachian elktoe	<i>Alasmidonta raveneliana</i>	E
Diana fritillary (butterfly)	<i>Speyeria diana</i>	FSC
French Broad crayfish	<i>Cambarus reburrus</i>	FSC
Southern Tawny Crescent butterfly	<i>Phyciodes batesii maconensis</i>	FSC
Whitewater crayfish ostracod	<i>Dactylocythere prinsi</i>	FSC
a harvestman	<i>Fumontana deprehendor</i>	FSC
Blue Ridge Ragwort	<i>Packera millefolium</i>	FSC
Butternut	<i>Juglans cinerea</i>	FSC
Cuthbert turtlehead	<i>Chelone cuthbertii</i>	FSC
Darlington's spurge	<i>Euphorbia purpurea</i>	FSC
Fraser fir	<i>Abies fraseri</i>	FSC
Fraser's loosestrife	<i>Lysimachia fraseri</i>	FSC
Gorge filmy fern	<i>Hymenophyllum tayloriae</i>	FSC
Granite dome goldenrod	<i>Solidago simulans</i>	FSC
Gray's saxifrage	<i>Saxifraga caroliniana</i>	FSC
Lobed Barren-strawberry	<i>Waldsteinia lobata</i>	FSC
Mountain Thaspium	<i>Thaspium pinnatifidum</i>	FSC
Mountain bitter cress	<i>Cardamine clematitis</i>	FSC
Mountain catchfly	<i>Silene ovata</i>	FSC
Radford's sedge	<i>Carex radfordii</i>	FSC
Small whorled pogonia	<i>Isotria medeoloides</i>	T

**Table A6 - Endangered Species, Threatened Species, and Federal Species of Concern
(Cont'd)**

Common Name	Scientific Name	Federal Status
Southern Oconee-bells	<i>Shortia galacifolia</i> var. <i>galacifolia</i>	FSC
Swamp pink	<i>Helonias bullata</i>	T
Sweet pinesap	<i>Monotropis odorata</i>	FSC
Tall larkspur	<i>Delphinium exaltatum</i>	FSC
Torrey's Mountain-mint	<i>Pycnanthemum torrei</i>	FSC
Gorge moss	<i>Bryocrumia vivicolor</i>	FSC
a liverwort	<i>Plagiochila sharpii</i>	FSC
a liverwort	<i>Plagiochila sullivanii</i> var. <i>spinigera</i>	FSC
a liverwort	<i>Plagiochila sullivanii</i> var. <i>sullivanii</i>	FSC
a liverwort	<i>Plagiochila virginica</i> var. <i>caroliniana</i>	FSC
a liverwort	<i>Sphenolobopsis pearsonii</i>	FSC
Rock gnome lichen	<i>Gymnoderma lineare</i>	E



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

July 15, 2008

MEMORANDUM TO: Derrick W. Lewis, P.E.
Feasibilities Studies Unit – Program Development Branch
Ryan L. White, P.E.
Project Development and Environmental Analysis

FROM: Keith G. Dixon
Western Traffic Forecasting Group - Transportation Planning Branch

SUBJECT: Traffic Forecast for TIP R-4745 & FS-0814A
Sylva-Dillsboro Southern Loop

The 2008 / 2035 traffic forecast for TIP R-4745 & FS-0814A is attached.

TIP R-4745 involves the construction of the Sylva-Dillsboro Southern Loop that will provide a 4-lane, divided, controlled-access, freeway that connects US 23-74, east of Sylva, with US 23-441, southwest of Dillsboro, with interchanges at NC 107, south of Webster, and NC 116, west of Webster. FS-0814A involves a parallel route that connects US 23-74, east of Sylva, with SR1002-Old Cullowhee Rd, and is also included with this forecast as the FS-0814A Alternative. This project does not lie within an MPO area.

A 2001/2025 forecast regarding a separate alternative was produced by Nithya Iyer for FS-0114C and delivered to Derrick Lewis, PE, of Feasibility Studies on February 5, 2002. The alternative presented in the forecast for FS-0114C differs from any of the alternatives considered in the current forecast for R-4745. Jackson County Planner, Tony Elders, and Transportation Planning Branch Engineers were consulted during the development of this forecast.

Four separate alternative are included in this forecast. The following documents are attached:

- Alternative 1 – Existing Alignment, 2008 – Sheets 1, 2 & 3
- Alternative 1 – Existing Alignment, 2035 – Sheets 1, 2 & 3
- Alternative 2 – Eastern Connector Only, 2008 – Sheets 1, 2 & 3
- Alternative 2 – Eastern Connector Only, 2035 – Sheets 1, 2 & 3
- Alternative 3 – Sylva-Dillsboro Southern Loop, 2008 – Sheets 1, 2 & 3
- Alternative 3 – Sylva-Dillsboro Southern Loop, 2035 – Sheets 1, 2 & 3
- FS-0814A Alternative – Eastern Parallel Route, 2008 – Sheets 1, 2 & 3
- FS-0814A Alternative – Eastern Parallel Route, 2035 – Sheets 1, 2 & 3

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH
1554 MAIL SERVICE CENTER
RALEIGH NC 27699-1554



LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH, NC 27601
Phone: 919-733-4705
Fax: 919-733-2417

Certain Assumptions were made during the development of this forecast.

Fiscal Constraint:

The 2035 forecast includes additional projects included in the 2009-2015 STIP:

- R-5000 – 0.5 Mile connector between NC 116 and NC 107 located just east of Webster.
- This project is currently scheduled to be completed in 2012.

Development Activity:

The 2035 forecasts included the following development assumptions:

- The Western Carolina University Millennial Initiative Program
 - The development of 344 newly acquired acres is currently being planned. This new development will double the size of the WCU campus and provide classrooms, labs and office-space for 6500 additional students by 2035.

Forecast Methodology:

Traffic growth rates derived from historic trends shown between 1983 and 2006 were analyzed along with Jackson County population growth projections and specific development plans regarding the WCU Millennial Initiative Program. This information was used as a guide for future year conditions. Overall, the area is expected to experience slow to moderate growth between 1.5% and 2.5%.

If it is determined that any of these assumptions have become inconsistent with the project and surrounding area activity, please request updated projections at this location.

Due to the restriction of left turns from US 23 Bus onto US 23-74, a directional traffic volume imbalance exists along US 23 Bus and US 23-74. In order to account for this imbalance, directional turning movements were provided at the effected intersections.

The Jackson County 2008/2035 Transportation Demand Model is currently under development and is expected to be available by October of 2008. If a forecast that utilizes this model is needed in the future please submit a forecast update request to the Transportation Planning Branch.

If we can be of any further assistance please do not hesitate to contact me at 715-5482x364, email: kdixon1@dot.state.nc.us or Elina Zlotchenko at 715-5482 x372, email: ezlotchenko@dot.state.nc.us.

cc (with Attachments):

Jay Bennett, PE, Highway Design Branch - State Roadway Design Engineer
Sarah Smith, PE, Transportation Planning Branch - Mountain Planning Group Supervisor
Deborah Hutchings, PE, Transportation Planning Branch - State Traffic Forecast Engineer
BenJetta L. Johnson, PE, Traffic Engineering Branch - Congestion Mgmt. Regional Engineer
Hardee Cox, Information Technology - Road Inventory Information Systems Section Manager
File Copy: R-4745 & FS-0814A Jackson County

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop

2008 Alt 1 - Existing Alignment

Sheet 1 of 3

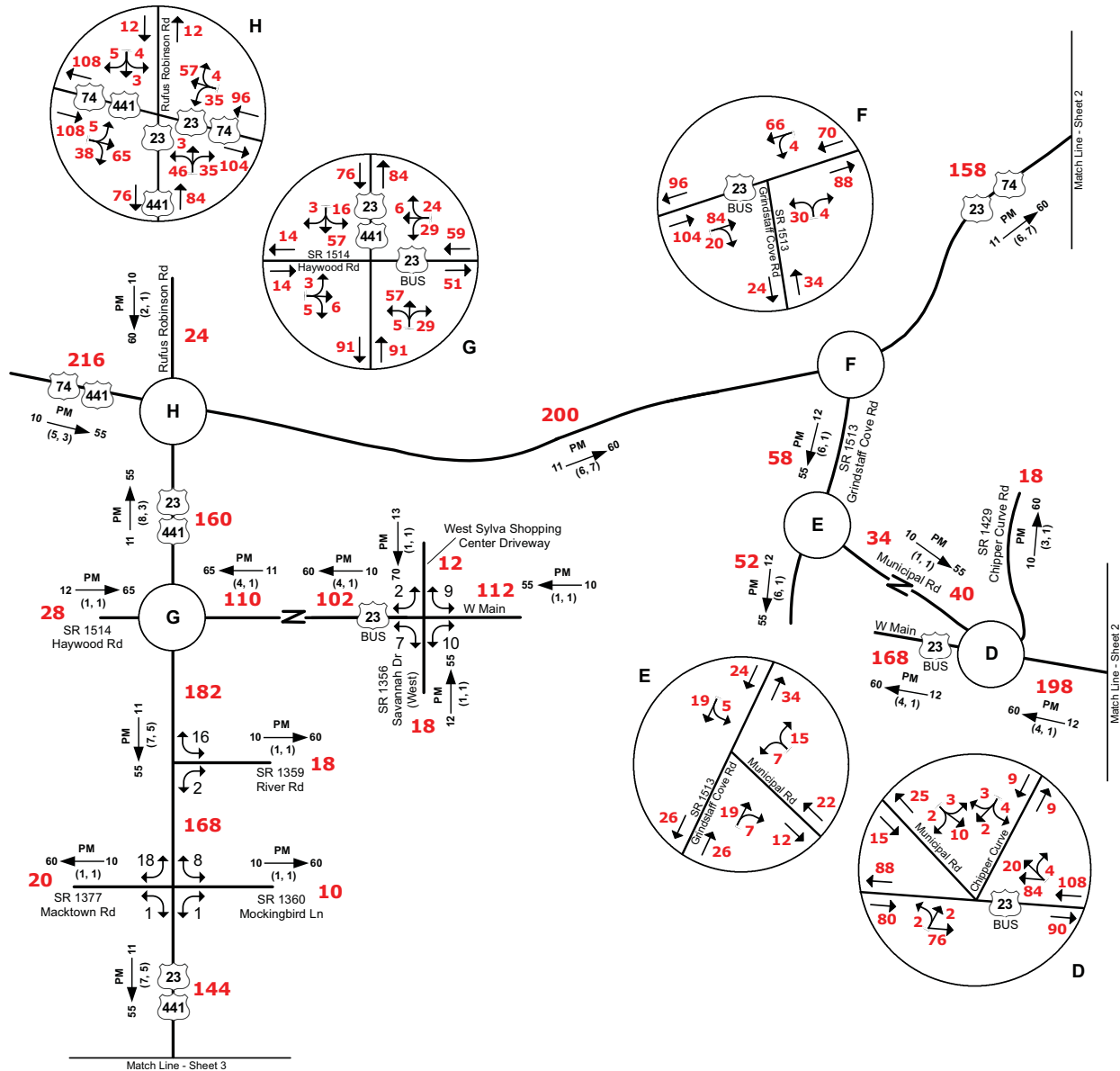


Diagram Not to Scale

2008 ANNUAL AVERAGE DAILY TRAFFIC	
ALT 1 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 1 of 3	
COUNTY: Jackson	WBS: 40106.1.1
TIP: R-4745	34263.1.1
FS-0814A	DIV: 14
DATE: July 15, 2008	
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop
2008 Alt 1 - Existing Alignment
Sheet 2 of 3

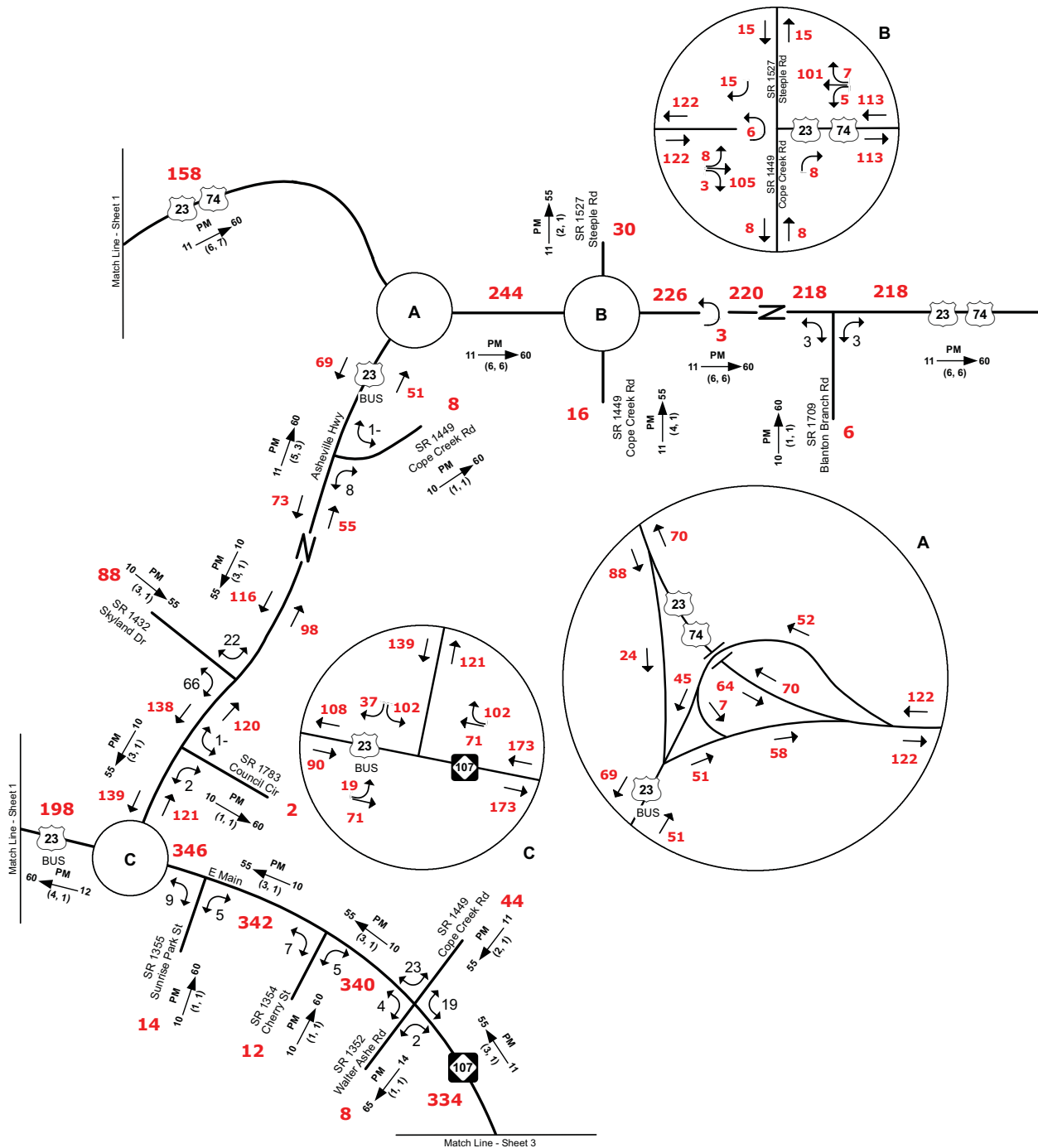


Diagram Not to Scale

2008 ANNUAL AVERAGE DAILY TRAFFIC			
ALT 1 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES			
Sheet 2 of 3			
COUNTY: Jackson		WBS: 40106.1.1 34263.1.1	
TIP: R-4745 FS-08144	DIV: 14	DATE: July 15, 2008	
LOCATION: US 23-74-441 & NC 107-116			
PROJECT: Sylva-Dillsboro Southern Loop			
PREPARED BY: Keith G. Dixon			



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge

Diagram Not to Scale

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop

2008 Alt 2 - Eastern Connector Only

Sheet 1 of 3

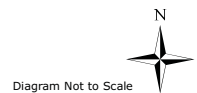
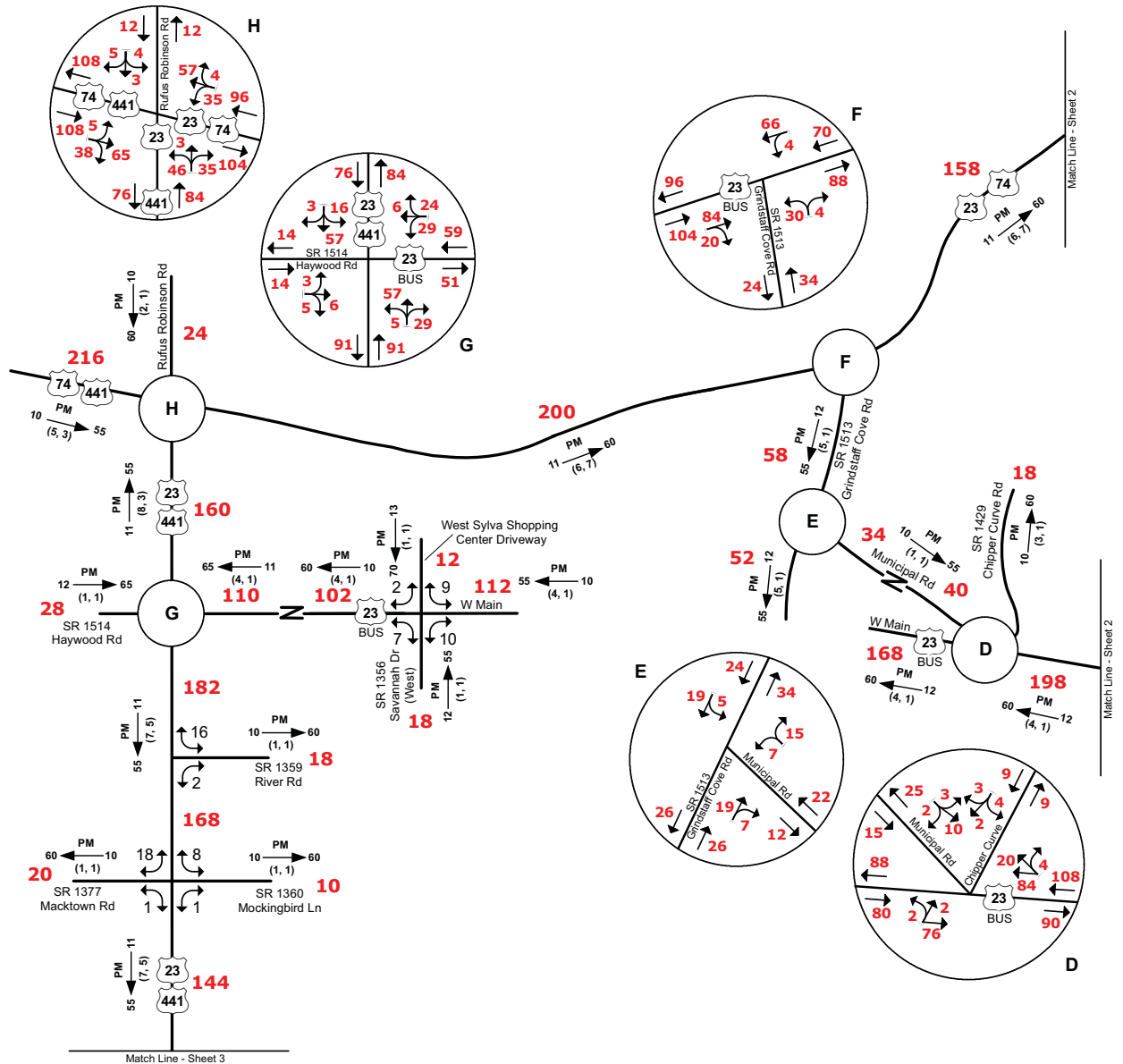


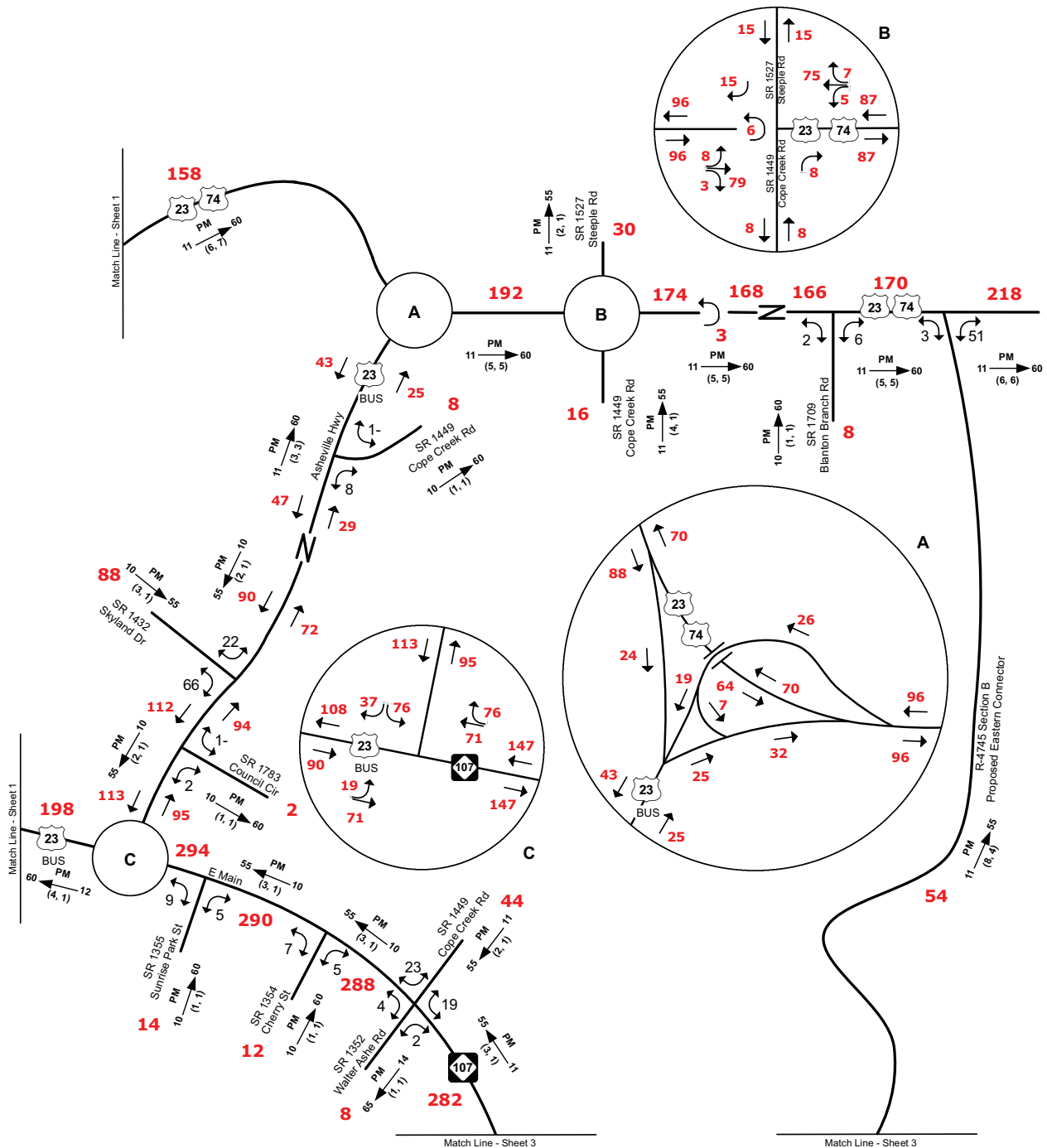
Diagram Not to Scale

2008 ANNUAL AVERAGE DAILY TRAFFIC	
ALT 2 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 1 of 3	
COUNTY: Jackson	WBS: 40106.1.1
TIP: R-4745	34263.1.1
FS-0814A	DIV: 14
DATE: July 15, 2008	
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge

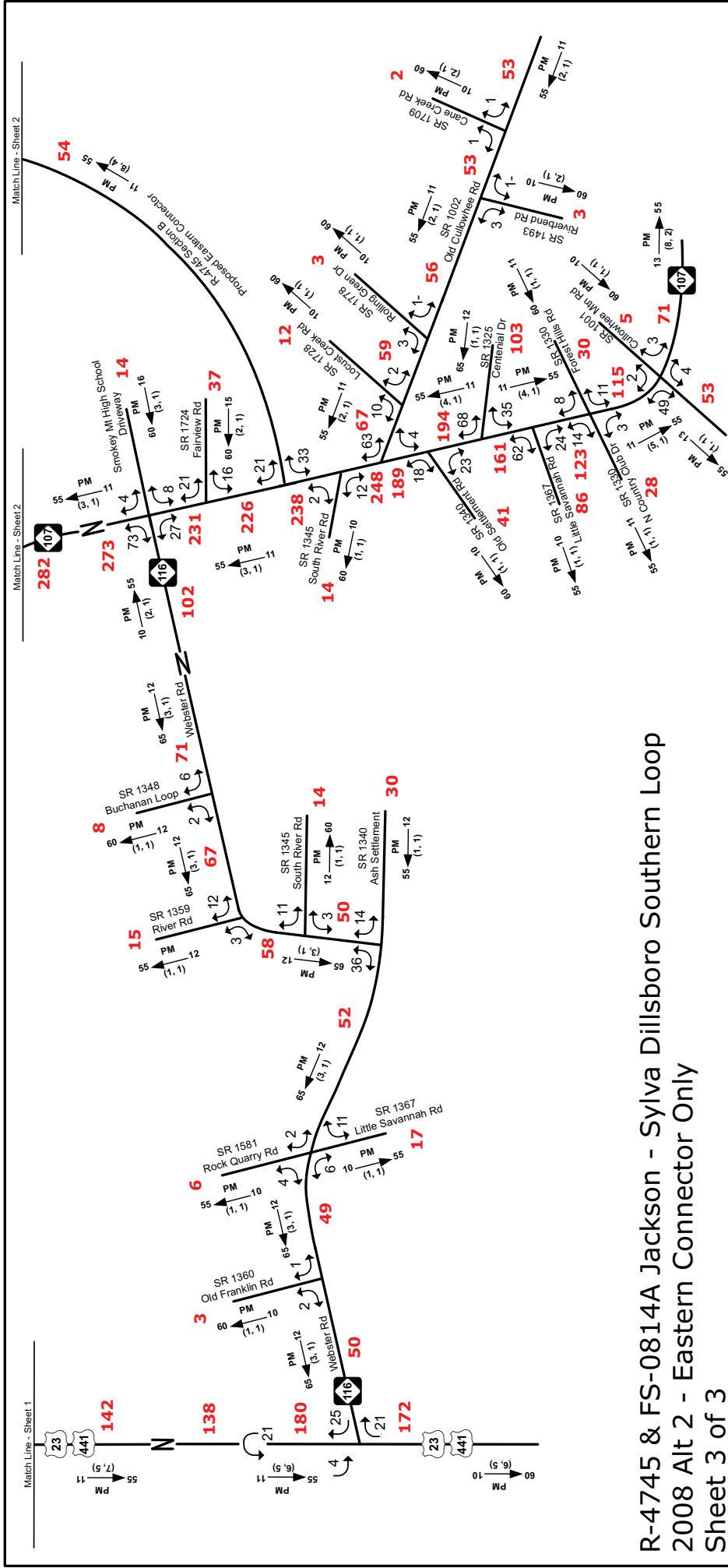
R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop
2008 Alt 2 - Eastern Connector Only
Sheet 2 of 3



2008 ANNUAL AVERAGE DAILY TRAFFIC	
ALT 2 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 2 of 3	
COUNTY: Jackson	WBS: 40106.1.1
TIP: R-4745	DIV: 14
FS-0814A	DATE: July 15, 2008
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge



R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop 2008 Alt 2 - Eastern Connector Only Sheet 3 of 3

2008 ANNUAL AVERAGE DAILY TRAFFIC	
ALT 2 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 3 of 3	
COUNTY: Jackson	WBS: 40106.1.1
TIP: R-4745	DATE: July 15, 2008
LOCATION: FS-0814A	US 23-74-441 & NC 107-116
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	

LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
(d, t)	Direction of D %
X	Duals % TT-STs %
—	Movement Prohibited
—	Bridge

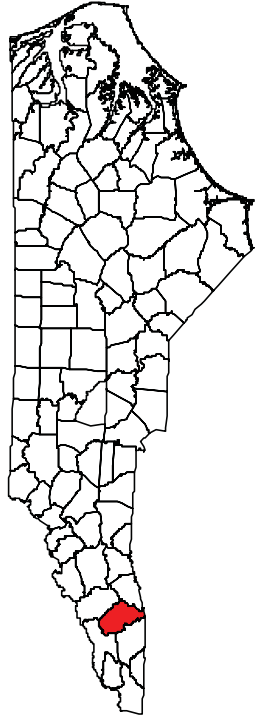


Diagram Not to Scale

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop

2008 Alt 3 - Sylva Dillsboro Southern Loop

Sheet 1 of 3

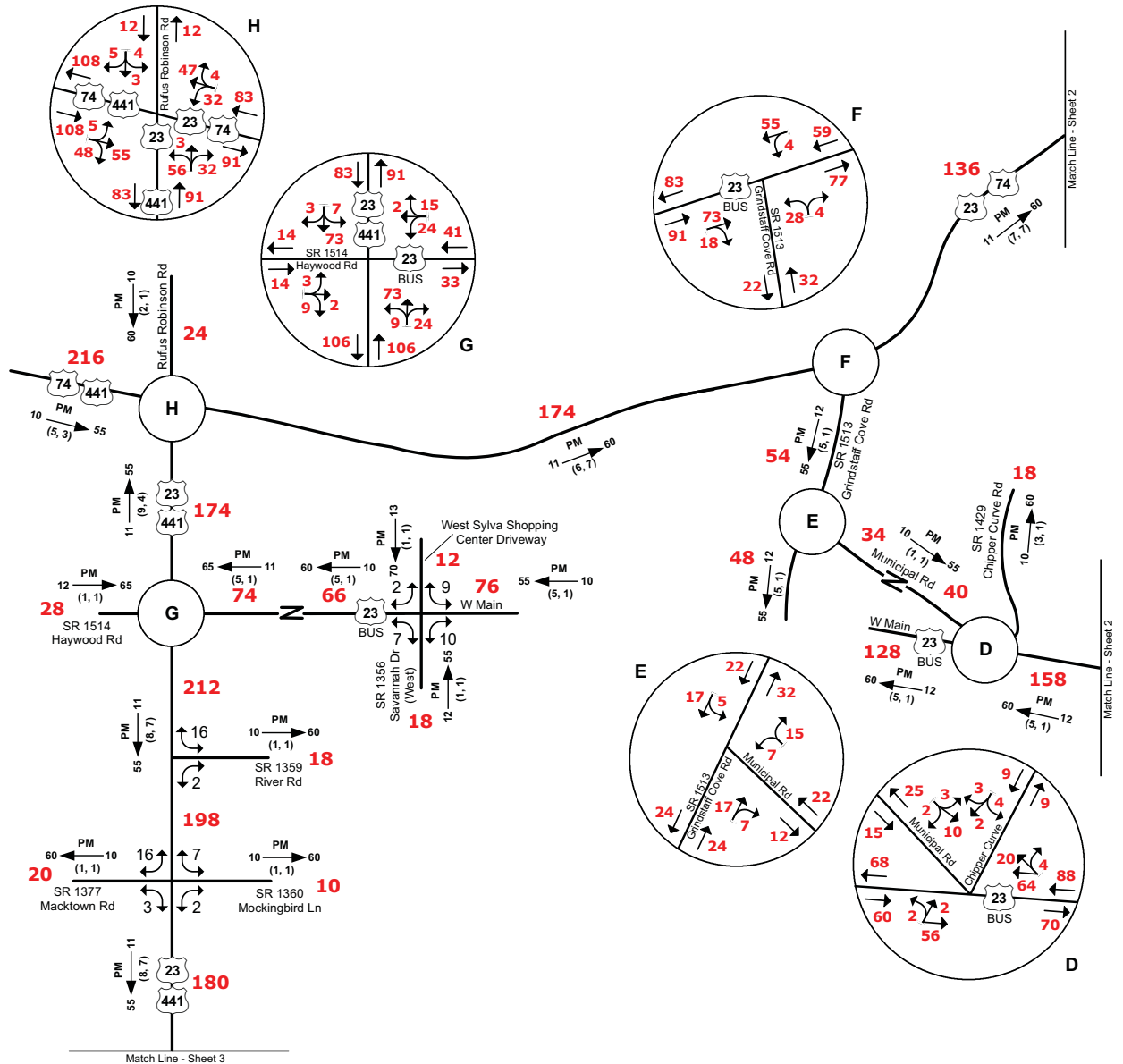


Diagram Not to Scale

2008 ANNUAL AVERAGE DAILY TRAFFIC
 ALT 3 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES
 Sheet 1 of 3

COUNTY: Jackson	WBS: 40106.1.1 34263.1.1
TIP: R-4745 FS-0814A	DIV: 14 DATE: July 15, 2008
LOCATION:	US 23-74-441 & NC 107-116
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND

- ### Number of Vehicles Per Day in 100s
- 1- Less Than 50 VPD
- ### Turning Volume VPD
- DHV → D
DHV (d, t)
- DHV Design Hour Volume % = K30
- PM PM Peak Period
- D Peak Hour Directional Split %
- Direction of D %
- (d, t) Duals %, TT-STs %
- X Movement Prohibited
- Bridge

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop
 2008 Alt 3 - Sylva-Dillsboro Southern Loop
 Sheet 2 of 3

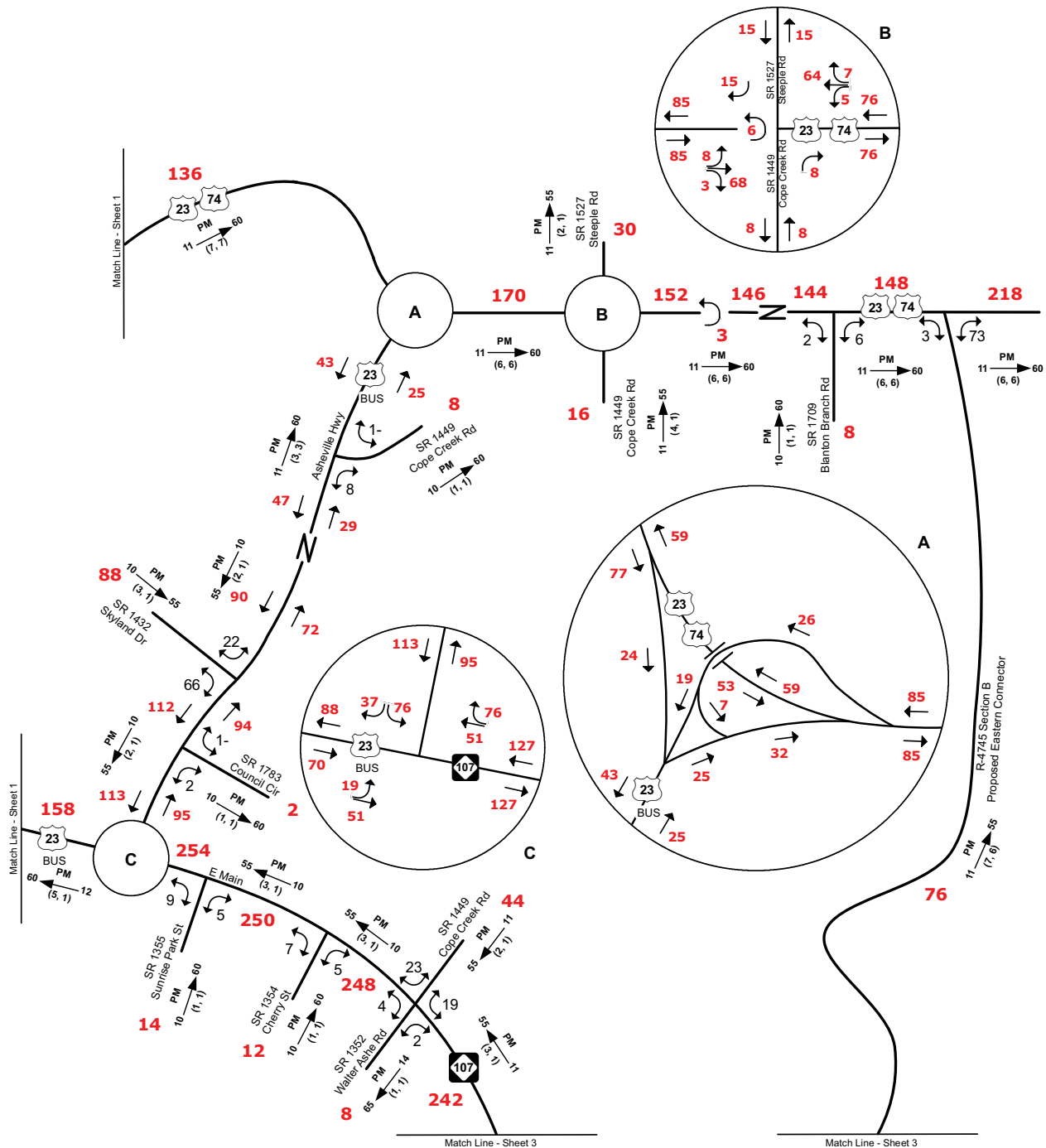


Diagram Not to Scale

2008 ANNUAL AVERAGE DAILY TRAFFIC	
ALT 3 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 2 of 3	
COUNTY: Jackson	WBS: 40106.1.1
TIP: R-4745	DIV: 14
FS-0814A	DATE: July 15, 2008
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge

Sheet 1 of 3

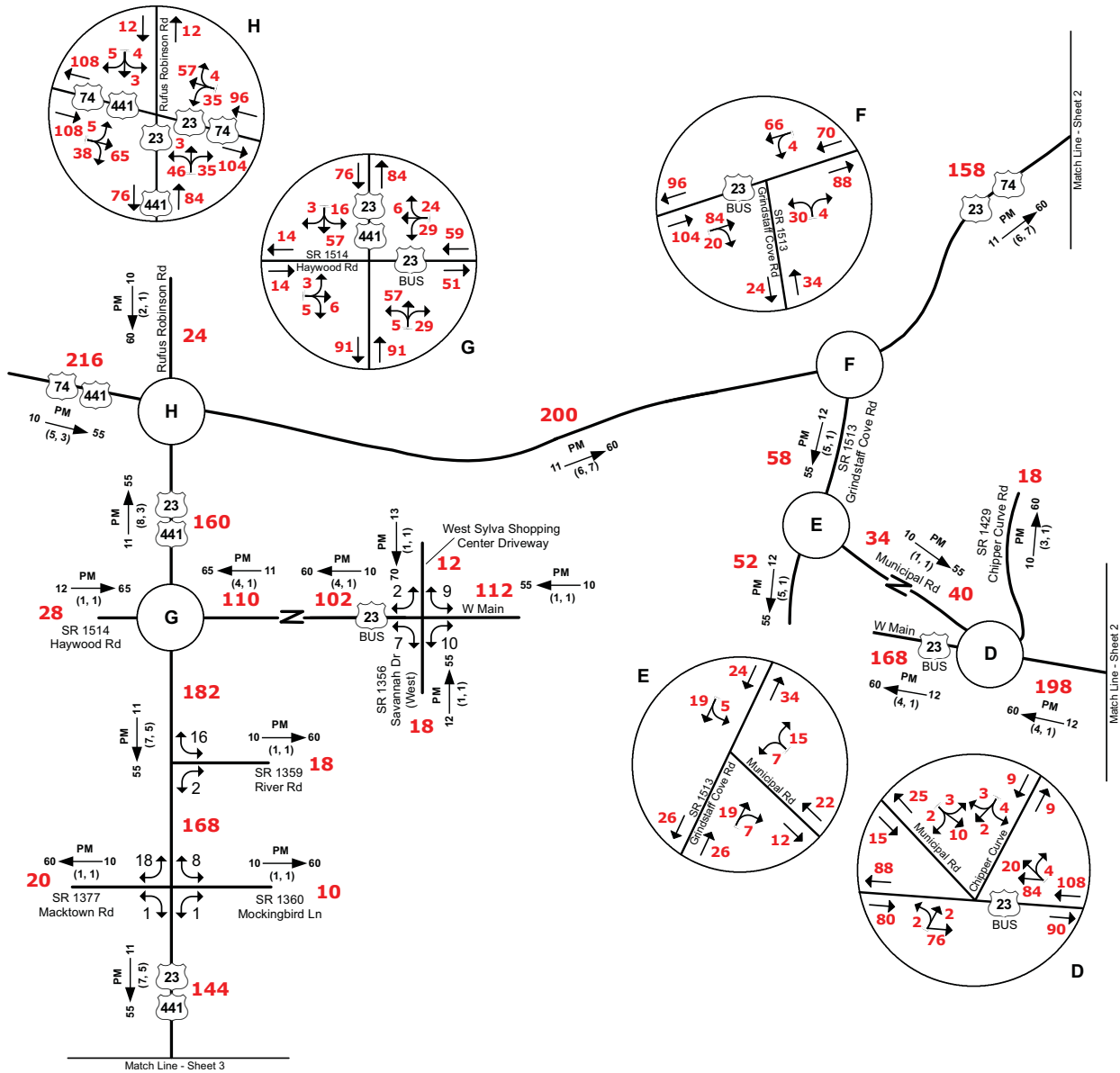


Diagram Not to Scale

2008 ANNUAL AVERAGE DAILY TRAFFIC
FS-0814A Alt WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES
Sheet 1 of 3

COUNTY: Jackson	WBS: 40106.1.1
------------------------	-----------------------

TIP: R-4745 DIV: 14 DATE: July 15, 2008
 ES-0814A

LOCATION: **US 23-74-441 & NC 107-116**

PROJECT: Sylva-Dillsboro Southern Loop

PREPARED BY: Keith G. Dixon



LEGEND

Number of Vehicles Per Day in 100s
1- Less Than 50 VPD
Turning Volume VPD

	PM	→	D
	DHV	(d, t)	
DHV	Design Hour Volume % = K30		
PM	PM Peak Period		
D	Peak Hour Directional Split %		
→	Direction of D %		
(d, t)	Duals %, TT-STs %		
<u>X</u>	Movement Prohibited		
<u> </u>	Bridge		

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop
 2008 FS-0814A Alt - Eastern Parallel Route
 Sheet 2 of 3

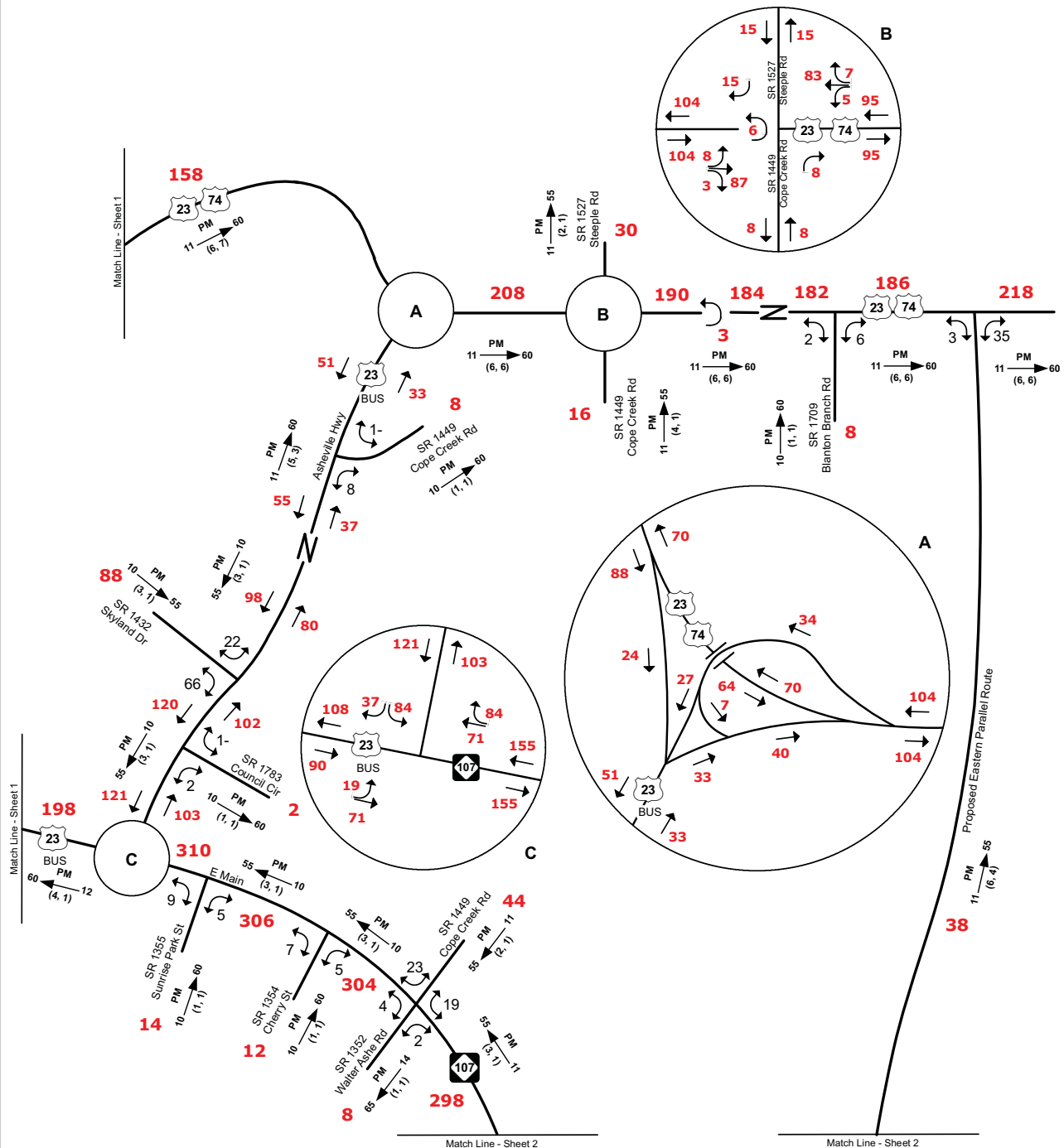


Diagram Not to Scale

2008 ANNUAL AVERAGE DAILY TRAFFIC	
FS-0814A ALT WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 2 of 3	
COUNTY: Jackson	WBS: 40106.1.1
TIP: R-4745	34263.1.1
DIV: 14	DATE: July 15, 2008
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop

2035 Alt 1 - Existing Alignment

Sheet 1 of 3

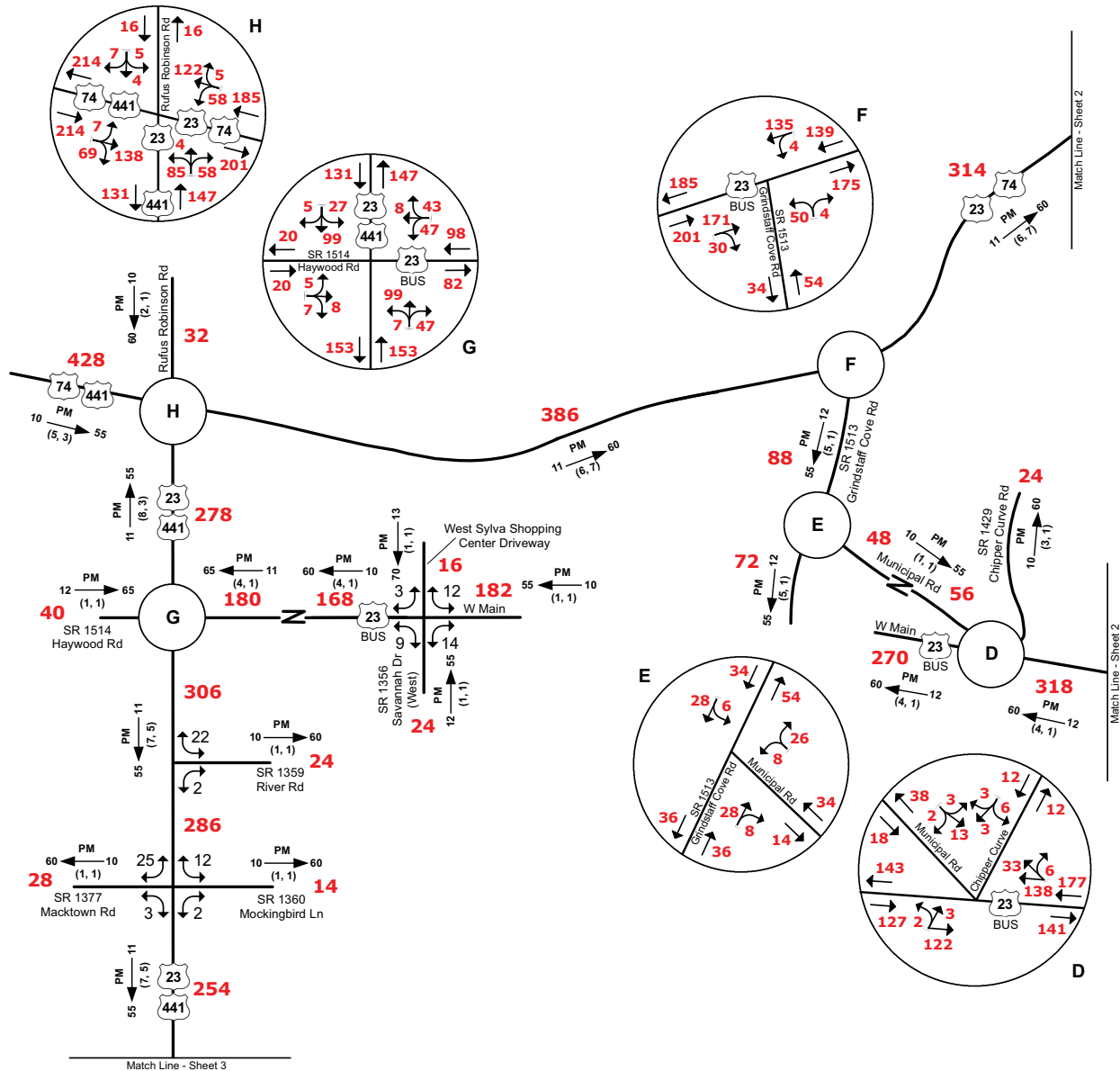


Diagram Not to Scale

2035 ANNUAL AVERAGE DAILY TRAFFIC	
ALT 1 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 1 of 3	
COUNTY: Jackson	WBS: 40106.1.1 34263.1.1
TIP: R-4745 FS-0814A	DIV: 14 DATE: July 15, 2008
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop
 2035 Alt 1 - Existing Alignment
 Sheet 2 of 3

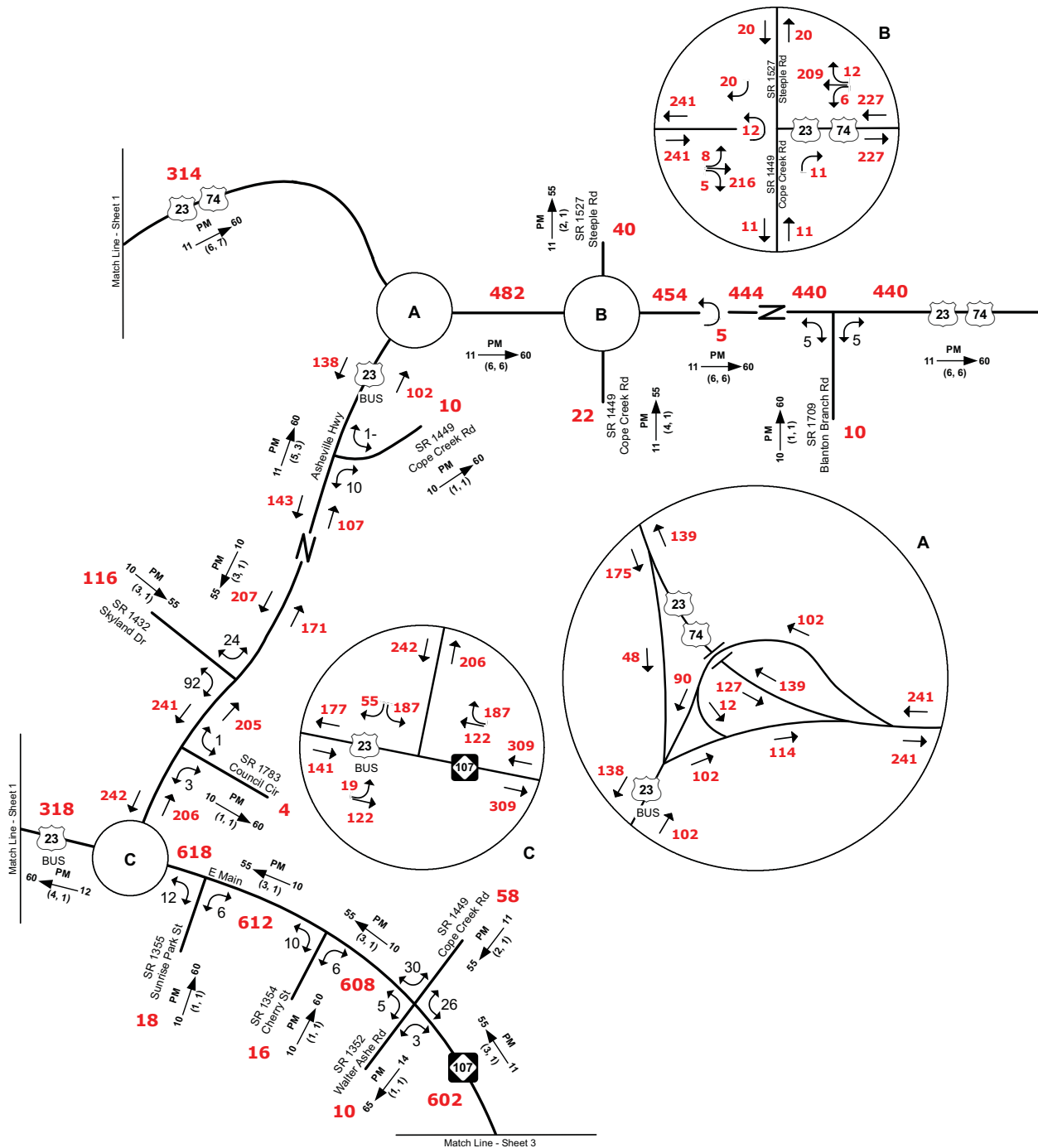
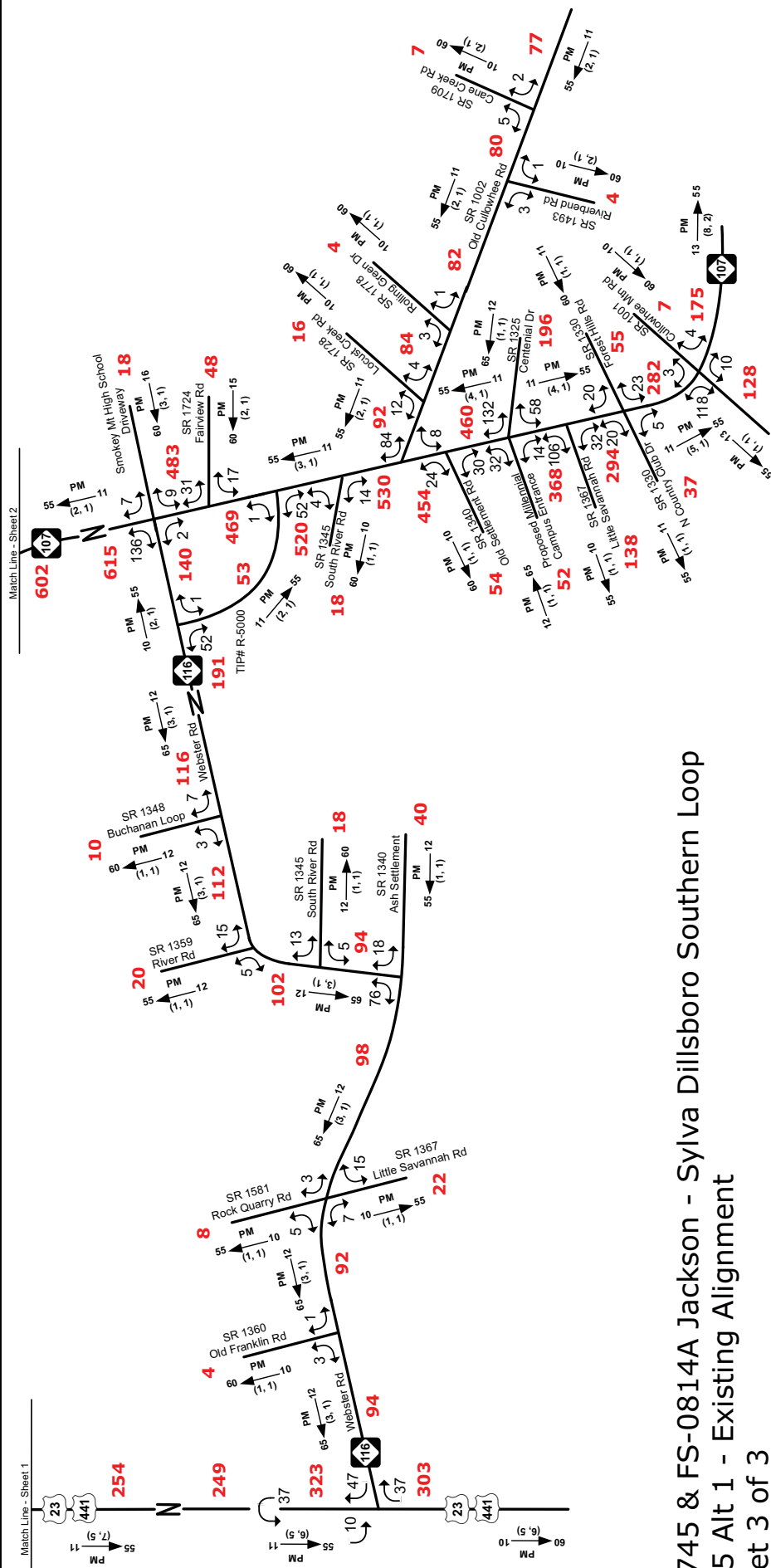


Diagram Not to Scale

2035 ANNUAL AVERAGE DAILY TRAFFIC	
ALT 1 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 2 of 3	
COUNTY: Jackson	WBS: 40106.1.1 34263.1.1
TIP: R-4745 FS-0814A	DIV: 14 DATE: June, 2008
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge

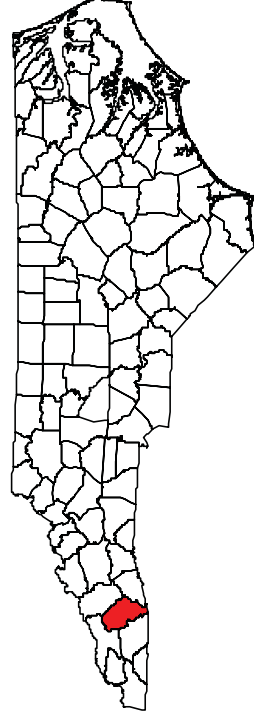


R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop
2035 Alt 1 - Existing Alignment
Sheet 3 of 3

2035
ANNUAL AVERAGE DAILY TRAFFIC
WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES
ALT 1
Sheet 3 of 3

COUNTY: Jackson		WBS: 40106.1.1 34263.1.1
TIP: R-4745 FS-0814A	DIV: 14	DATE: July 15, 2008
LOCATION: US 23-74-441 & NC 107-116		
PROJECT: Sylva-Dillsboro Southern Loop		

PREPARED BY: Keith G. Dixon



LEGEND

Number of Vehicles Per Day in 100s
1- Less Than 50 VPD
Turning Volume VPD

DHV $\xrightarrow{\text{PM}} \text{D}$
 Design Hour Volume = K30
 PM Peak Period
 Peak Hour Directional Split %
 Direction of D %
 Duals % TT-STs %
 Movement Prohibited
 Bridge



Diagram Not to Scale

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop

2035 Alt 2 - Eastern Connector Only

Sheet 1 of 3

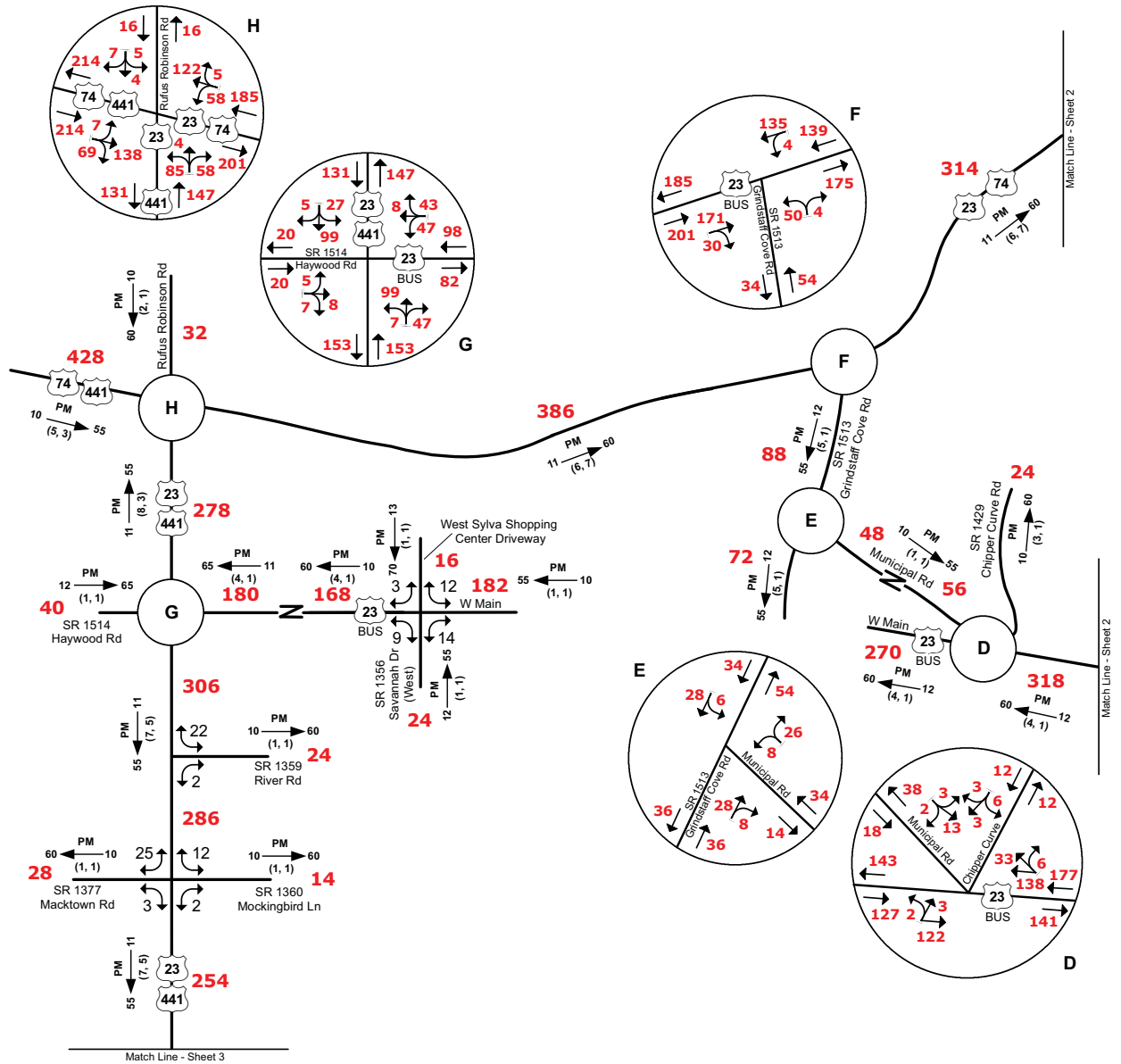


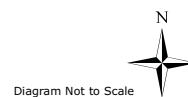
Diagram Not to Scale

2035 ANNUAL AVERAGE DAILY TRAFFIC	
ALT 2 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 1 of 3	
COUNTY: Jackson	WBS: 40106.1.1
TIP: R-4745	34263.1.1
FS-0814A	DIV: 14
DATE: July 15, 2008	
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge

Sheet 2 of 3



A map of North Carolina showing its county boundaries. Wayne County, located in the western part of the state, is highlighted in red.

Number of Vehicles Per Day in 100s
1- Less Than 50 VPD
Turning Volume VPD

$$\frac{PM}{DHW} \rightarrow D$$

$$(d, t)$$

DHV Design Hour Volume % = K30
PM PM Peak Period
D Peak Hour Directional Split %

$$\rightarrow$$

$$(d, t)$$

X Direction of D %
 Duals %, TT-STs %
 Movement Prohibited
 Bridge

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop

2035 Alt 3 - Sylva Dillsboro Southern Loop

Sheet 1 of 3

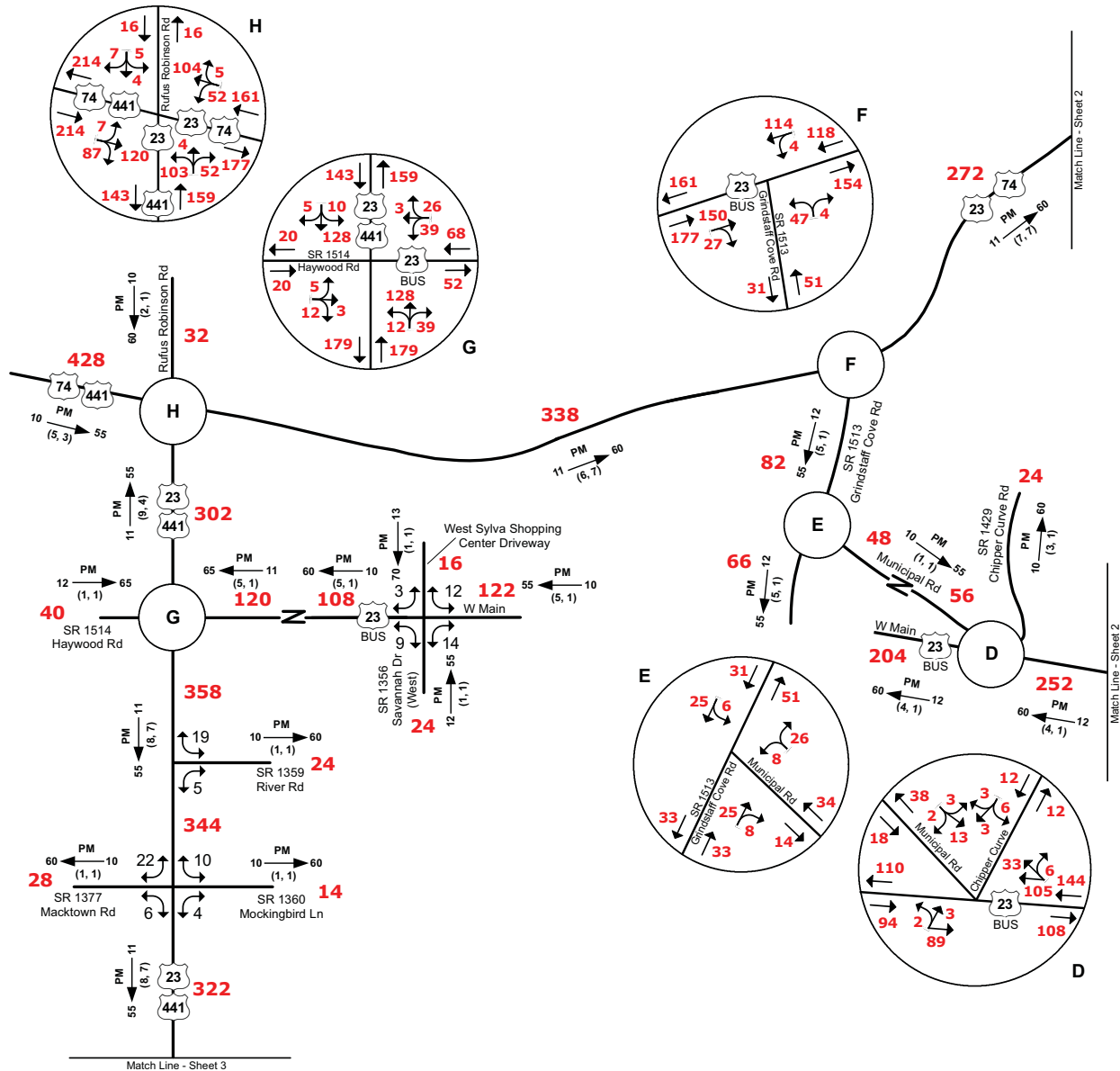
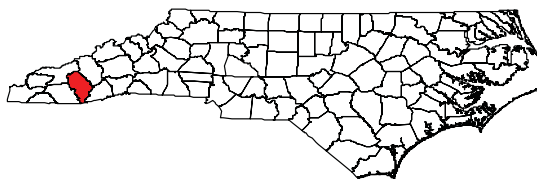


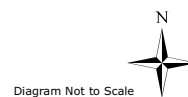
Diagram Not to Scale

2035 ANNUAL AVERAGE DAILY TRAFFIC	
ALT 3 WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES	
Sheet 1 of 3	
COUNTY: Jackson	WBS: 40106.1.1
TIP: R-4745	34263.1.1
FS-0814A	DIV: 14 DATE: July 15, 2008
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: Sylva-Dillsboro Southern Loop	
PREPARED BY: Keith G. Dixon	



LEGEND	
###	Number of Vehicles Per Day in 100s
1-	Less Than 50 VPD
###	Turning Volume VPD
DHV	Design Hour Volume % = K30
PM	PM Peak Period
D	Peak Hour Directional Split %
→	Direction of D %
(d, t)	Duals %, TT-STs %
X	Movement Prohibited
—	Bridge

Sheet 2 of 3



PROJECT: Sylva-Dillsboro Southern Loop
PREPARED BY: Keith G. Dixon



Number of Vehicles Per Day in 100s
1- Less Than 50 VPD
Turning Volume VPD

$\xrightarrow{\text{PM}}$
 $\text{DHV} \xrightarrow{(d,t)} \text{D}$

DHV Design Hour Volume % = K30
PM Peak Hour
D Peak Hour Directional Split %

$\xrightarrow{(d,t)}$

X Direction of D %
X Duals %, TT-STs %
X Movement Prohibited
X Bridge

R-4745 & FS-0814A Jackson - Sylva Dillsboro Southern Loop
2035 FS-0814A Alt - Eastern Parallel Route
Sheet 1 of 3

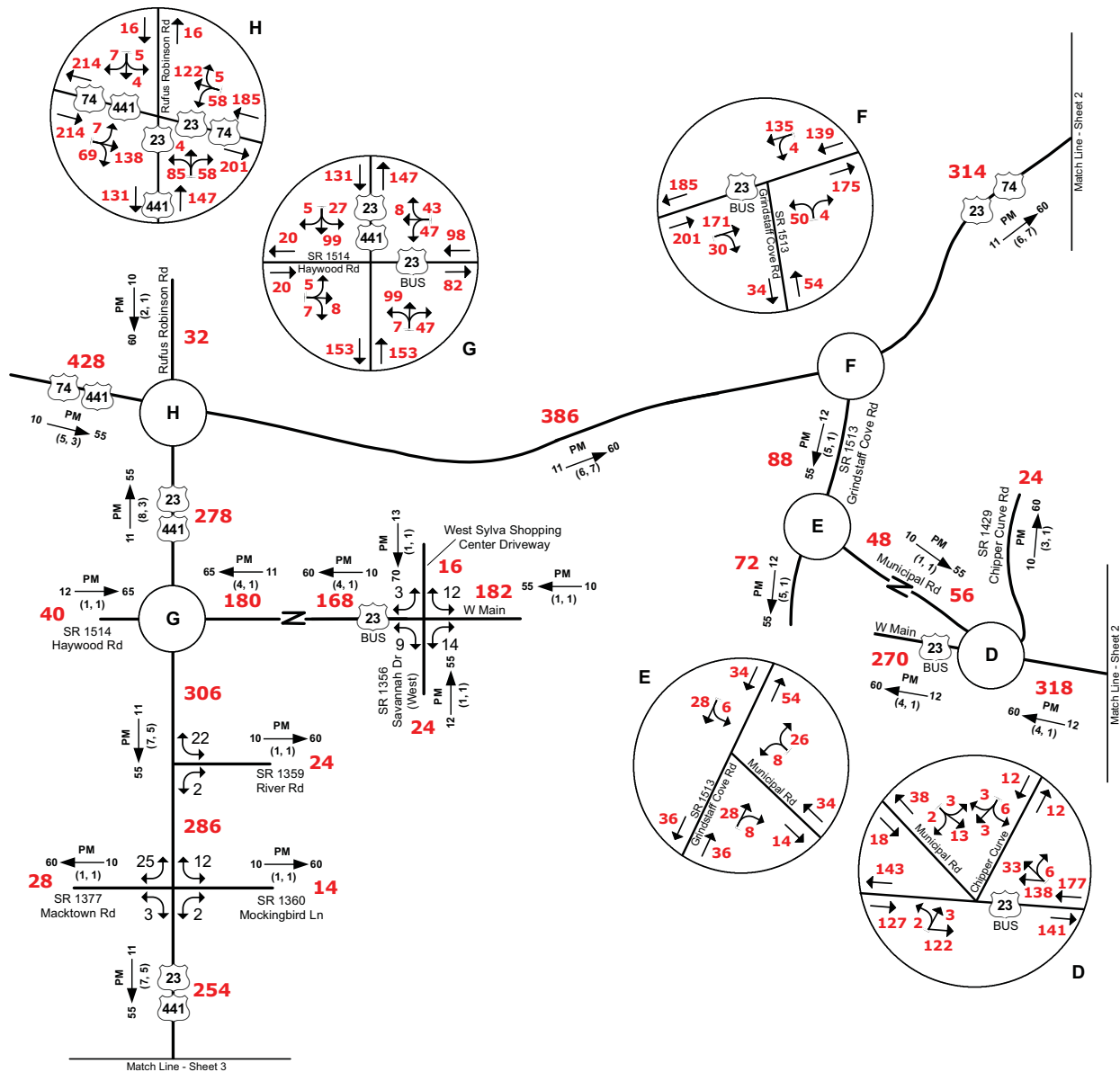


Diagram Not to Scale

2035 ANNUAL AVERAGE DAILY TRAFFIC
 FS-0814A ALT WITH TRUCK, DHV AND DIRECTIONAL PERCENTAGES
 Sheet 1 of 3

COUNTY: Jackson		WBS: 40106.1.1 34263.1.1
TIP: R-4745 FS-0814A	DIV: 14	DATE: July 15, 2008
LOCATION: US 23-74-441 & NC 107-116		

PROJECT: **Sylva-Dillsboro Southern Loop**
PREPARED BY: **Keith G. Dixon**



LEGEND

Number of Vehicles Per Day in 100s
 1- Less Than 50 VPD
 ### Turning Volume VPD

DHV \rightarrow PM
 (d, t) Design Hour Volume = K30
 PM Peak Period
 D Peak Hour Directional Split %
 \rightarrow (d, t) Direction of D %
 X Duals %, TT-STs %
 Movement Prohibited
 Bridge

Sheet 2 of 3



Diagram Not to Scale

A map of North Carolina showing its county boundaries. Wayne County, located in the western part of the state, is highlighted in red.

DHV $\xrightarrow[\text{(d, t)}]{\text{PM}}$ D
 Design Hour Volume % = K30
 PM Peak Period
 D Peak Hour Directional Split %
 $\xrightarrow[\text{(d, t)}]{\text{}}$ Direction of D %
 X Duals %, TT-STs %
 Movement Prohibited
 Bridge



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

June 18, 2009

MEMORANDUM TO: Ryan L. White, P.E.
Project Development and Environmental Analysis

FROM: Keith G. Dixon
Western Traffic Forecasting Group
Transportation Planning Branch

SUBJECT: Traffic Forecast for TIP R-4745
NC 107 Connector between US 23-74 east of Sylva
and NC 107 north of Cullowhee

Please find attached the 2009/2035 traffic forecast for TIP R-4745. This traffic forecast considers three alternatives, a No Build alternative and two bypass alternatives. Alternative 1 consists of the NC 107 Connector, which will provide a 2-lane, controlled-access, freeway that connects US 23-74 east of Sylva with NC 107 north of Cullowhee. Alternative 2 consists of the Eastern Parallel Route, which will provide a 2-lane, controlled-access, freeway that connects US 23-74 east of Sylva with SR1002-Old Cullowhee Rd north of Cullowhee. This project does not lie within an MPO area.

A 2008/2035 traffic forecast for R-4745, which included the NC 107 Connector and the Eastern Parallel Route, was produced by Keith G. Dixon and delivered to Ryan L. White, PE, of PDEA, and Derrick Lewis, PE, of Feasibility Studies, on July 15, 2008. This forecast is an update of the NC 107 Connector and Eastern Parallel Route portions of the previous 2008/2035 forecast for R-4745 and replaces that forecast. This forecast was prepared utilizing the new Jackson County model, prepared by Parsons Brinkerhoff (PB) and available as of January 29, 2009.

Due to the use of the new Jackson County model in this update, 2035 traffic volume estimates are approximately 25% to 40% lower than in the previous traffic forecasts. Previous 2035 traffic volumes were estimated primarily through a linear regression analysis of historic traffic counts. In this update, 2035 traffic volumes were estimated primarily based upon SE data growth estimates developed by the NCDOT Transportation Planning Branch in coordination with the Southwestern RPO with input from Jackson County officials and approved by the Jackson County Transportation Task Force.

Jackson County Planner, Tony Elders, NCDOT Southwestern RPO Coordinator, Cooper Sellers, and NCDOT Transportation Planning Engineer, Pam Cook, were consulted during the development of this forecast.

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH
1554 MAIL SERVICE CENTER
RALEIGH NC 27699-1554



<http://ncdot.org/doh/preconstruct/tpb/>

LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH, NC 27601
Phone: 919-733-4705
Fax: 919-733-2417

The following diagrams are attached:

- 2009 No Build – Sheets 1-1 and 1-2
- 2035 No Build – Sheets 2-1 and 2-2
- 2009 Alternative 1 – NC 107 Connector – Sheets 3-1 and 3-2
- 2035 Alternative 1 – NC 107 Connector – Sheets 4-1 and 4-2
- 2009 Alternative 2 – Eastern Parallel Route – Sheets 5-1 and 5-2
- 2035 Alternative 2 – Eastern Parallel Route – Sheets 6-1 and 6-2

Certain Assumptions were made during the development of this forecast.

Fiscal Constraint:

All 2035 traffic forecasts include TIP R-5000, which concerns a 0.5 Mile connector between NC 116 and NC 107 located just east of Webster. R-5000 is currently scheduled to be completed in 2012 according to the 2009-2015 STIP.

TIP R-4745 is currently unfunded in the 2009-2015 STIP.

No other projects in the 2009-2015 STIP affect this forecast.

Development Activity:

All 2035 traffic forecasts include the Western Carolina University Millennial Initiative Program development. This new development will provide new classrooms and other facilities for 6,500 additional students. This development is included in the SE data used with the Jackson County model.

Forecast Methodology:

The Jackson County model was a primary tool used in this forecast along with 2009 traffic counts and historic AADT data from 1983 to 2007.

Due to the restriction of left turns from US 23 Bus onto US 23-74, a directional traffic volume imbalance exists along US 23 Bus and US 23-74. In order to account for this imbalance, directional turning movements were provided at the affected intersections.

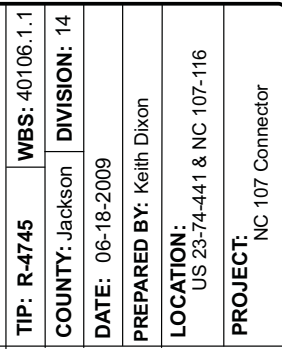
If it is determined that any of these assumptions have become inconsistent with the project and surrounding area activity, please request updated projections at this location.

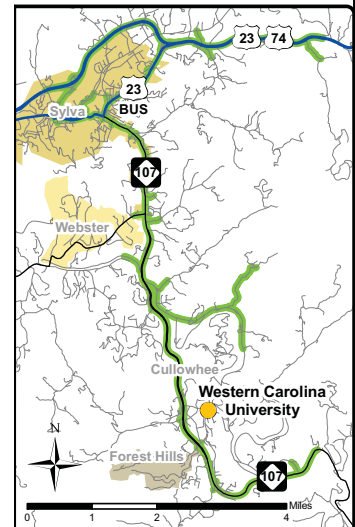
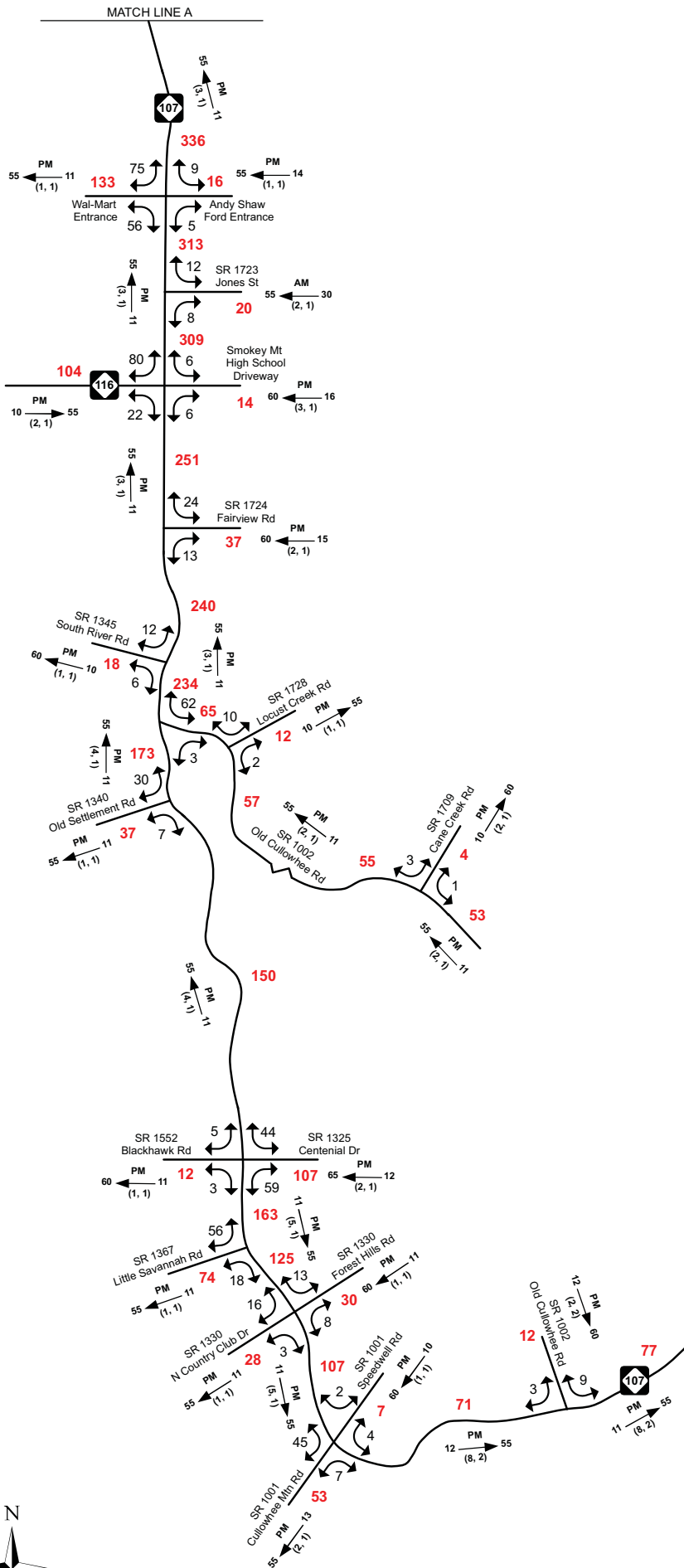
The use of straight-line interpolation to estimate AADT for years between 2009 and 2035, or straight-line extrapolation to estimate AADT for up to 2 years beyond 2035, is acceptable.

If we can be of any further assistance on this project please do not hesitate to contact me at 715-5482x364, email: kdixon1@ncdot.gov or Michael Orr, AICP, at 715-5482 x372, email: mlorr@ncdot.gov

CC (with Attachments):

Jay Bennett, PE, Highway Design Branch
Sarah Smith, PE, Transportation Planning Branch
Deborah Hutchings, PE, Transportation Planning Branch
James Dunlop, PE, Congestion Management Section
Don Chen, PE, Pavement Management
Faith Baxter Stuart, Geographic Information Systems Unit
File Copy: R-4745 Jackson County





2009 ANNUAL AVERAGE DAILY TRAFFIC

**No Build
SHEET 1 - 2**

LEGEND

- ### No. of Vehicles Per Day (VPD) in 100s
 1- Less than 50 VPD
 X Movement Prohibited
 --- Roadway
 DHV Design Hourly Volume
 PM PM Peak Period
 D Peak Hour Directional Split
 Indicates Direction of D
 (d,t) Duals, TT-STs (%)

TIP: R-4745

WBS: 40106.1.1

COUNTY: Jackson

DIVISION: 14

DATE: 06-18-2009

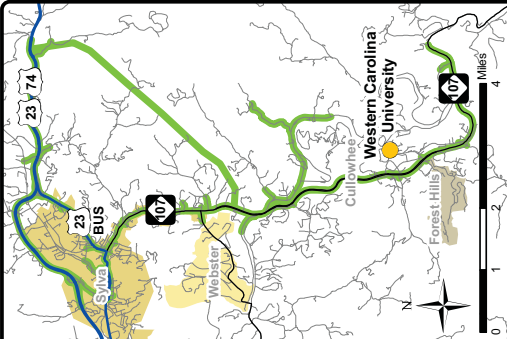
PREPARED BY: Keith Dixon

LOCATION:

US 23-74-441 & NC 107-116

PROJECT:

NC 107 Connector



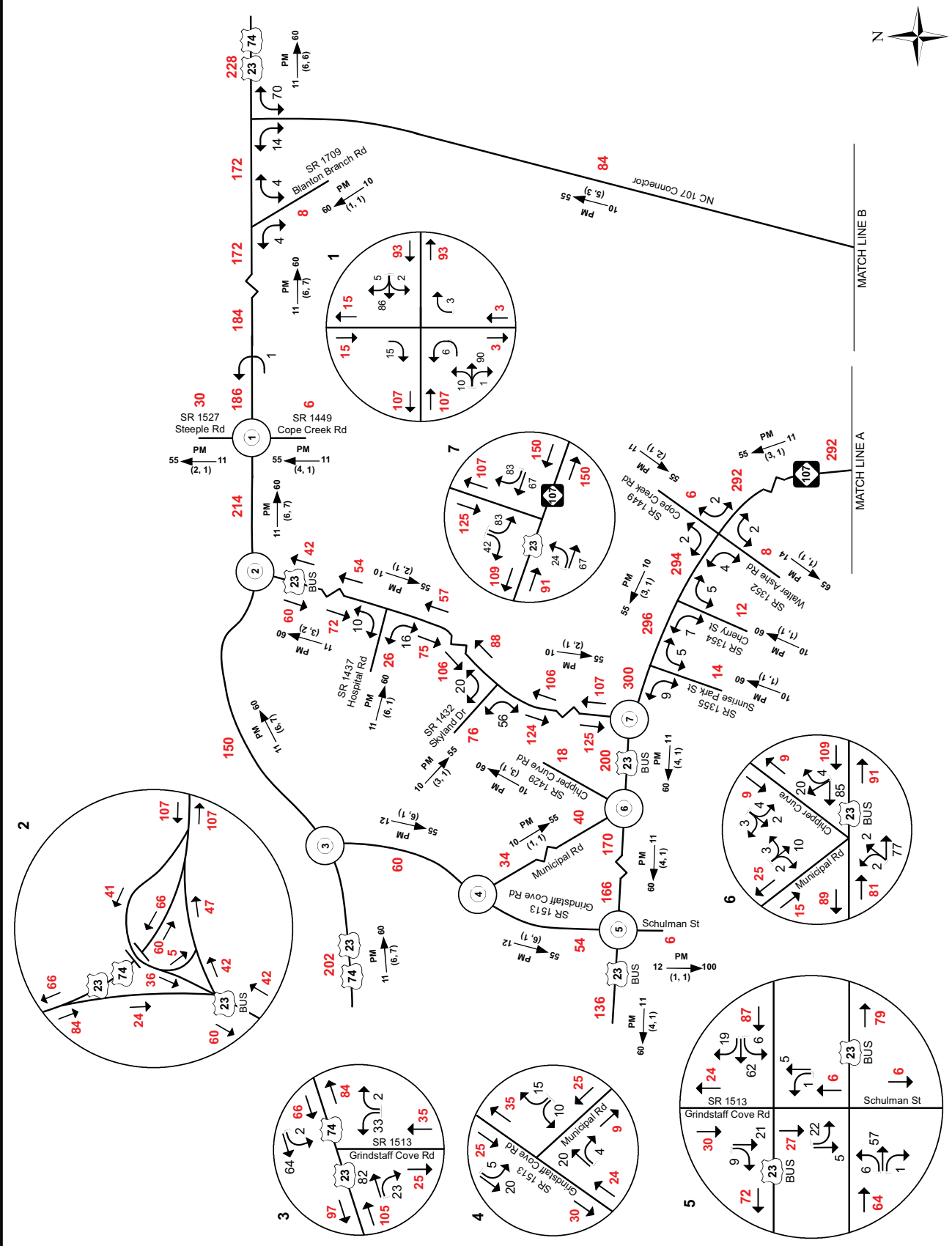
2009

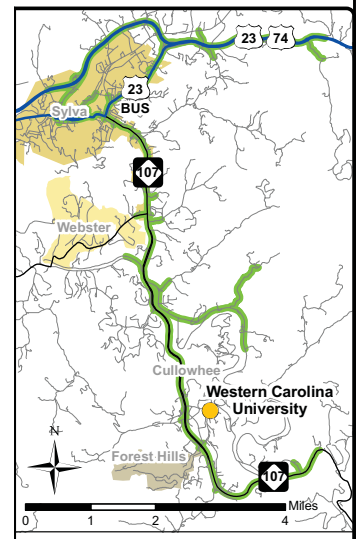
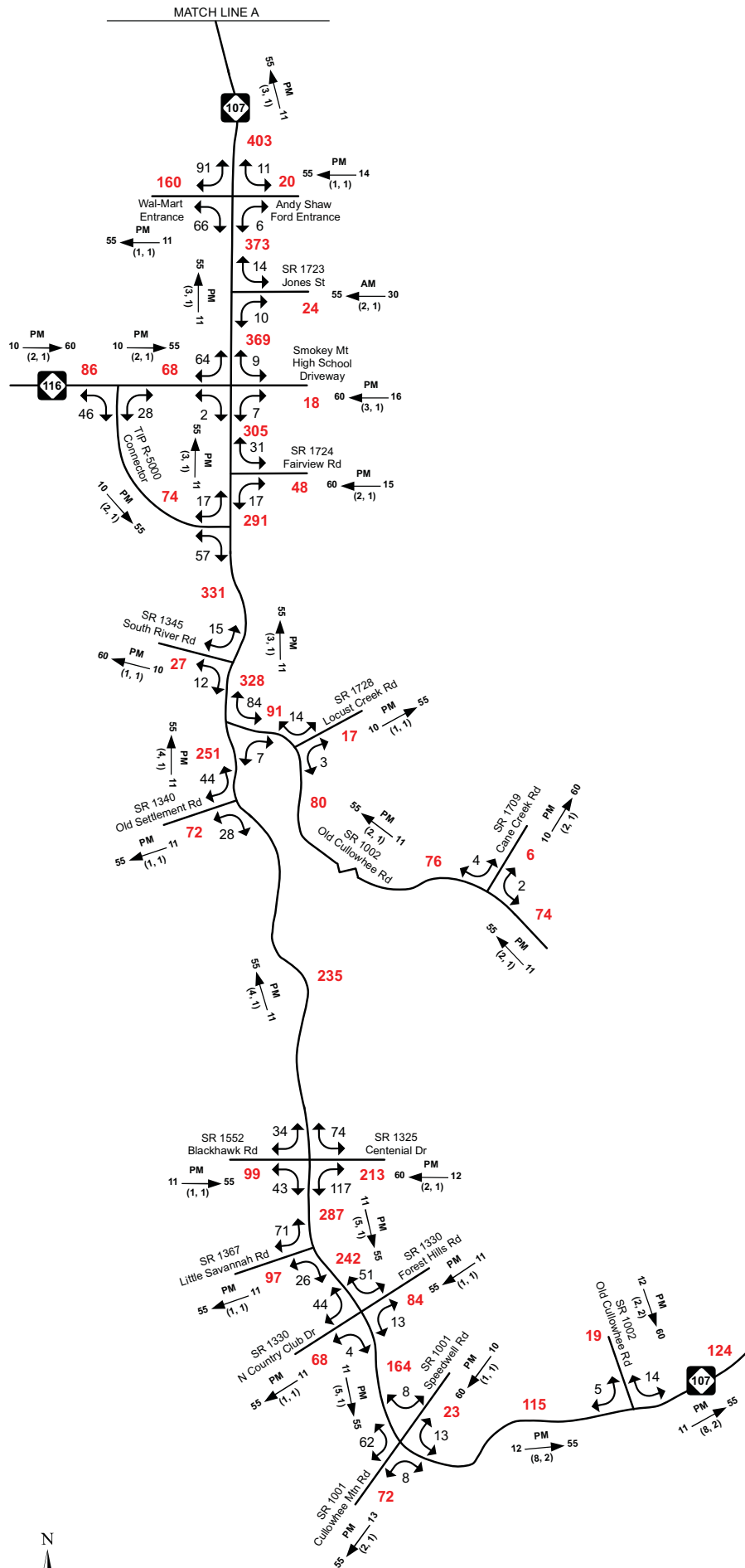
ANNUAL AVERAGE
DAILY TRAFFIC
Alternative 1
NC 107 Connector
SHEET 3 - 1

LEGEND

###	No. of Vehicles Per Day (VPD) in 100s
1-	Less than 50 VPD
X	Movement Prohibited
DHV	Roadway Design Hourly Volume
PM	PM Peak Period
D	Peak Hour Directional Split
(d.t)	Indicates Direction of D
	Duals, TT-STs (%)

TIP: R-4745	WBS: 40106.1.1
COUNTY: Jackson	DIVISION: 14
DATE: 06-18-2009	
PREPARED BY: Keith Dixon	
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: NC 107 Connector	





2035 ANNUAL AVERAGE DAILY TRAFFIC

No Build SHEET 2 - 2

- ### LEGEND
- ### No. of Vehicles Per Day (VPD) in 100s
 - 1- Less than 50 VPD
 - X Movement Prohibited
 - Roadway
 - DHV Design Hourly Volume
 - PM PM Peak Period
 - D Peak Hour Directional Split
 - Indicates Direction of D
 - (d,t) Duals, TT-STs (%)

TIP: R-4745	WBS: 40106.1.1
COUNTY: Jackson	DIVISION: 14
DATE: 06-18-2009	
PREPARED BY: Keith Dixon	
LOCATION: US 23-74-441 & NC 107-116	
PROJECT: NC 107 Connector	

