This is the Final Report for the Washington County Thoroughfare Plan. It provides: 1) inventory of the existing transportation system in rural Washington County, Tennessee; 2) a review of relevant socioeconomic information; and, 3) recommended actions and projects.

Washington County Thoroughfare Plan

Final Report

By:
The Corradino Group

For:
Tennessee Department of Transportation
Long Range Transportation Division &
Washingon County Highway Department, TN

March 2015

Executive Summary

This Final Report for the Washington County Thoroughfare Plan presents recommended actions and projects through the horizon year of 2040 for roads under the jurisdiction of the Washington County Highway Department (WCHD). The WCHD maintains nearly 800 miles of County Roads. These are roads in Washington County that are not within the city limits of Johnson City or Jonesborough.

This Thoroughfare Plan represents proposed projects that the WCHD considers a priority. The emphasis of the plan is connectivity and safety. Connectivity and safety mean better roads with fewer horizontal and vertical deficiencies, more moderate curves, wider lanes, and shoulders. Technical analysis for this Plan was provided in Technical Memorandum # 1, Transportation System Inventory, which covered:

- The existing transportation network;
- Existing and future Average Annual Daily Traffic;
- Roadway and intersection Level of Service;
- Crashes and safety;
- Planned safety projects; and,
- Projects on the Long Range Plan and Transportation Improvement Program of the Johnson City Metropolitan Transportation Planning Organization.

Technical Memorandum # 2 provided a socioeconomic background with information on:

- Population, employment, median income, and commuting patterns;
- Land use and zoning, plus considerations related to historic resources, parks, floodplains, wetlands, and, water and sewer service.

The WCHD has identified eleven roadway improvement projects for inclusion in the Washington County Thoroughfare Plan. Five are County Road projects and six are suggested improvements to State Routes. The eleven proposed roadway improvement projects are listed, in priority order, in **Table ES.1: Construction Cost Estimate Summary**. A range of estimated construction cost is provided for each project. It is estimated that suggested improvements to County Roads will cost between $35 and $85 million and that suggested improvements to State Routes will cost between $140 and $282 million, in Year 2015 Dollars.

These proposed projects anticipate continued growth of the Gray area, north of I-26 near State Route 75; near the Daniel Boone High School and to its east, over to State Route 354; and, in the southwest county accessed by State Route 81 and State Route 107. Growth is anticipated in the southwest county in part because sewer and water lines have been extended along State Route 34 (US11E) to the Washington County Industrial Park.

TABLE ES.1: CONSTRUCTION COST ESTIMATE SUMMARY

County Roads

ID	Route	Length (Miles)	Estimated Cost (2015)	
			From	To
1C	Old Gray Station Road/Center Street/Ruritan Drive	1.38	**$ 7,701,000**	**$ 12,608,000**
2C	Highland Church Road/Knob Creek Road Connector - Option A	0.40	**$ 1,227,000**	**$ 3,353,000**
2C	Highland Church Road/Knob Creek Road Connector - Option B	0.43	**$ 1,311,000**	**$ 3,604,000**
3C	Highland Church Road/Shadden Road	4.99	**$ 16,641,000**	**$ 43,038,000**
4C	Old Gray Station Road	2.00	**$ 6,939,000**	**$ 17,249,000**
5C	Roy Martin Road Connector	0.74	**$ 2,255,000**	**$ 8,991,000**
Total County Roads:		9.94	**$ 34,763,000**	**$ 85,490,000**

State Routes

ID	Route	Length (Miles)	Estimated Cost (2015)	
			From	To
1S	State Route 75 (at Daniel Boone High School)	0.62	**$ 3,279,000**	**$ 7,437,000**
2S	State Route 75 (from State Route 81 to Hugh Cox Road)	4.95	**$ 27,489,000**	**$ 53,902,000**
3S	State Route 107	5.98	**$ 17,346,000**	**$ 19,644,000**
4S	State Route 81 (from State Route 107 to Jonesborough)	4.32	**$ 24,653,000**	**$ 51,056,000**
5S	State Route 81 (from Jonesborough to I-81)	11.20	**$ 60,151,000**	**$132,368,000**
6S	State Route 81 (from Unicoi County to the Nolichucky River)	1.49	**$ 7,405,000**	**$ 17,610,000**
Total State Routes:		28.56	**$140,323,000**	**$282,017,000**

(Calculated 2013, Updated 2014)

Table of Contents

Figures

Tables

Appendix A

Appendix B

Appendix C

1.0 INTRODUCTION

This Final Report for the Washington County Thoroughfare Plan presents recommended actions and projects through the horizon year of 2040 for roads under the jurisdiction of the Washington County Highway Department (WCHD). The study area includes all of Washington County outside the city limits of Johnson City and Jonesborough. Washington County's location is shown in **Figure 1.1 Vicinity Map**. This Final Report includes, by reference. Technical Memoranda # 1 and # 2. These reports are provided on a computer disk in a sleeve on the back cover of this report. Technical Memorandum # 1 described the existing roadway network and multi-modal facilities, plus existing and design-year traffic, existing and design-year capacity, and safety conditions for the entire study area. Technical Memorandum # 2 included population and employment information, and the relationship of these to infrastructure - such as water and sewer services within the study area. The recommendations present in this Final Report for the Washington County Thoroughfare Plan are based, in part, on the data presented in these technical memoranda.

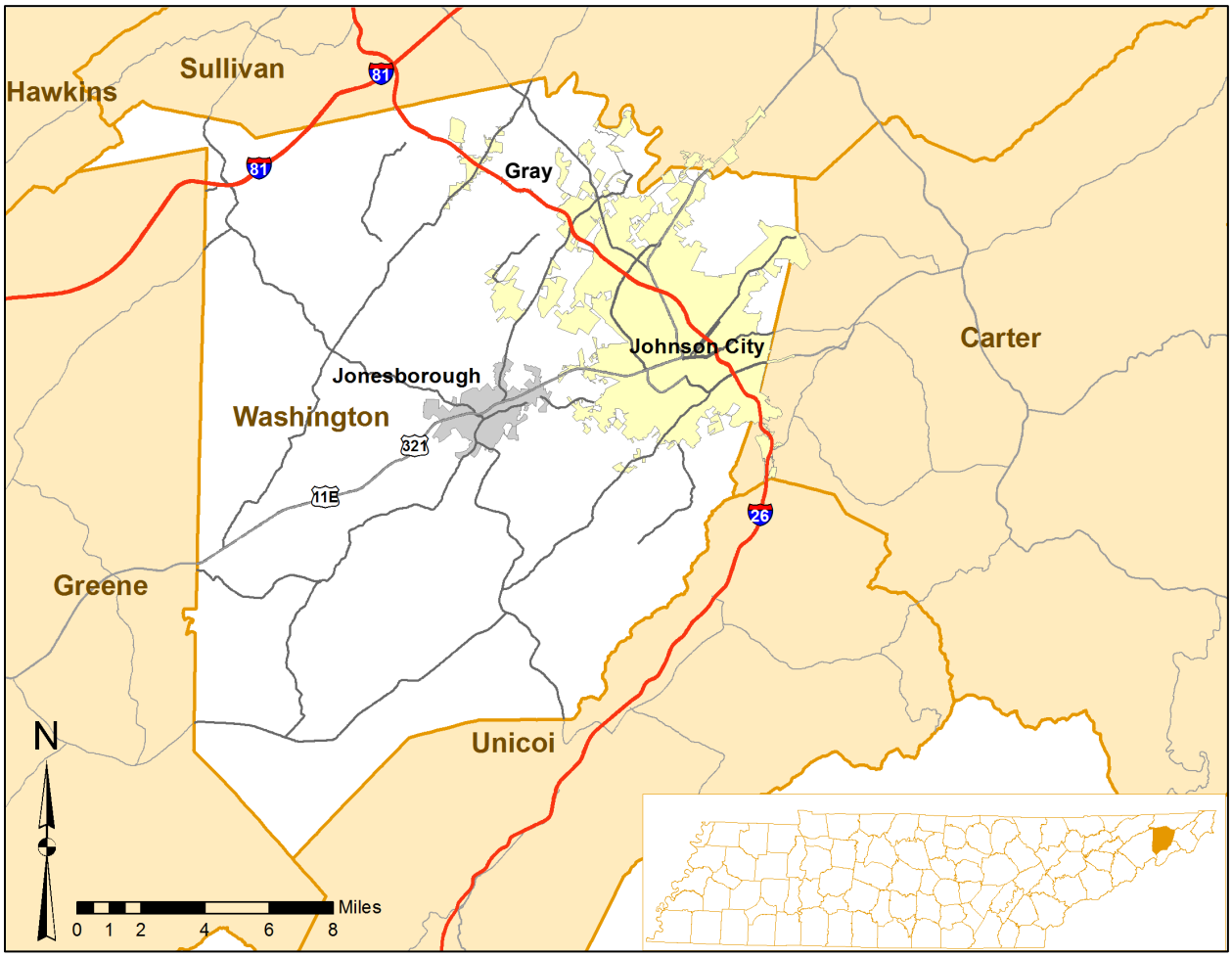


FIGURE 1.1: VICINITY MAP
Source: The Corradino Group

All study area roads with a functional classification[1] of collector and above, excluding the Interstate system, have been reviewed in this Thoroughfare Plan - over two hundred and sixty four (264) centerline miles of roadway. Interstates are excluded because improvements along these routes generally originate from the State or relevant Metropolitan Planning Organization, not from the County. Almost all Interstate mileage is within areas annexed by the city of Johnson City. Only about four miles of I-81 are outside city limits in northwest Washington County.

The Washington County Thoroughfare Plan represents a comprehensive transportation planning document for the rural portion of the County, including the State and County maintained road systems, as prioritized by the WCHD. The proposed projects herein are consistent with the long range planning process of the Johnson City Metropolitan Transportation Planning Organization (JCMTPO) and the Kingsport Metropolitan Transportation Planning Organization (KMTPO). JCMTPO is responsible for planning for the urbanized portion of Washington and Carter counties, as well as part of the Town of Unicoi. KMTPO covers a small portion of northern Washington County. Each MTPO also considers planning in the area likely to become urbanized.

The purpose of the Washington County Thoroughfare Plan is to establish a realistic set of multi-modal transportation improvements that can be prioritized and programmed as funding becomes available between now and the design year of 2040 for rural Washington County. Analysis has taken into account where growth is occurring and where it is expected to occur. During the development of this Thoroughfare Plan, the JCMTPO was completing its own long range plan. For that plan, socioeconomic data were developed to generate the trip table for the travel demand modeling process. Socioeconomic data were developed by the JCMTPO for all of Washington County. So, those data were used in the Thoroughfare Plan for consistency. Additionally, the Thoroughfare Plan examined and mapped additional development drivers, including sewer and water lines. Discussions were also held with officials such as the Mayor of Jonesborough, the Director of the Washington County Economic Development Council, and Washington County Commissioners to discuss economic development opportunities within the county.

As growth occurs, and especially as roads are upgraded, it is recommended that bicycle/pedestrian improvements be incorporated into the planning and design of the roadways.

Access management is a way to reduce crashes and accommodate traffic with minimal capital input. Access management is the systematic control of the location, spacing, design, and operation of driveways and street connections to a roadway. It is included as a tool for managing traffic growth (see **Section 6.1**). Access management is included in Washington County's Zoning Ordinance, which applies to the county, outside city limits, and specifies land uses and densities throughout.

[1] Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of traffic service they are intended to provide. Exclusive of the Interstate system, there are three highway functional classifications: arterial, collector, and local roads. All roads are grouped into one of these classes, depending on the character of the road, traffic (i.e., local or long distance), and the degree of land access allowed. The functional classes here are drawn from TDOT's database.

2.0 SOCIOECONOMIC BACKGROUND

Socioeconomic analysis was presented in Technical Memorandum # 2, which is available on disk at the back of this report. Key points are summarized here.

The Johnson City Metropolitan Transportation Planning Organization (JCMTPO) recently completed its own long range plan, which covered its entire planning area, including much of Washington County. Washington County is a member of the JCMTPO. The travel demand model used to support the planning included all of Washington County as part of that process. Socioeconomic data for all of Washington County were developed by JCMTPO. Those data were used in this Thoroughfare Plan to determine growth areas, which are concentrated along the borders of Johnson City.

One area not yet annexed is Gray, which lies to the north of I-26 and west of State Route 75. That area, home to the County Fairgrounds and Armory, also contains a landlocked parcel owned by Johnson City to which an access road is now being built. There is an elementary school there and the area has experienced some of the largest increases in population and employment in the county in the last ten years.

In addition to areas of growth at the edges of Johnson City and Jonesborough, there is potential in the south county for growth due to the presence of the Washington County Industrial Park, to which sewer and water lines have been extended. The industrial park is located just west of Jonesborough and has direct access to State Route 34 (US 11E), which, in-turn, accesses I-81 via State Route 81. The presence of water and sewer is a strong factor in development decisions. For example, a greater density of development is allowed if public sewers are present. In agriculturally zoned areas, the number of dwelling units allowed by the Washington County zoning code is one-per-acre without sewers and three-per-acre with sewers. And, there is a new elementary school just to the west of the industrial park, which is an attraction for residential growth.

2.1 POPULATION

The population of the study area, meaning Washington County outside Johnson City and Jonesborough, was based on data from the JCMTPO transportation model. For the transportation modeling process, the JCMTPO allocates population and employment to Traffic Analysis Zones (TAZs), which are closely matched to US Census units, but do not conform to the boundaries of Johnson City and Jonesborough. Therefore, TAZs along the edges of the two cities were examined individually to allocate the population and employment of each TAZ between the part within a city's boundaries and the part outside city boundaries (and therefore within the study area). **Table 2.1: Population Growth in Study Area vs. Fringe Areas** shows the result. **Table 2.2** shows that the study area is expected to grow at about the same rate as the entire county – 24 percent versus 22 percent for Washington County.

TABLE 2.1: POPULATION GROWTH IN STUDY AREA VS. FRINGE AREAS

	2010 Population	2040 Population	Growth
Fringe TAZs	10,114	13,727	36%
Fully Rural TAZs	41,622	50,533	21%
Study Area Total	51,736	64,260	24%

Sources: JCMTPO and The Corradino Group.

TABLE 2.2: WASHINGTON COUNTY AND STUDY AREA POPULATION
(Study Area = Washington County less Johnson City and Jonesborough)

	Washington County Population	% Growth from Previous Period	Study Area Population	% Growth from Previous Period
2010	122,979	15%	51,736	NA
2040	150,611	22%	64,260	24%

[a] Based on 2040 LRTP Transportation Analysis Zone data (see text).
Sources: JCMTPO, US Census, Woods and Poole, Inc., and The Corradino Group.

This population allocation process shows that the fringe areas are forecast by the MTPO to grow at a higher rate than the fully rural portion of Washington County. This is reasonable as the urban areas expand.

Figure 2.1: Population Change 2010 to 2040 shows the increase in population anticipated between 2010 and 2040. Darker shading indicates areas of greatest growth. The absolute numbers for each TAZ are shown, so the reader can see whether the high growth in a TAZ truly reflects substantive growth, or merely a large percentage growth where there are few residents. It is clear that the fastest growing areas (greater than 50 percent) are in the Gray area, north of Johnson City, and between Johnson City and Jonesborough. Areas of moderate growth (20 to 50 percent) by 2040 ring the two cities. Two growth areas removed from the city fringes are in the southwest quadrant of I-81 and I-26 and in the south county along State Route 107.

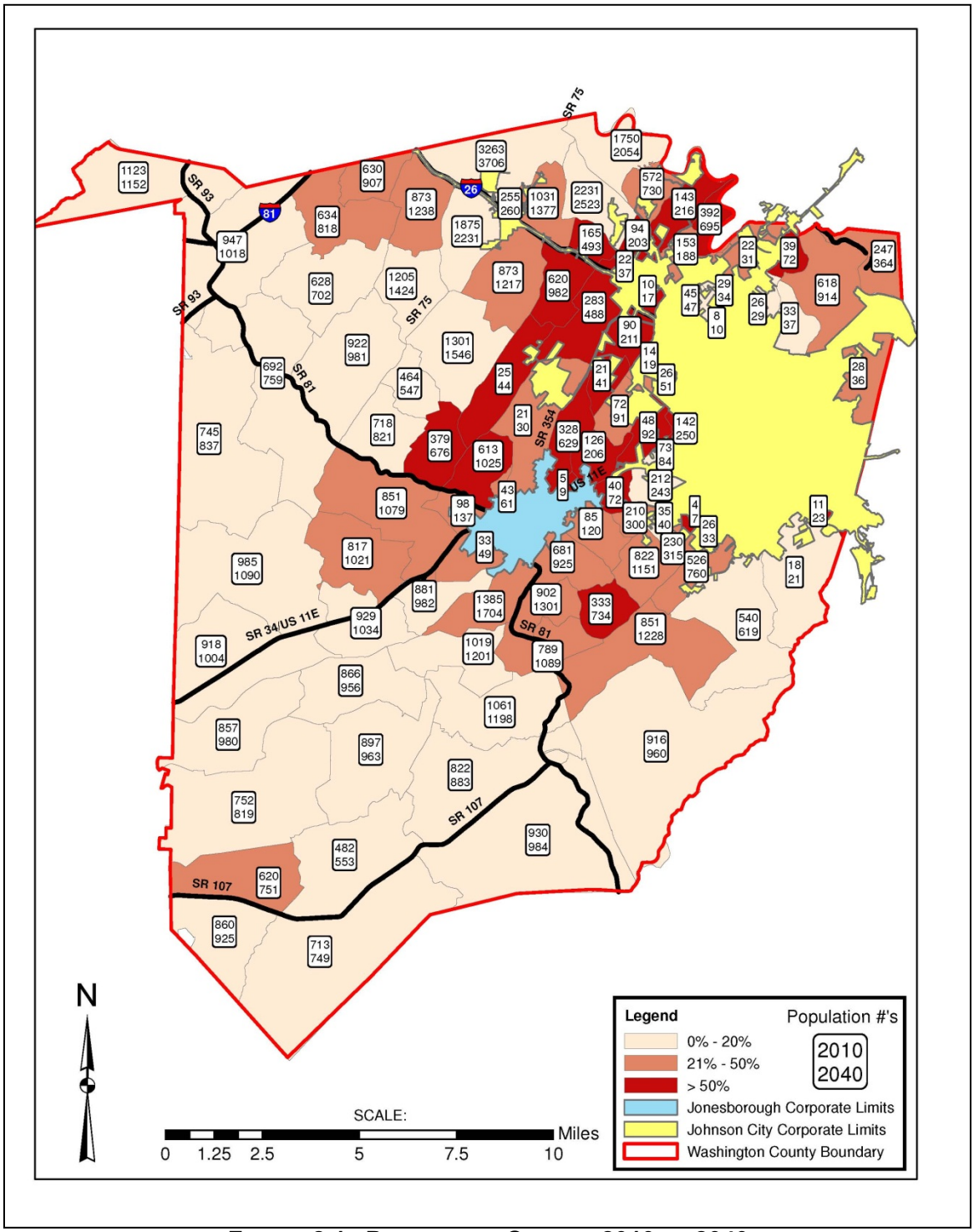


FIGURE 2.1: POPULATION CHANGE 2010 TO 2040
Sources: JCMTPO, US Census, Woods and Poole, Inc., and The Corradino Group

2.2 EMPLOYMENT

Table 2.3: Washington County and Study Area Employment shows job data for all of Washington County and for the study area. Robust employment growth in Washington County is projected by the JCMTPO. Whereas population is expected to increase in the county by 22 percent between 2010 and 2040, employment is expected to grow at more than double that, 46 percent. Based on the proration of employment to either the cities or study area, the employment of the study area is projected to increase at a greater rate than the overall county, 127 percent. This strong increase in jobs is important in terms of transportation as more jobs mean more work trips and more vehicles on the road.

TABLE 2.3: WASHINGTON COUNTY AND STUDY AREA EMPLOYMENT
(Study Area = Washington County less Johnson City and Jonesborough)

	Washington County Employment	% Growth from Previous Period	Study Area Employment [a]	% Growth from Previous Period
2010	65,892	10%	4,467	NA
2040	96,013	46%	10,136	127%

[a] Based on 2040 LRTP Transportation Analysis Zone data.
Sources: JCMTPO, US Census, Woods and Poole, Inc., and The Corradino Group.

The analysis of employment by TAZ shows the strongest growth in the fringe areas around Johnson City and Jonesborough (**Table 2.4: Employment Growth in Study Area vs. Fringe Areas**). This is logical as jobs tend to concentrate in built-up areas.

TABLE 2.4: EMPLOYMENT GROWTH IN STUDY AREA VS. FRINGE AREAS

	2010 Employment	2040 Employment	Growth
Fringe TAZs	1,362	3,980	192%
Fully Rural TAZs	3,105	6,156	98%
Study Area Total	4,467	10,136	127%

Sources: JCMTPO and The Corradino Group.

Figure 2.2: Employment Change 2010 to 2040 shows the relative job growth of the TAZs in the study area. Growth will occur throughout the county. Referring to the data in the boxes, it can be seen that absolute job growth is anticipated to be strongest in Gray, along I-26, and in the TAZ southwest of Jonesborough that is home to the Washington County Industrial Park.

Census data examined in the socioeconomic analysis show the number of people in 2010 coming into Washington County to work (33,888) is much greater than the number of Washington County residents who leave the County for work (20,187). This net of 13,000+ workers indicates a need to provide good roads for longer distance travel to/from the County to provide access to jobs and support economic development.

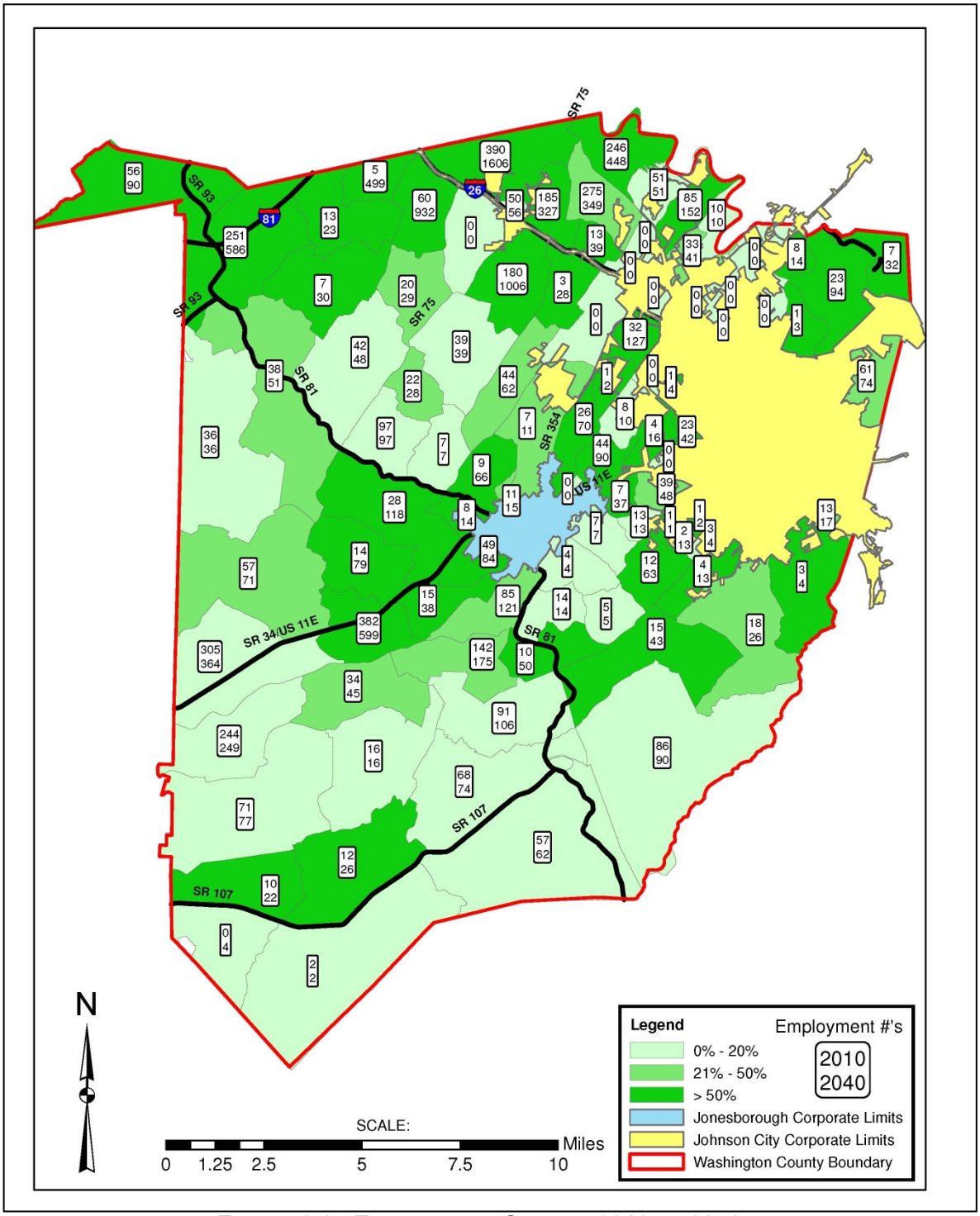


FIGURE 2.2: EMPLOYMENT CHANGE 2010 TO 2040
Sources: JCMTPO, US Census, Woods and Poole, Inc., and The Corradino Group

3.0 EXISTING TRANSPORTATION NETWORK

Technical Memorandum # 1, which is included on a disk at the back of this report, covered the existing transportation network, existing and future traffic, an analysis of roadway capacity, and a review of safety.

3.1 ROADWAY NETWORK

Washington County has some of the oldest roads in Tennessee; many were constructed before modern design standards were developed. The region's first roads led to Jonesborough and later Johnson City. The dominant ridge and valley terrain means many roads follow the southwest-to-northeast alignment of the topography. Such roads are straighter and more amenable to improvement than roads that run "across the grain." The latter have more horizontal and vertical challenges. Additionally, the topography and the long history of roadway development have led to a roadway system that has many discontinuities. A point of emphasis in this Thoroughfare Plan will be to provide better connectivity by upgrading roads that provide cross county links, or penetrate areas served only by winding, narrow roads.

I-26 and I-81 provide the primary links beyond Washington County. I-26 has a strong unifying effect within the County and region because it cuts the grain of the topography and links Johnson City, the Gray area, and Kingsport. Of the nine State Routes that serve the study area, only State Route 34 (US 11E) and State Route 75, have four-lane sections (except for a short length of State Route 93 over I-81). State Route 34 (US 11E) is uniformly four lanes. State Route 75 has recently been upgraded to four lanes northeast of I-26 to the Tri-Cities Regional Airport in Sullivan County. State Route 36 is being reconstructed (2014) to four lanes. **Table 3.1: State Routes in Washington County** list the roads' characteristics. They are mapped in **Figure 3.1: State Routes in Washington County**.

Table 3.1: State Routes in Washington County

Route	Length in Wash. Co. (Miles)	2010 AADT [a]	Cross Section	Shoulders
SR 34 (US 11E/321)	23.8	10,000 to 20,000	4 12' lanes	10'
SR 36	7.6	15,000 to 20,000	2 12' lanes [b]	2-3'
SR 67	11.5	2,000 to 5,000	2 10-12' lanes	1'
SR 75 south of I-26	18.7	2,000 to 10,000	2 10-11' lanes	1-3'
SR 75 north of I-26		5,000 to 15,000	4 12' lanes	10'
SR 81 south of Jonesborough	23.4	2,000 to 5,000	2 10-12' lanes	1-9'
SR 81 north of Jonesborough		2,000 to 10,000	2 10-11' lanes	2-3'
SR 93	5.2	2,000 to 10,000	2 10-11'lanes/ 4 12' lanes	1-3'/ 10'
SR 107	11.3	2,000 to 5,000	2 12' lanes	2-3'/10'
SR 353	13.3	2,000 to 15,000	2 9-10' lanes	2-3'
SR 354	7.5	5,000 to 20,000	2 12' lanes	4-9'

[a] AADT means Average Annual Daily Traffic.
[b] Now (2014) being widened to four lanes.
Source: TDOT TRIMS Data (Geometrics) and JCMTPO Travel Demand Model (Traffic Data)

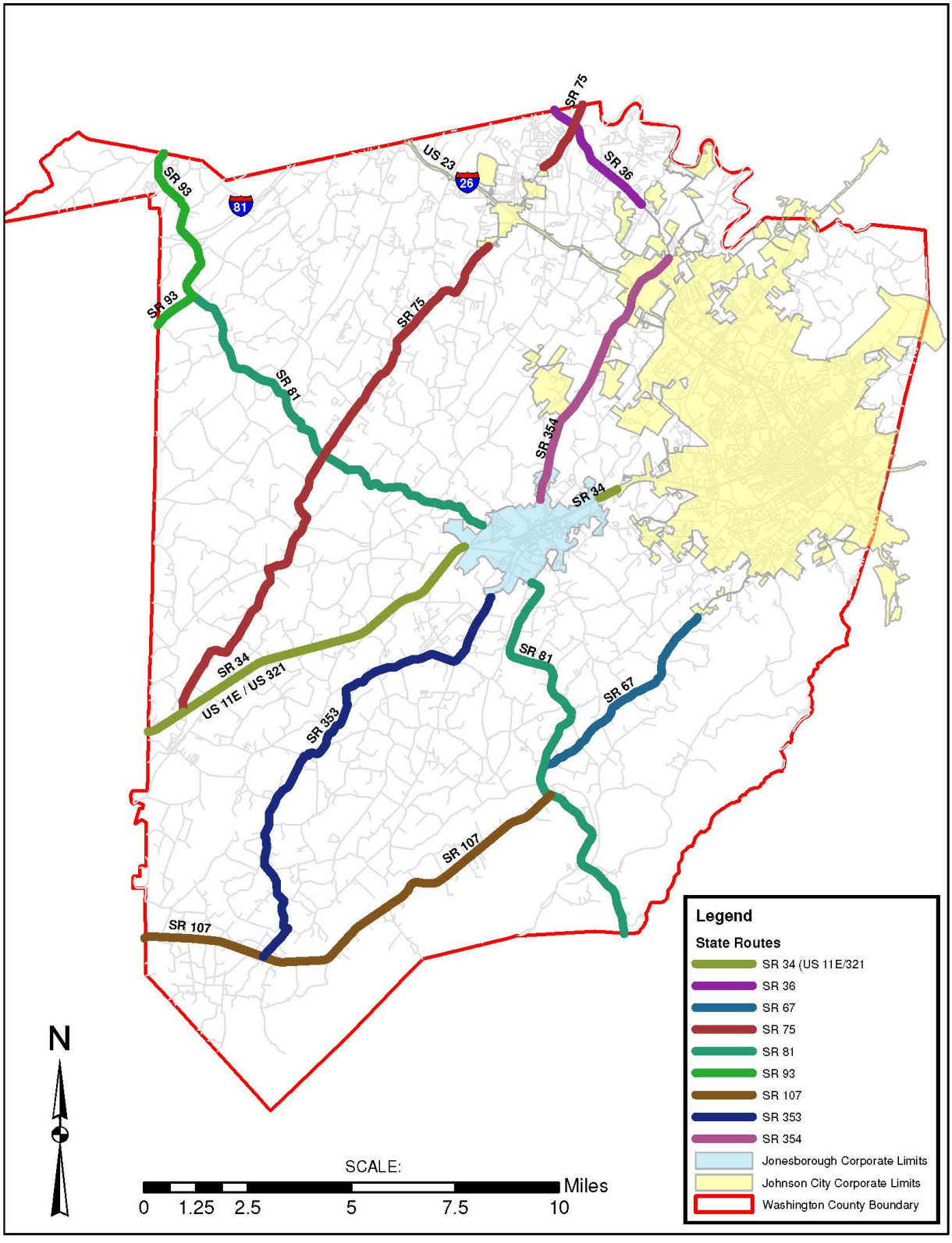


FIGURE 3.1: STATE ROUTES IN WASHINGTON COUNTY
Source: The Corradino Group

The travel way of rural roads in Washington County typically is ten-feet wide or narrower, with shoulders of zero to two feet in width. This means there is no way to safely accommodate bicyclists, disabled vehicles, passing by emergency vehicles, and mail delivery.

Speed limits are generally 45 miles per hour, or lower. The rolling hills mean most roads have sharp horizontal and vertical curves. WCHD has addressed these locations by posting supplemental speed-limit signs with slower recommended speeds. Nonetheless, the actual safe travel speed along many roads is considerably less than the posted speed limit.

3.2 NON-MOTORIZED NETWORK

Pedestrian facilities, bikeways, airports, rail networks, intermodal facilities, inland waterways, and transit are discussed in Technical Memorandum # 1 with major points summarized below.

There are few pedestrian facilities (sidewalks, wide shoulders, crosswalks, and the like) in rural Washington County. The need for pedestrian facilities is generally limited by the rural nature of the study area. In general, the need is concentrated near a few generators, including churches and schools. Existing and proposed state bike routes are exhibited in Technical Memorandum # 1, and a discussion of bicycle level of service is provided there.

3.3 AIRPORTS


Tri-Cities Regional Airport

Tri-Cities Regional Airport is in Sullivan County to the northeast, with access via I-81 and/or State Route 75. Passenger and air cargo services are provided. **Table 3.2: Passenger Service at Tri-Cities Regional Airport** shows service provided between Tri-Cities and Charlotte, a US Air hub, and Atlanta, a Delta hub. Allegiant Air has service to Clearwater and Orlando, Florida, several times a week. Charter service and flight training are available. Total enplaned passengers for 2013 were 204,000, down six percent from two years ago and below the average of the last ten years.[2] General aviation is also on the decline, reflecting a national trend.

Table 3.2: Passenger Service at Tri-Cities Regional Airport (Weekday, April 2014)

Arrival Time	Departure Time	Airline	Connecting City
8:50 AM	9:15 AM	Delta	Atlanta
10:08 AM	10:33 AM	Delta	Atlanta
10:37 AM	11:10 AM	US Air	Charlotte
12:30 PM	12:57 PM	US Air	Charlotte
12:39 PM	1:04 PM	Delta	Atlanta
1:54 PM	2:26 PM	US Air	Charlotte
2:00 PM	2:25 PM	Delta	Atlanta
4:32 PM	5:15 PM	Delta	Atlanta
4:37 PM	5:05 PM	US Air	Charlotte
7:07 PM	7:30 AM	Delta	Atlanta
10:44 PM	5:45 AM	Delta	Atlanta
11:43 PM	5:20 AM	US Air	Charlotte

Source: Tri-Cities Airport flight schedule website - www.triflight.com/

[2] pg. 110, *Comprehensive Annual Financial Report For the Fiscal Year Ended June 30, 2013*, Tri-Cities Airport Authority.

The airport's Foreign Trade Zone 204 offers importers exclusive benefits only available to zone users. Land parcels are available for development at the airport, and this intermodal sector is expected to grow. Nonetheless, "Cargo Landed Weight" in 2013 was 250 million pounds, reflecting a continuous decline over the last ten years.[3] State Route 75 was recently widened in Washington County to four lanes north of State Route 36 to provide better access to the airport.

3.4 RAIL

Washington County has two primary rail providers, CSX Transportation and Norfolk Southern (NS). CSX track runs north/south through the eastern portion of the county. NS track is oriented southwest/northeast. The rail lines in Washington County are mapped in **Figure 3.2**. According to the Washington County Economic Development Council's website, approximately 275 trains pass through Washington County weekly.[4]

The NS line is part of the Crescent Corridor, a national endeavor by NS to move intermodal (container) goods from east coast ports through the lower Midwest and South via two separate lines. The more westerly of the lines runs through Washington County and then west to Memphis, where there is a large new intermodal (truck/rail) facility. The nature of this line is such that it carries double-stack trains and has exceptional height and width clearances. Its emphasis as a developing corridor for NS implies that volumes on that line will increase over time. Presently, the line carries 12-15 trains a day.[5]

CSX mostly hauls coal through the area. In the Johnson City/Elizabethton area, the East Tennessee Railway operates a short-line railroad, connecting to both NS and CSX lines.

The nearest rail/truck intermodal facility that handles cargo containers is in Chattanooga. There had been discussion of a NS intermodal facility in east Tennessee, but there is nothing firm on that happening.

Technical Memorandum #1 lists and maps the 16 at-grade crossings of NS lines by roads, and the five at-grade crossings of the CSX railroad.

[3] pg. 112, *Comprehensive Annual Financial Report For the Fiscal Year Ended June 30, 2013*, Tri-Cities Airport Authority.
[4] http://www.thewcedc.com/accessible.php
[5] Phone call with NS Industrial Development Manager

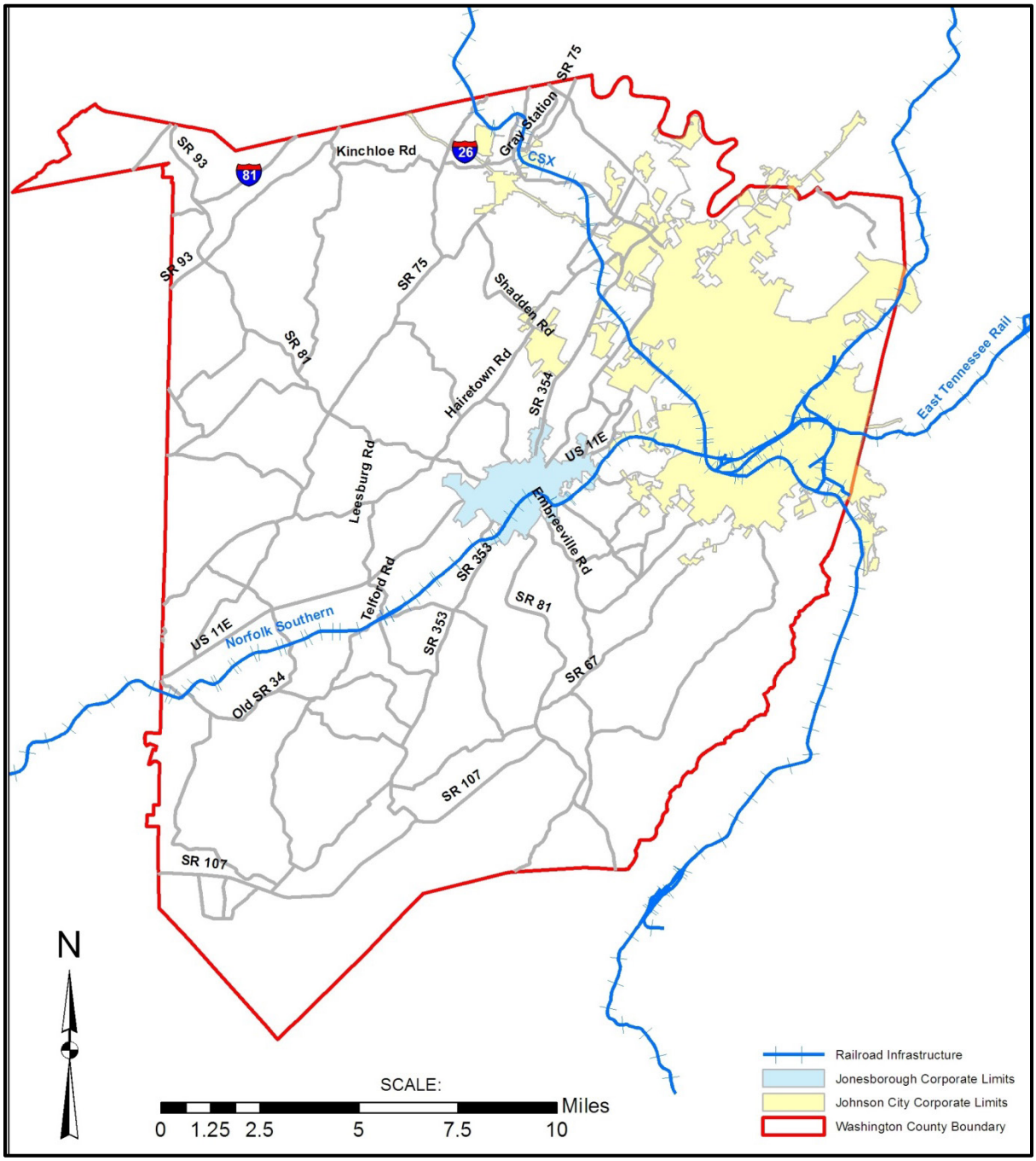


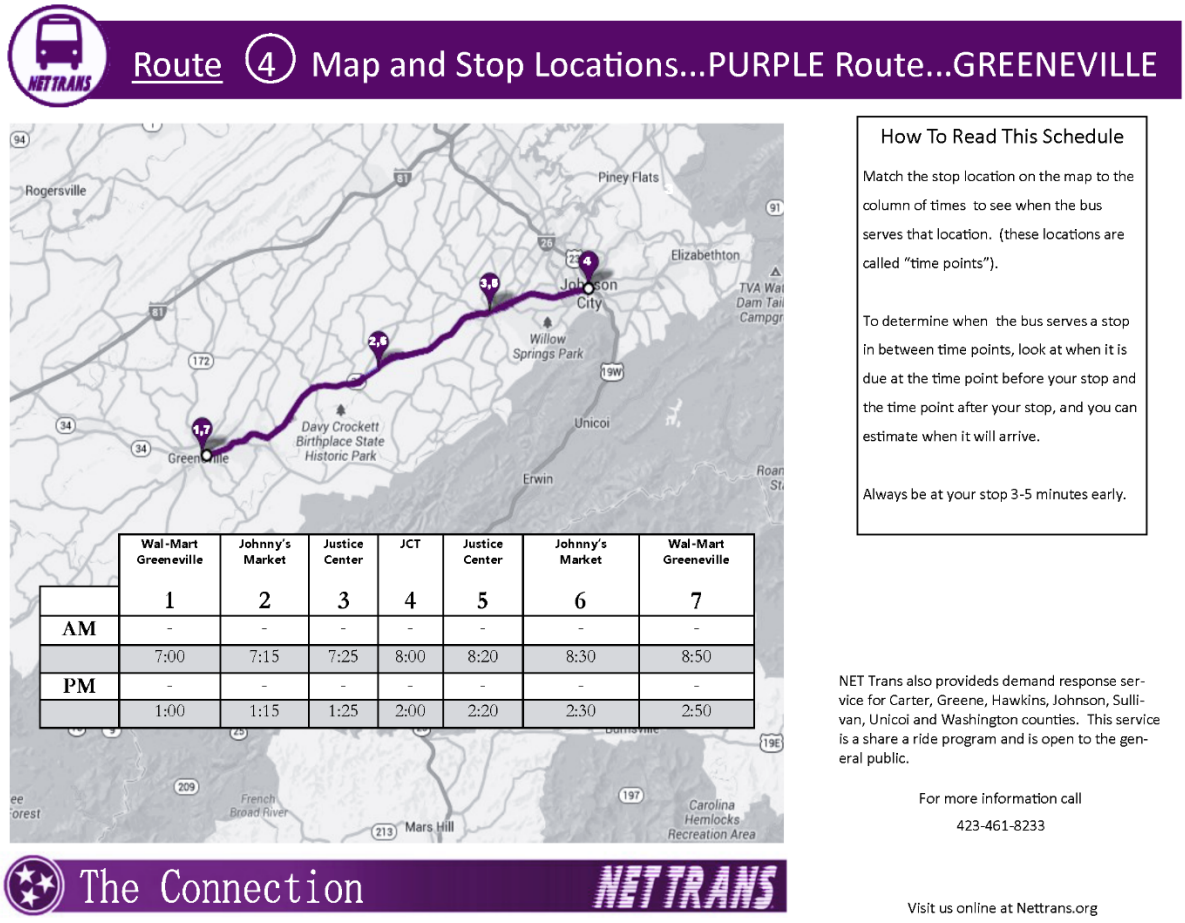
FIGURE 3.2: RAIL LINES IN WASHINGTON COUNTY
Source: The Corradino Group

3.5 INLAND WATERWAY

The Nolichucky River along the south County edge is listed by the U.S. Army Corps of Engineers as a navigable river; however, it is not used commercially, in part due to impoundments downstream. It is primarily used for recreational purposes and is known for white water rafting and fishing.

3.6 TRANSIT

Transit service is provided within Johnson City by Johnson City Transit (JCT). Outside the urbanized area there is a Rural Transportation Program, operated by Northeast Tennessee Rural Public Transit (NET TRANS). Point-to-point paratransit service is provided Monday through Friday from 6:00 a.m. to 6:00 p.m., with some special services. NET TRANS formerly provided rural, fixed-route service on seven routes, but that service was reduced to a single line in Washington County effective February 3, 2014. The remaining line is Route 4, the Purple Route, shown in **Figure 3.3: Route 4 Purple Route**. It provides two round trips weekdays between Greensburg and downtown Johnson City along State Route 34 (US 11E). Greyhound provides transportation services from Johnson City to various locations across the United States.



	Wal-Mart Greeneville	Johnny's Market	Justice Center	JCT	Justice Center	Johnny's Market	Wal-Mart Greeneville
	1	2	3	4	5	6	7
AM	-	-	-	-	-	-	-
	7:00	7:15	7:25	8:00	8:20	8:30	8:50
PM	-	-	-	-	-	-	-
	1:00	1:15	1:25	2:00	2:20	2:30	2:50

FIGURE 3.3: NET TRANS PURPLE ROUTE
Source: NET TRANS

4.0 TRAFFIC AND CAPACITY ANALYSIS

Technical Memorandum # 1 offers extensive information on existing and future traffic and Level of Service (LOS). Basic conclusions are included here.

Most roadways in the study area have Average Annual Daily Traffic (AADT) of fewer than 5,000 vehicles per day (vpd). The routes with the most traffic are State Route 34 (US 11E), and routes extending from Johnson City to Jonesborough and the Gray area.

The existing year (2010) and design year (2040) roadway mainline LOS data utilized in this study were obtained from the Johnson City Metropolitan Transportation Planning Organization's (JCMTPO) Travel Demand Model Output. Most roads operate at a LOS B or better through the design year. The roadway segments with LOS lower than D are adjacent to Johnson City's City Limits. The LOS for 2010 and 2040 are shown in **Figure 4.1: 2010 Level of Service** and **Figure 4.2: 2040 Level of Service.**

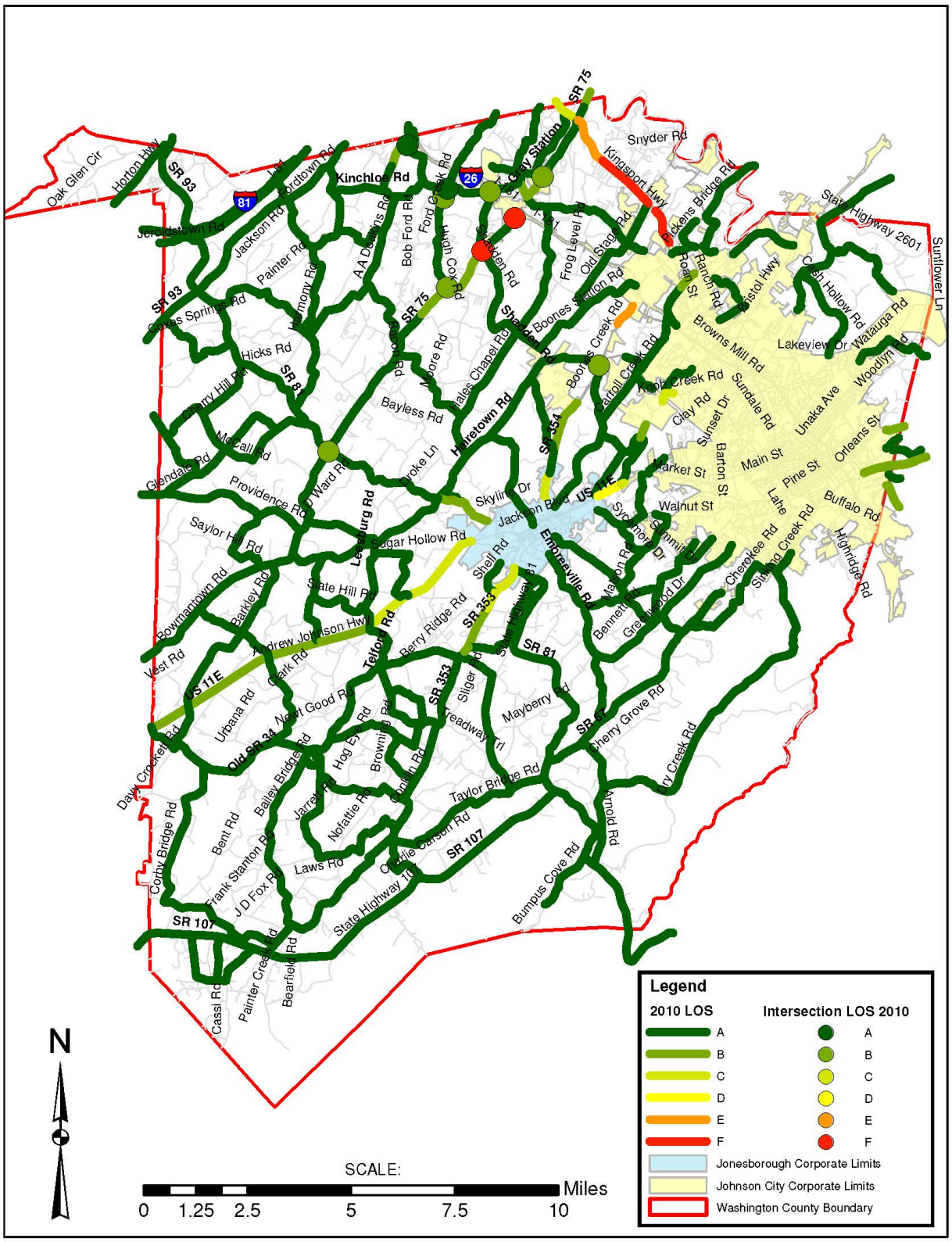


FIGURE 4.1: 2010 LEVEL OF SERVICE
Source: The Corradino Group with Data from JCMTPO Travel Demand Model

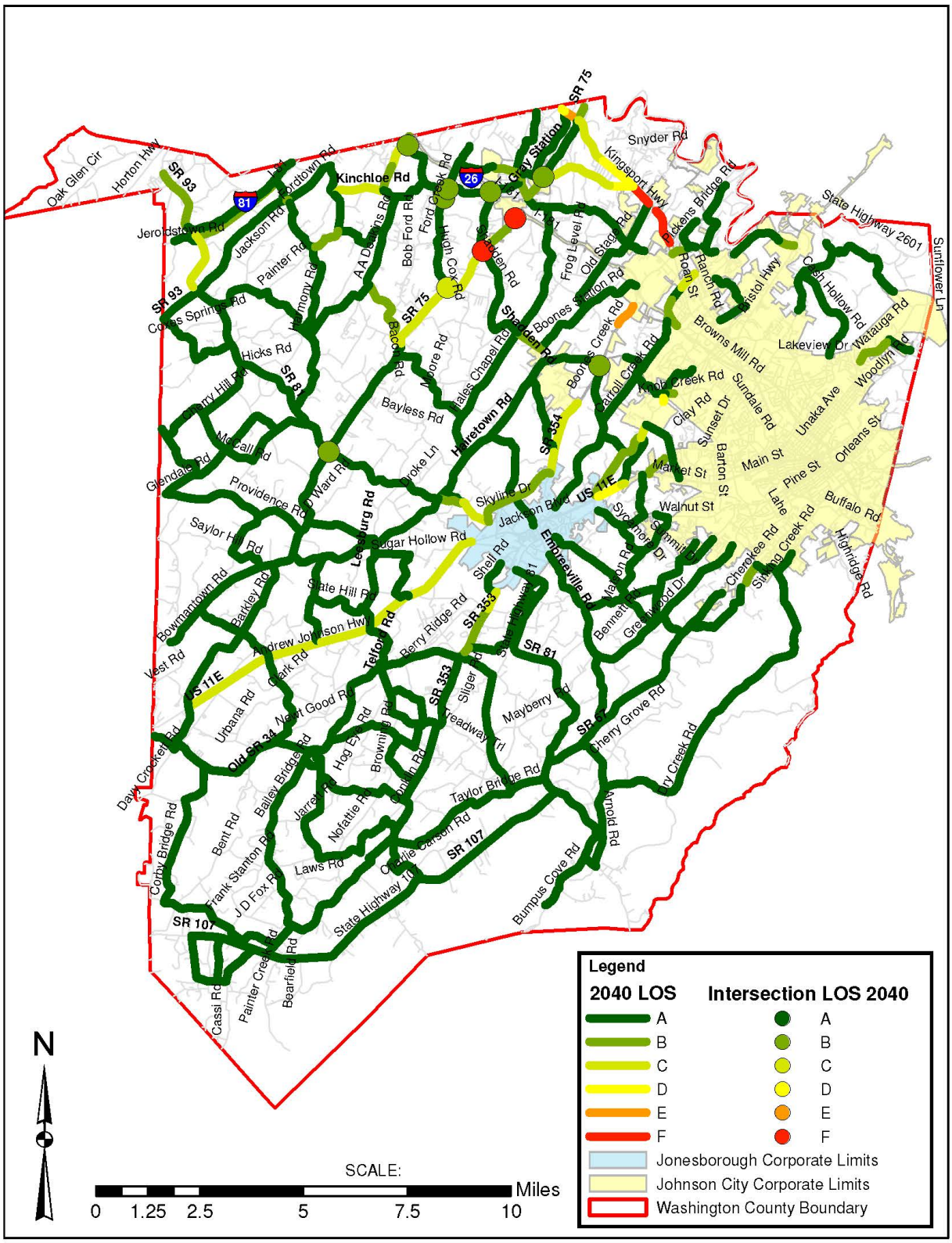


FIGURE 4.2: 2040 LEVEL OF SERVICE
Source: The Corradino Group with Data from JCMTPO Travel Demand Model

5.0 SAFETY ANALYSIS

Locations in Washington County that are under study by TDOT's Project Safety Office were provided for this plan. The study data date from 2009 to 2011. These locations were initiated following the completion of the most current Highway Safety Improvement Program (HSIP) list. The projects included on this list have been determined through crash data analyses to be in need of safety improvements due to either having an actual to critical (a/c) crash ratio above a designated point, or other criteria including the presence of fatal or incapacitating injury crashes.

Table 5.1: Roadways Under Study by TDOT for Safety Improvements provides a list of the locations in Washington County that are under study, or have recently been under study, by TDOT's Project Safety Office for safety improvements. A location's presence on the HSIP list indicates a safety improvement is likely needed at the respective location, and a Road Safety Audit Review (RSAR) is warranted. **Table 5.1** provides the type of improvement being considered at each location. In general, the improvements are roadway signing and pavement marking upgrades. **Table 5.1** also notes the project status. Once safety improvements have been constructed, TDOT monitors, or tracks, the project for three (3) years to determine if the safety improvements have had the desired effect. If the safety of the route has not been improved, more substantial measures may be justified. These locations are mapped in **Figure 5.1: Roadways Under Study for Safety Improvements**.

Additionally, TDOT initiated a Local Road Safety Project Study. This study noted safety needs in a multicounty area and found several route sections in need of additional signing, striping, and guardrail installations. The locations are listed in **Table 5.2: Summary of Local Road Safety Projects** and mapped in **Figure 5.1**. A location's presence in this study also indicates a safety improvement is likely needed at the respective location.

The safety improvements implemented from these two studies will be monitored for three (3) years after their construction. If the safety of the locations is not improved, additional improvements may be warranted.

Additionally, staff from the Washington County Highway Department noted several locations with perceived safety deficiencies. The locations are mapped in **Figure 5.1** and listed below.

Location	Safety Concern
▪ Hog Hollow at Ford Creek Road	Sight distance at the intersection
▪ SR 75 at Hugh Cox Road	Sharp horizontal curves and poor sight distance, located near Daniel Boone High School
▪ Greenwood Drive near Rock Church Road	Sharp horizontal curves
▪ Old State Route 34 at David Crockett High School	Lack of turn lanes at the school

TABLE 5.1: ROADWAYS UNDER STUDY BY TDOT FOR SAFETY IMPROVEMENTS

Map #	Route	Road Name	Termini	Description	Status
1	Local	Jackson Bridge Rd./ Conklin Road	Extent of Road (L.M. 0.00 to 5.00)	Minor paving, minor earthwork, tree removal, signing, striping	Constructed/ Tracking Project
2	SR 67		SR 81 to Cherokee Mountain Rd. (L.M. 0.00 to 4.06)	Signing, striping, tree trimming, gravel shoulder improvements	Constructed/ Tracking Project
3	SR 400		At Watauga Avenue	Signing, striping, vegetation removal	Constructed/ Tracking Project
4	SR 81		SR 81 at Old Persimmon Ridge Rd. (L.M. 11.98 to 12.14)	Signing, striping, relocate a private driveway	No further action, city may do work
5	SR 81		Five Points Intersection with SR 353 (L.M. 11.52 to 11.57)	ROW, utility relocation, earthwork, pavement, signing, guardrail	ROW phase
6	SR 34	Andrew Johnson Highway	Intersection at Persimmon Ridge Rd/Ben Gamble Rd.	Separate turn movements, install a traffic signal	Constructed/ Tracking Project
7	SR 353		Conklin Rd. to Old SR 34 (L.M. 0.91 to 5.78)	Signing, guardrail, and raised pavement markers	Constructed/ Tracking Project
8	SR 353		Conklin Rd. to Old SR 34 (L.M. 0.00)	Guardrail and replace concrete bridge rail	Environment al phase
9	Local	South Cherokee St.	South Cherokee St. at Woodrow St. (L.M. 0.62)	Paving, signing, striping, and guardrail	Constructed/ Tracking Project
10	Local	Old Gray Station Road	Old Gray Station Rd. near Buckingham Rd. (L.M. 4.14 to 4.24)	Signing, striping, guardrail	Constructed/ Tracking Project
11	SR 93		SR 93 at Fall Branch Elementary School (L.M. 3.14 to 3.61)	Install flashing beacon, striping, signing	Constructed/ Tracking Project
12	Local Route 1066	Telford Road	SR 353 to SR 34 (L.M. 1.35)	ROW, earthwork, clearing, paving, signing, striping, guardrail	ROW phase
13	Local Route 1355	Dry Creek Road	From Arnold Rd. to near Sinking Creek Rd.		Draft phase
14	SR 34	Andrew Johnson Highway	At SR 354, Boone's Creek Road	Second left-turn lane on SR 34, and second receiving lane on SR 354. Remove channelized right turn lane and bring under signal control.	Environ-mental phase

Source: The Corradino Group with Data from TDOT Project Safety Office's Master Safety List

TABLE 5.2: SUMMARY OF LOCAL ROAD SAFETY PROJECTS

Map #	Route	Road Name	Termini	Description	Status
15	Local	Greenwood Drive	SR 81 and Old Embreeville Road	Signing, striping and guardrails	Noted in Safety Study
16	Local	Greenwood Drive	Summit Drive and Bank Saylor Road	Signing, striping and guardrails	Noted in Safety Study
17	Local	Hales Chapel Road	Pleasant Valley Road and I-26	Signing, striping and guardrails	Noted in Safety Study
18	Local	Conklin Road	SR 353 (Bailey Bridge Road) and Jackson Bridge Road	Signing, striping and guardrails	Noted in Safety Study
19	Local	Conklin Road	Washington College Rd. and Treadway Trail	Signing, striping and guardrails	Noted in Safety Study
20	Local	Arnold Road	SR 81 at the Nolichucky River and SR 67 (Cherokee Rd.)	Signing, striping and guardrails	Noted in Safety Study
21	Local	Dry Creek Road	Arnold Road and Sinking Creek Road	Signing, striping and guardrails	Noted in Safety Study

Source: Mattern & Craig Safety Study and The Corradino Group.

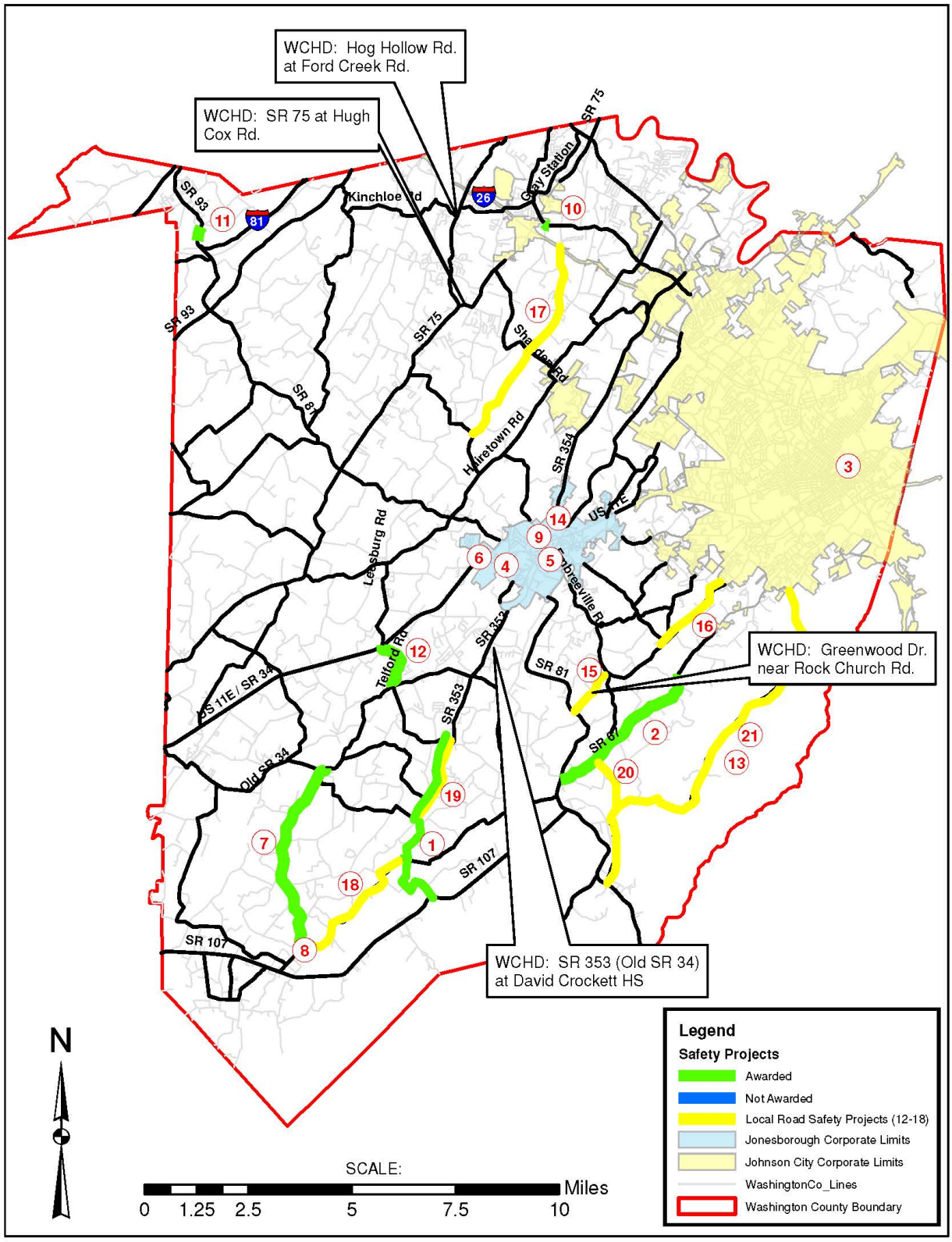


FIGURE 5.1: ROADWAYS UNDER STUDY FOR SAFETY IMPROVEMENTS
Source: The Corradino Group, TDOT's Project Safety Office, The Washington County Highway Department (WCHD) and Mattern & Craig Safety Study

Additionally, an indicator of overall route safety is the ratio of a roadway segment's crash rate to that of the statewide average of roadways with a similar functional class and cross section. **Figure 5.2: Crash Ratio 3x or More than Statewide Average** shows road segments that have a ratio greater than three for the study area. This data set was provided by TDOT in GIS and Excel format in April of 2014. It should be noted that a road segment's presence in this data set does not necessarily indicate a safety issue, as these locations did not qualify for the HSIP or Local Road Safety Project studies previously discussed, and the geographic information systems (GIS) data should be considered preliminary. The purpose of this analysis is to identify potential areas that may require further analysis by TDOT and may assist in the prioritization of projects in Washington County.

It is important to note that the Tennessee Department of Transportation, by conducting this analysis and publishing this report, does not waive the protections of 23 U.S.C §409 as stated below:

> **23 USC §409: Discovery and admission as evidence of certain reports and surveys**
> *Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.* (http://www.gpo.gov/fdsys/granule/USCODE-2011-title23/USCODE-2011-title23-chap4-sec409/content-detail.html)

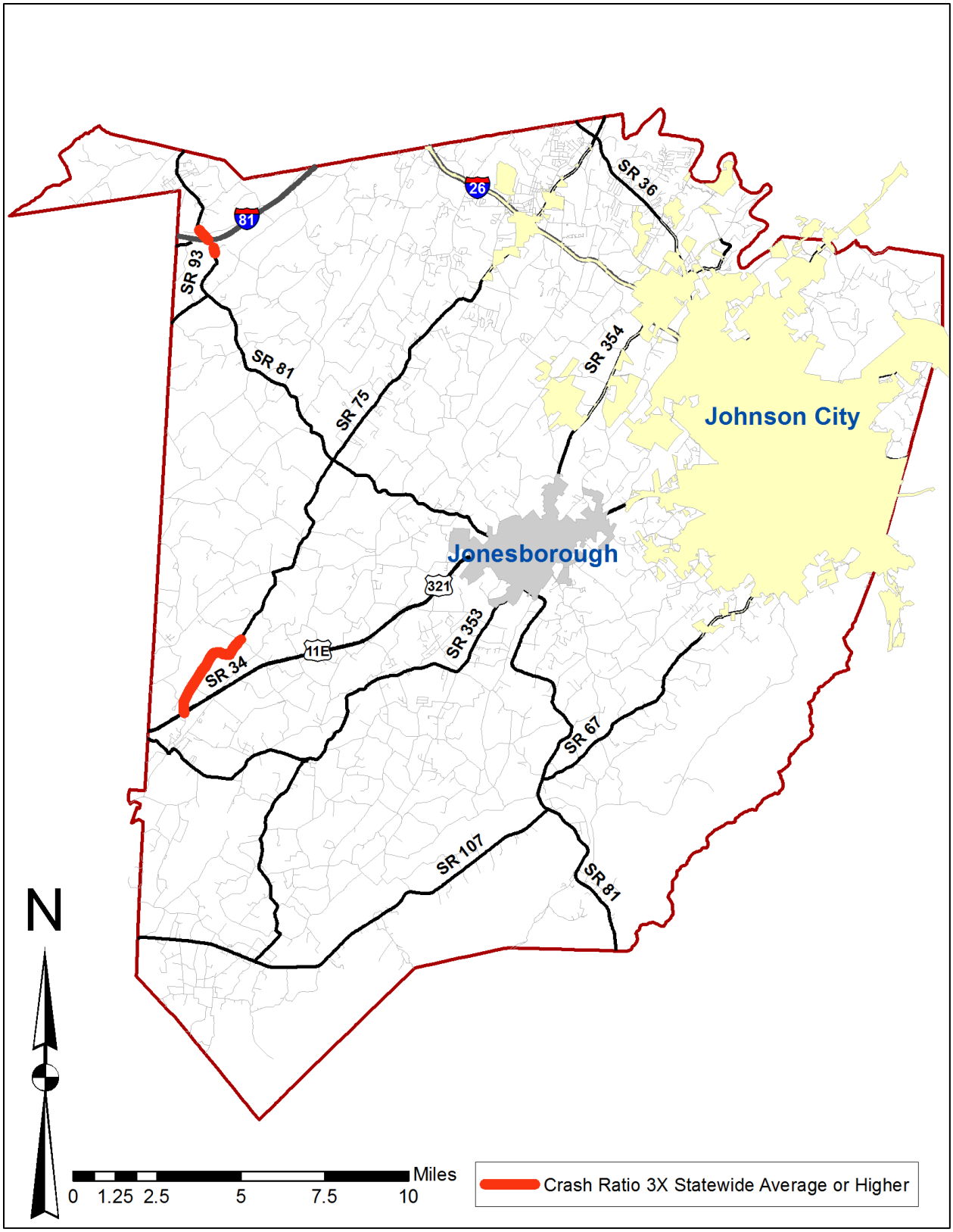


FIGURE 5.2: CRASH RATIO 3X OR MORE THAN STATEWIDE AVERAGE
Source: TDOT

6.0 RECOMMENDATIONS

6.1 ACCESS MANAGEMENT

Access management is the systematic control of the location, spacing, design, and operation of driveways and street connections to a roadway. Access control is noted in Washington County's Zoning Ordinance, which is included in **Appendix A**.[6] Effective access management has been proven to reduce crashes as much as 50 percent, increase roadway capacity by up to 45 percent, and reduce travel time and delay as much as 60 percent. Access management is particularly important along arterials like State highways that are expected to provide not only safe and efficient movement of traffic, but direct access to adjacent land uses. Often the need for access management becomes evident after development has limited the choices and increased the costs of the "optimal fixes." The challenge is to identify best practices before problems develop to minimize long-term costs to businesses and the public. Access management can help achieve the following objectives.

- Reduce the number of traffic conflicts and crashes;
- Reduce congestion/delay;
- Delay costly capacity improvements;
- Identify acceleration/deceleration lanes to reduce delay;
- Improve access to businesses;
- Inform land use decisions; and,
- Improve the aesthetic appeal of the road environs.

The process of administering access management principles through ordinances and site plan review processes is essential to maintaining traffic flows and improving safety.

The top two photos in **Figure 6.1** show an example of a driveway closure. The bottom set illustrates the addition of a deceleration lane. Both treatments minimize vehicular conflicts along the route, improving safety and traffic operations.

To benefit fully from access management improvements, analysis of traffic operations needs to focus on: the number of access points to properties; their positions with respect to one another; conflicts of turning movements; the interface with traffic signals; the need for adding turning lanes; and, the overall ability of the corridor to handle forecast traffic growth.

The point of access management is to reduce conflicts among vehicles and, in some cases, pedestrians. Planning

FIGURE 6.1: ACCESS MANAGEMENT EXAMPLES

[6] See Section 506. Access Control. Page 137 of the Washington County Zoning Resolution of October 28, 2013.

can be done proactively by controlling the number of driveways and amount of ill-defined pavement.

Access management regulations typically are incorporated within a community's zoning ordinance. As new development or redevelopment occurs, plans must be submitted to the planning commission for site plan approval, during which the access management regulations are applied.

The regulations may contain provisions regarding the number of driveways, cross-access easements, and dimensions of drives and entrances. The regulations may be applied community-wide on local, County and State roads, or may be applied only to specified roads through corridor plans or "overlay districts," which provide specific regulations for defined roads or areas.

Communities can take a proactive role by going directly to the business owners to arrange cross-access agreements or driveway closings. The community can develop incentives to encourage cooperation of property owners. An example of an incentive is allowing a business owner to erect a sign nearer a road than might not otherwise be allowed, if that business agrees to cross-access and closes its driveway. These types of activities should take place in advance of expected land use and/or transportation improvements and should be documented and managed following implementation.

Presently the WCHD issues driveway permits in the form of a construction permit. Applicants receive guidance with the permit application. The primary intents are to prevent new driveways from creating drainage problems and to control placement of obstructions, such as mailboxes, within the right-of-way. Nonetheless, the precedent is set that certain provisions must be met before a driveway is approved. And, the WCHD has been mindful of driveway placement with respect to sight distance and safety. WCHD's driveway permit application and procedures are provided in **Appendix B**.

6.2 BICYCLE AND PEDESTRIAN PLANNING

Looking forward, policies can be put into place in Washington County in the form of a bicycle plan that results from a planning process. Plans should include four interrelated components: policies, public outreach, design guidelines, and facilities.

A preliminary approach to bikeway planning is to create an inventory of road suitability for bike use. This is similar to the Bicycle Level of Service (BLOS) mapping of TDOT in its "Update of Tennessee's State Bicycle Route Plan,"[7] but at a more refined level, reflecting input from local sources. Such a map combines information on road speeds, traffic volumes, width, and geometrics (including grade and sight distance). Most such information is available from the Technical Memorandum # 1 analysis, including grades and sight distance, and TDOT's BLOS mapping with general characteristics of each BLOS score (A to F).

The suitability mapping can point to locations where special efforts should be made to improve access and connectivity. For example, an important element is gap analysis, where two or more viable sections of suitable bike use can be connected by fixing an intermediate section. An overlay to suitability mapping is crash analysis. Crashes indicate points of conflict that can sometimes be addressed by specific countermeasures. This is more likely true in fringe areas that in isolated rural locations.

[7] http://www.tdot.state.tn.us/bikeped/plan.htm

The planning process can be formalized by a relative demand analysis that evaluates population density, land use diversity, activity generators, transit availability, and connectivity. This analysis helps identify where there is demand for bicycle use, and it is applied to help prioritize improvements. The process reflects an approximation of the latent demand for non-motorized travel in an area (see **Figure 6.2: RELATIVE NON-MOTORIZED DEMAND EXAMPLE).** Other factors may promote or inhibit actual non-motorized travel levels. This analysis is a useful tool to highlight system deficiencies, point to potential projects and prioritize improvements. Note that a similar approach can be used for pedestrian facilities.

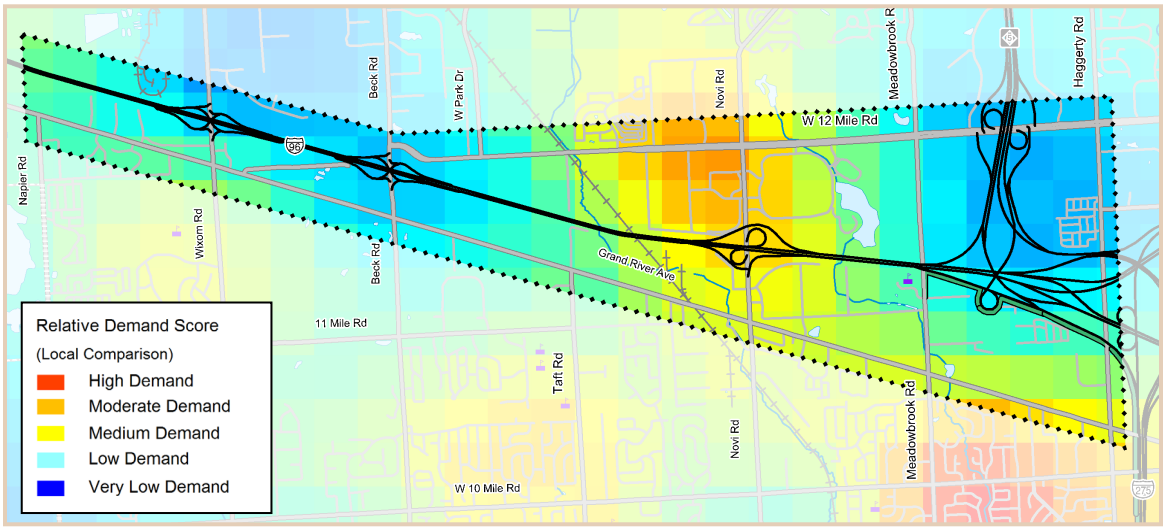


FIGURE 6.2: RELATIVE NON-MOTORIZED DEMAND EXAMPLE
Source: The Greenway Collaborative

TDOT's "Bicycle and Pedestrian Policy"[8] calls for integration of bicycle and pedestrian facilities into new construction and reconstruction through design features appropriate for the context and function of the transportation facility.

8 http://www.tdot.state.tn.us/bikeped/pdfs/policy.pdf

7.0 THOROUGHFARE PLAN – ROADWAY IMPROVEMENTS

The emphasis of this plan is to enhance roadway connectivity and safety. Enhanced connectivity and safety can be obtained through better roads with fewer horizontal and vertical deficiencies, more moderate curves, wider lanes, and shoulders.

The Washington County Highway Department (WCHD) has identified eleven priority roadway improvement projects in the unincorporated areas of Washington County. Five of the suggested projects are County Routes. Six of the suggested projects are State Routes. County Routes are typically constructed and improved using local funding. Improvements to State Routes depend on State and Federal funding. Use of Federal funds for a project carries with it the obligation to adhere to Federal laws, such as the National Environmental Policy Act, which requires documenting the social, economic, and environmental impacts of a project, and addressing how to avoid, minimize, or mitigate any negative impacts.

The proposed projects are listed below, and mapped in **Figure 7.1: Proposed Project Locations**. The proposed projects are listed in order of priority, as determined by the WCHD. The County Routes and State Routes are listed separately due to the different funding streams to be utilized. The prioritization of the projects may change in the future based on developmental pressures and funding availability. It should also be noted that the State Route priorities represent the WCHD's preference. Ultimately, the prioritization of these routes is the responsibility of the State, working in conjunction with the First Tennessee Rural Planning Organization.

County Routes	Map ID
1C. Old Gray Station Road/Center Street/Ruritan Drive	1C
2C. Highland Church Road/Knob Creek Road Connector	2C
3C. Highland Church Road/Shadden Road	3C
4C. Old Gray Station Road	4C
5C. Roy Martin Road Connector	5C

State Routes	Map ID
1S. State Route 75 (at Daniel Boone High School)	1S
2S. State Route 75 (from State Route 81 to Hugh Cox Road)	2S
3S. State Route 107	3S
4S. State Route 81 (from State Route 107 to Jonesborough)	4S
5S. State Route 81 (from Jonesborough to I-81)	5S
6S. State Route 81 (from Unicoi County to the Nolichucky River)	6S

None of the projects propose adding travel lanes to existing routes. The proposed projects will provide new roadway connections, improve existing geometric deficiencies, and add shoulders. Therefore, these improvements can generally be considered transportation system management (TSM) type improvements.

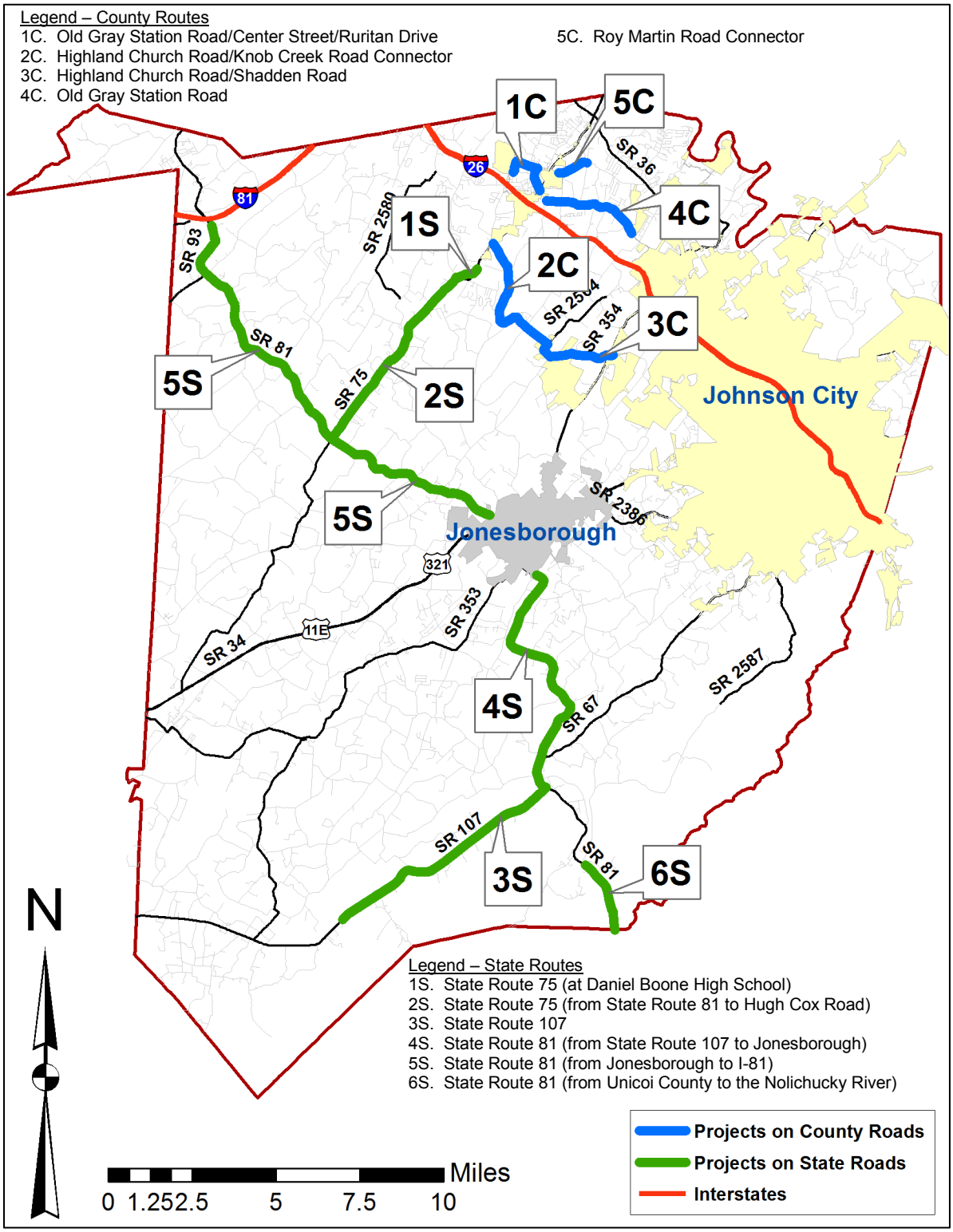


FIGURE 7.1: PROPOSED PROJECT LOCATIONS
Source: The Corradino Group

The Washington County Highway Department (WCHD) maintains nearly 800 miles of County Routes. The primary focus of the proposed County Route projects is to improve traffic operations within and around the fast growing Gray community. As discussed in Chapter 2, Gray lies to the north of I-26 and west of State Route 75. Gray and its surrounding area just north of Johnson City along I-26 have experienced some of the largest increases in population and employment in the county in the last ten years. The proposed County Route projects will provide improved connectivity and safety in this area. The proposed projects typically parallel I-26. These improved routes will become more attractive to motorists for local trips, which will reduce traffic along I-26, improving regional mobility.

The primary focus of the proposed State Route projects is to improve access in the south and western portions of Washington County. Large parcels of developable land are present in this area. The area currently has considerable agriculture-related traffic due to the plentiful farmland and produce stands present in the area. Furthermore, there is potential in the south county for growth due to the presence of the Washington County Industrial Park, to which sewer and water lines have been extended. The industrial park is located just west of Jonesborough along State Route 34 (US 11E). The industrial park accesses I-81 via State Route 81. The presence of water and sewer is a strong factor in development decisions. For example, a greater density of development is allowed if public sewers are present. In agriculturally zoned areas the number of dwelling units allowed by the Washington County zoning code is one per acre without sewers and three per acre with sewers. And, there is a new elementary school just to the west of the industrial park, which is an attraction for residential growth.

In addition to the potential for future growth in the south and western portions of Washington County, several of the State Routes recommended for improvement are utilized as shortcuts between I-81 and I-26, including traffic heading to Jonesborough and Erwin. These routes include State Route 34 (US 11E), State Route 107, and State Route 81. These routes are mapped in **Figure 7.2**. Several of these routes have considerable truck traffic. Geometrically, many segments of these routes are not adequate for truck traffic due to tight curve radii, narrow lanes, and narrow shoulders.

None of the projects propose adding travel lanes to existing routes. The proposed projects will provide new roadway connections, improve existing geometric deficiencies, and add shoulders. Narrow existing lane widths will be widened. This will improve safety by reducing the risk of lane-departure crashes. Geometrically deficient curves will be improved. Deficient curves limit the safe operating speed of the roadways. Curves with safe operating speeds less than the posted speed limit pose a safety concern, especially for unfamiliar drivers. Improving these curves will not only improve safety, but improve mobility by allowing the route to be safely travelled at a speed consistent with the posted speed limit. Shoulders will be widened or added. Adding shoulders where none exist will improve safety by reducing the risk of lane-departure crashes. Wide shoulders provide a safe refuge for disabled vehicles, improving safety and mobility. Wide shoulders also allow for the safe passage of service vehicles, including mail delivery, improving mobility. Finally, shoulders of four feet or more generally provide a safe area for bicyclists and pedestrians.

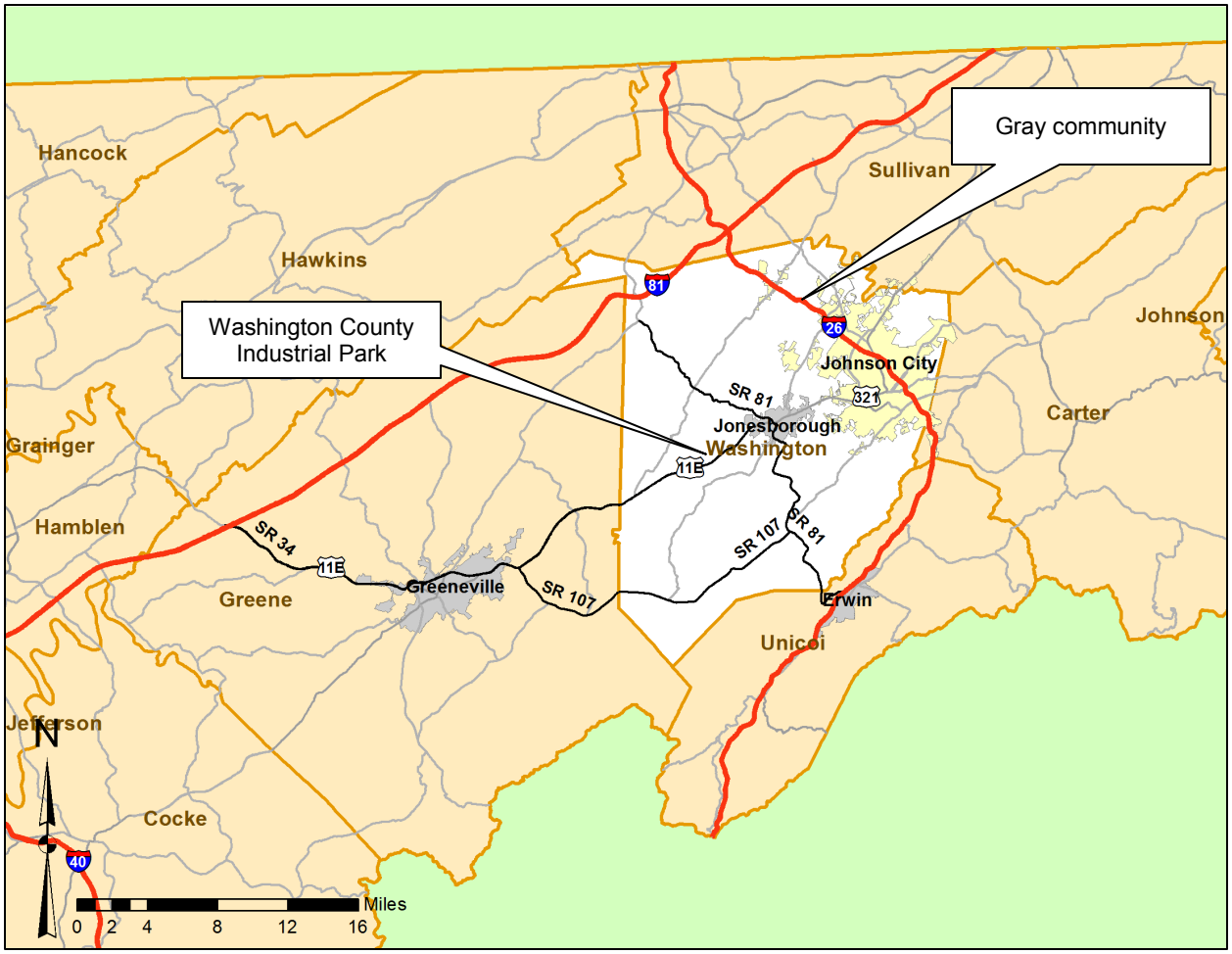


FIGURE 7.2: REGIONAL HIGHWAY MAP
Source: The Corradino Group

A desktop environmental resources scan was conducted as part of this study. Sources utilized in this environmental resources scan include the following: Environmental Protection Agency Envirofacts, United States Geological Survey Topographic Mapping, aerial photography, TDOT maps, FEMA Flood Maps, and the National Register of Historic Places. Environmental considerations discovered as part of the scan are discussed with each proposed project.

Items investigated in the environmental scan included, but were not limited to, if the proposed project crosses a stream (as shown by a blue line on a United States Geological Survey map), if the proposed project is within a 100-year floodplain, if wetland impacts are anticipated, and if the proposed project is adjacent to a school, historic property, park, church, or cemetery. Each of these items can require actions to avoid or mitigate negative impacts, especially for federally funded projects.

7.1 COUNTY ROUTES

The primary focus of the proposed County Route projects is to improve traffic operations within and around the fast growing Gray community. Improvements to County Routes should provide twelve-foot lanes and two-foot paved shoulders, except as noted. Curves should be straightened where possible, depending on right-of-way availability, impacts, and cost. County Routes are typically constructed and improved using local funding. Proposed County Route projects are discussed individually in the following pages. A proposed project summary table is provided for each project in **Section 7.3**.

7.1.1 Old Gray Station Road/Center Street/Ruritan Drive

This proposed project will improve Old Gray Station Road/Center Street/Ruritan Drive from State Route 75 to Lakeview Street. The existing route has ten-foot travel lanes with no shoulders and no turn lanes. The proposed project will provide twelve-foot travel lanes. A two-way center left-turn lane will be constructed along Old Gray Station Road. The proposed project will provide improved access to the Washington County Fairgrounds and Ruritan ball fields. The proposed project length is 1.49 miles. The 2010 average daily traffic was 4,440 vehicles per day, forecast to increase to 5,000 vehicles per day by the design year of 2040. Trucks comprise 3 percent of this traffic. The 2010 level of service of this roadway was A. The 2040 level of service is calculated to be A. The cost to improve this route is anticipated to range from $7.7 to $12.6 million. A limited number of residential and commercial relocations are anticipated to be necessary to construct this proposed project. This is ranked as the WCHD's first priority for County Route improvements. This proposed project is currently in preliminary design. A location map is provided in **Figure 7.3**.

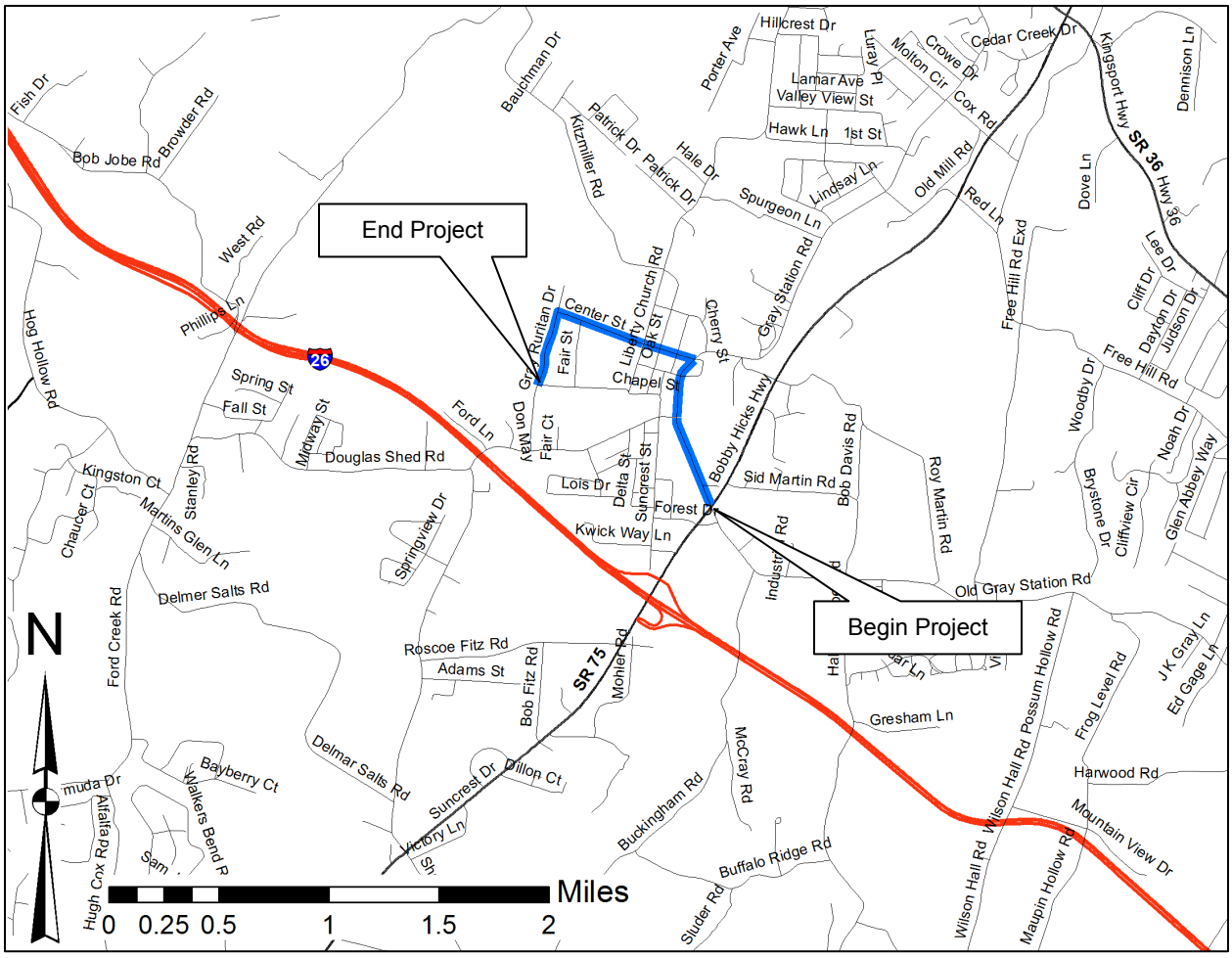


FIGURE 7.3: OLD GRAY STATION ROAD/CENTER STREET/RURITAN DRIVE LOCATION MAP
Source: The Corradino Group

This proposed project provides a "back door" to the Washington County Fairgrounds and the Ruritan ball fields on Ruritan Drive. The Fairgrounds is the site of the Appalachian Fair in August and has over 50 events a year, a number of them running several days. The Ruritan ball fields consist of five diamonds along the west side of Ruritan Drive that have been developed through volunteer and community resources and that are used heavily during the summer. It also provides a partial access path to a large tract of Johnson City owned land to the northwest of the Fairgrounds. The Washington County Industrial Board is considering constructing two 200,000 square foot buildings at this site. These locations are mapped in **Figure 7.4**.

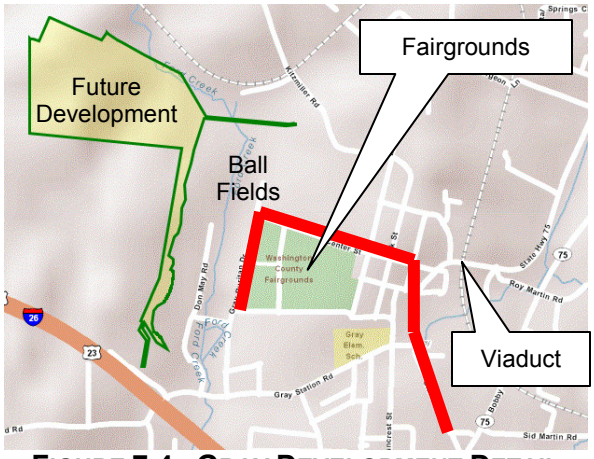


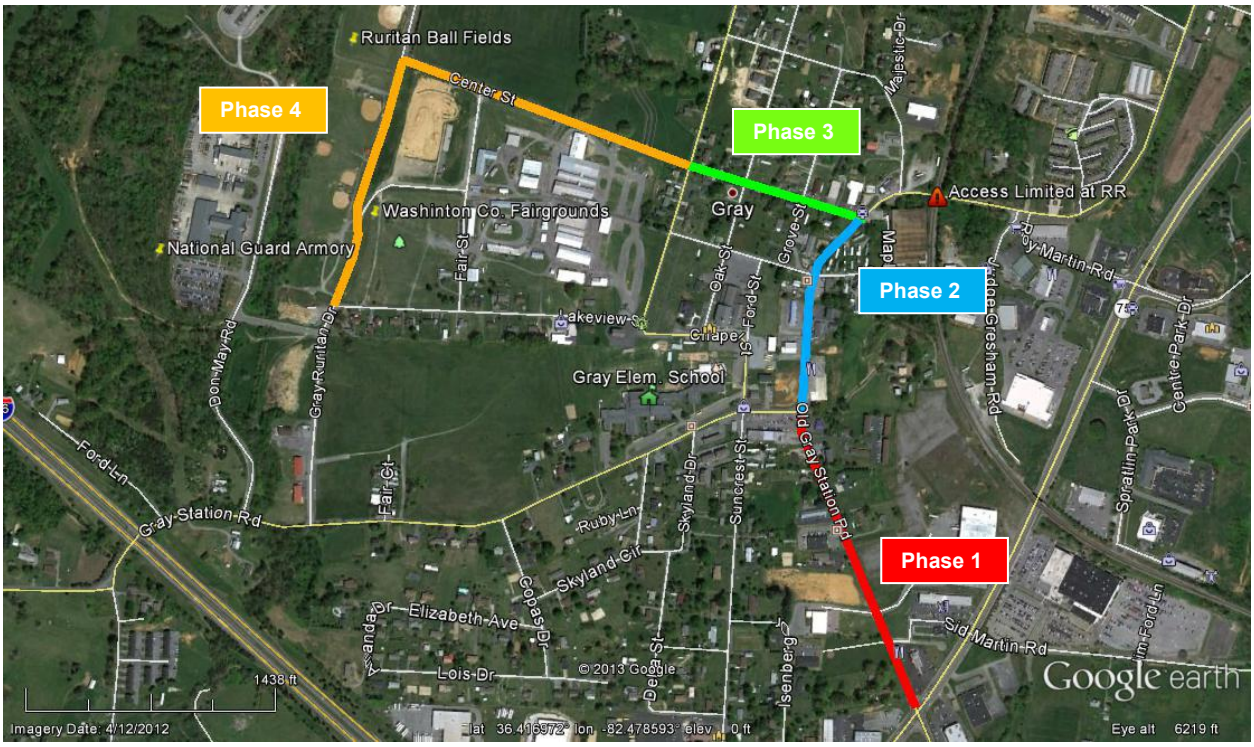
FIGURE 7.4: GRAY DEVELOPMENT DETAIL
Source: The Corradino Group

Figure 2.1 shows the Gray area to be the most populous in the study area with the 2010 population of 3,263 growing to 3,706 by 2040 (per the data for this Traffic Analysis Zone in the JCMTPO's Travel Demand Model). The traffic model's road network does not fully extend into this area of local roads, but Old Gray Station Road does show traffic volumes increasing from 6,000 today to approximately 10,000 in the horizon year of 2040. The three-lane section proposed along Old Gray Station Road will accommodate that demand and still provide safe access to adjoining commercial land uses. The three-lane cross section will consist of one travel lane in each direction with a center two-way left-turn lane.

The proposed project would provide a travel path that avoids the central section of Gray, where a number of important community facilities are located: Gray Elementary School and its grounds, the Gray Baptist Church, the Gray United Methodist Church, and the Gray community Cemetery. These facilities and other development in the area do not allow for construction on new alignment. While the roads in the area are adequate to carry traffic under normal circumstances, all roads in the area are very narrow and curvy, without curb and gutter or shoulders, with many driveways, and poor sight distance. The proposed project will provide a defined way to get to the Fairgrounds. As shown in **Figure 7.5**, access via Old Gray Station Road to the east, an alternative path, is limited by the very narrow viaduct under the railroad. This project is proposed to be constructed in four phases. The phases are summarized in **Figure 7.6**.

FIGURE 7.5: GRAY STATION ROAD VIADUCT
Source: Google Earth Pro

It is important to note that if Federal funds were used for this proposed project, any "use" of the Fairgrounds (typically acquisition of right-of-way) is subject to a review under Section 4(f) of the Transportation Act of 1966. Section 4(f) was written to protect parkland and other public facilities and historic resources from use for transportation purposes.



Phase 1 Improvements

Three twelve-foot lanes with two-foot paved shoulders along Old Gray Station Road

Phase 2 Improvements

Three twelve-foot lanes with two-foot paved shoulders along Old Gray Station Road

Phase 3 Improvements

Two twelve-foot lanes with two-foot paved shoulders along Center Street

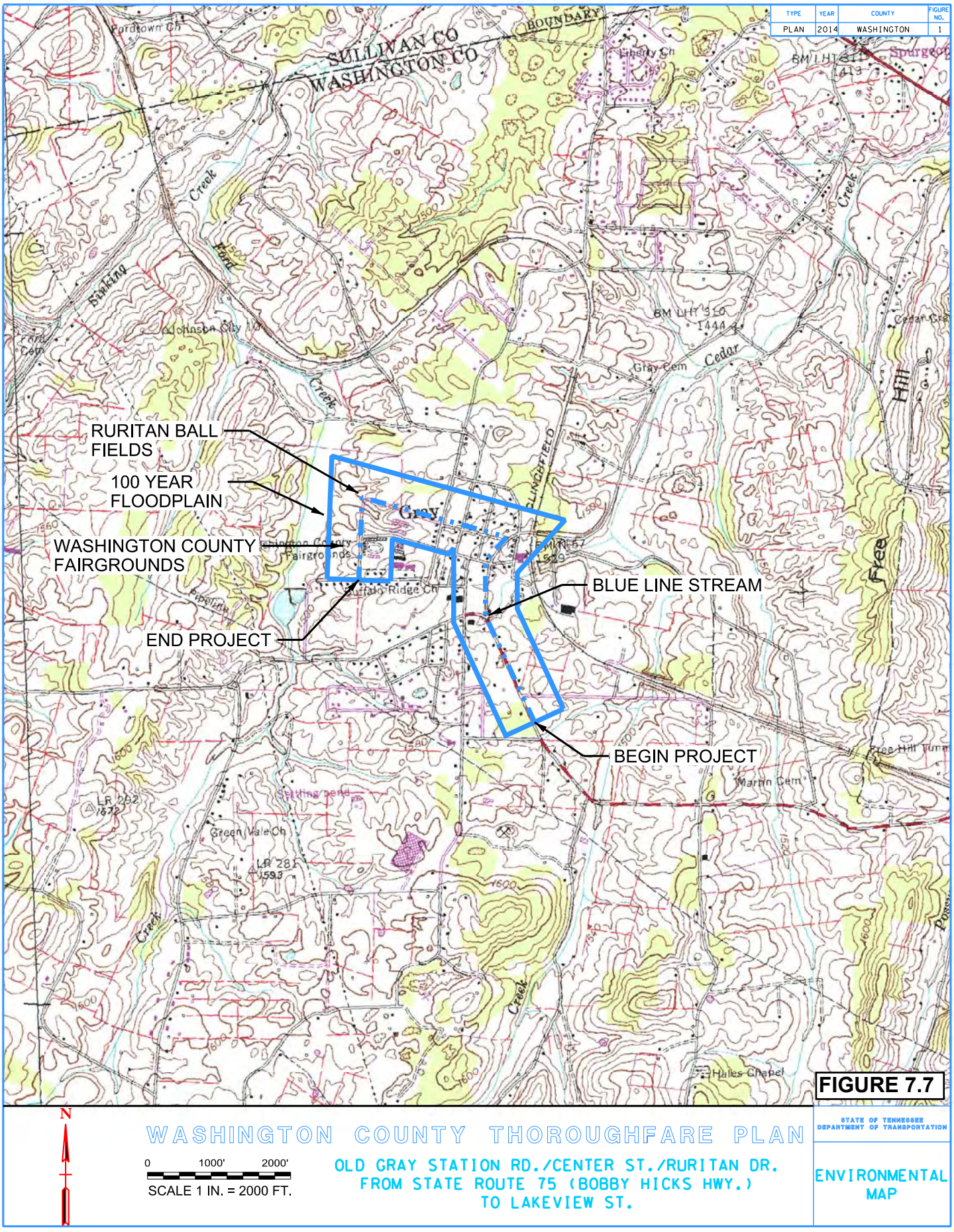
Phase 4 Improvements

Two twelve-foot lanes with two-foot paved shoulders along Center Street and Ruritan Drive

FIGURE 7.6: OLD GRAY STATION ROAD/CENTER STREET/RURITAN DRIVE IMPROVEMENTS
Source: The Corradino Group, Google Earth Pro

There are environmental considerations with this proposed project. It will cross a stream, as designated on USGS mapping. The proposed project abuts a 100-year floodplain along Ruritan Drive. No wetlands are anticipated to be impacted with the improvements. No school, historic property, church, or cemetery directly abuts the proposed project. The Washington County Fairgrounds and Ruritan Ball Fields are located adjacent to Center Street and Ruritan Drive. A map of environmental considerations is provided in **Figure 7.7**.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, TDOT provided a GIS database of horizontal curvature and stopping sight distance. These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. Based on these sources, the existing Old Gray Station route does not have a safety concern.



Source: The Corradino Group, USGS Map

7.1.2 Highland Church Road/Knob Creek Road Connector

This proposed project will construct a new connector roadway from State Route 354 to either Highland Church Road or Knob Creek Road. The proposed project will provide improved access between Johnson City and the Gray community and provide access to developable land on the northwest side of State Route 354. Two Options are provided for this proposed project. Option A provides a 0.40 mile connector from Knob Creek Road to State Route 354, and is the preferred option. Option B is 0.43 miles long. The 2040 design year average daily traffic for either option is forecast to be 10,000 vehicles per day. Trucks are anticipated to be 1% percent of this traffic. The 2040 level of service is calculated to be B. The cost to construct Option A is anticipated to range from $1.2 to $3.4 million. The cost to construct Option B is anticipated to range from $1.3 to $3.6 million. No relocations are anticipated to be necessary to construct either option. This is ranked as the WCHD's second priority for County Route improvements. A location map is provided in **Figure 7.8**.

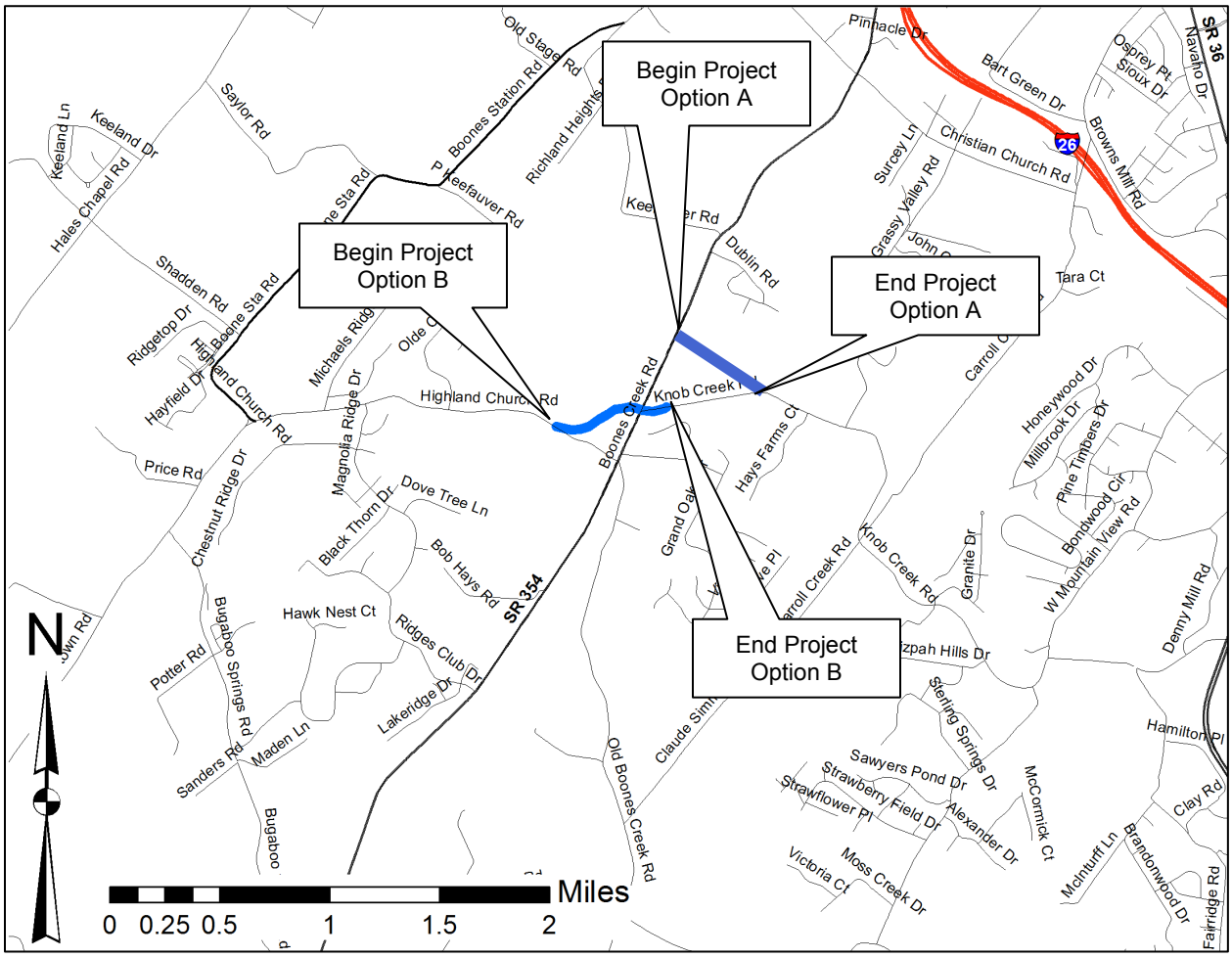


FIGURE 7.8: HIGHLAND CHURCH ROAD/KNOB CREEK ROAD CONNECTOR LOCATION MAP
Source: The Corradino Group

This proposed project will realign Knob Creek Road or Highland Church Road over farmland to provide continuity. Improved shoulders will be provided. Knob Creek Road crosses the CSX railroad tracks farther east. That crossing is in the Johnson City Long Range Transportation Plan for reconstruction. Together with the realignment of Highland Church Road and Shadden Road (discussed in **Section 7.1.3**), the route will provide a continuous way to move southeast/northwest across the mid-county, where no such path exists today. These roads together form an important mid-county east-west link between Gray and Johnson City, and connect several State Routes. There is discussion of constructing a school near the intersection of Highland Church Road and State Route 354 in the Knob Creek area, but no firm plans. Furthermore, the Johnson City MTPO has in its plan a connector from Knob Creek Road to State Route 381, which would feed into these roadway improvements. The earliest this proposed project will be in the MTPO's TIP is 2017 due to funding constraints. This is a connectivity project designed to rationalize a set of roads that developed early in the County's history. This coordinated effort between the WCHD and Johnson City MTPO will provide a cohesive mid-county east-west route.

There are no environmental considerations with Option A. There are environmental considerations with Option B. Option B will cross a stream, as designated on USGS mapping. The proposed project also crosses a 100-year floodplain. No wetlands are anticipated to be impacted with Option A or B. No school, historic property, park, church, or cemetery directly abuts Option A or B. A map of environmental considerations is provided in **Figure 7.9**.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, TDOT provided a GIS database of horizontal curvature and stopping sight distance. These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. There are no safety concerns with this proposed route.

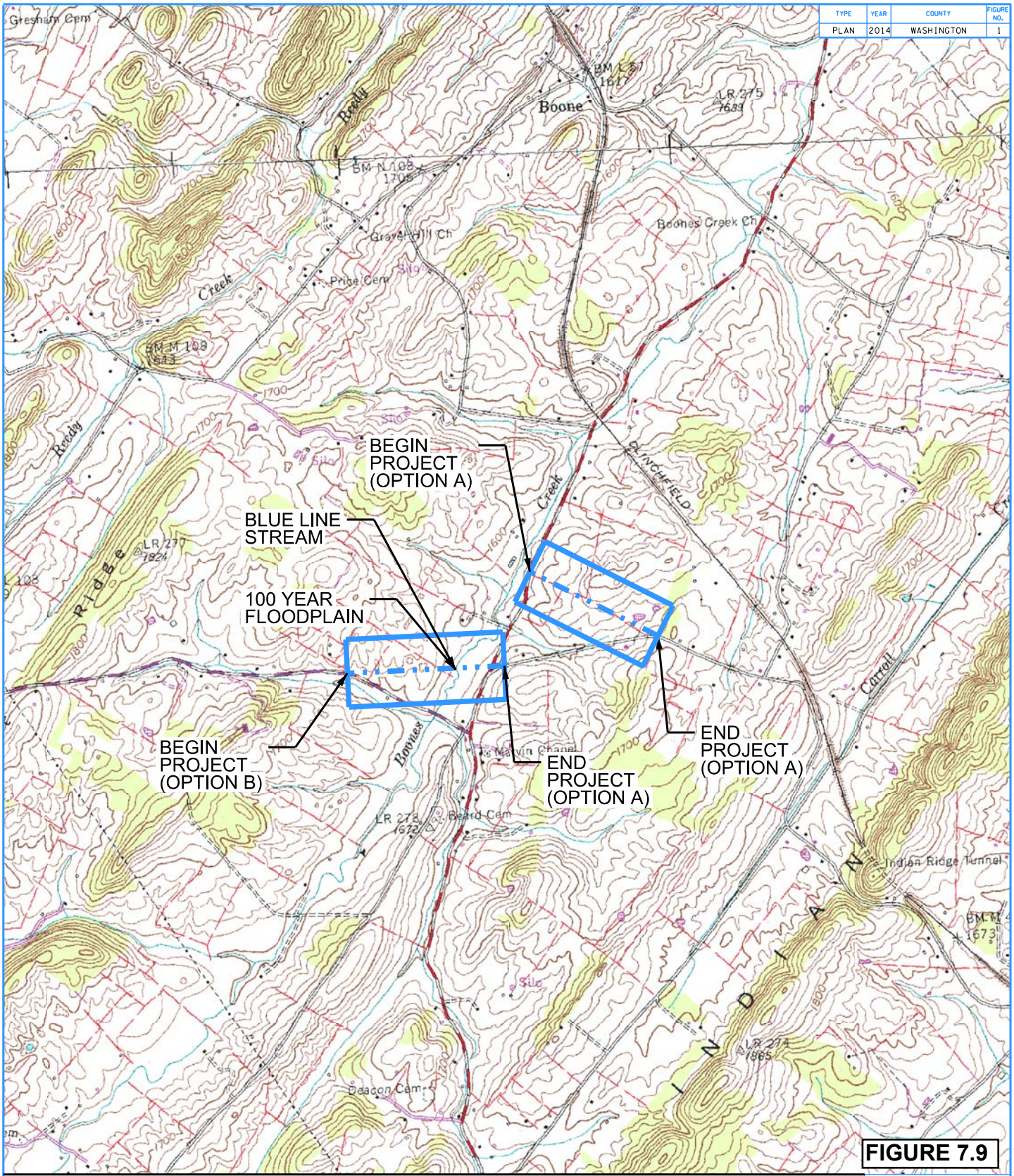


FIGURE 7.9

WASHINGTON COUNTY THOROUGHFARE PLAN

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

HIGHLAND CHURCH RD./KNOB CREEK RD. CONNECTOR
FROM HIGHLAND CHURCH RD.
TO KNOB CREEK RD. AT SR 354

ENVIRONMENTAL MAP

7.1.3 Highland Church Road/Shadden Road

This proposed project will improve Highland Church Road/Shadden Road from State Route 354 to State Route 75. The existing route has nine-foot travel lanes with zero to one-foot shoulders and several curves that must be navigated slowly. The proposed project will provide twelve-foot travel lanes and provide two-foot minimum paved shoulders. Deficient curves will be improved. The proposed project will provide improved access between Johnson City and the Gray community. The proposed project length is 4.99 miles. The 2010 average daily traffic was 1,243 vehicles per day, forecast to increase to 10,000 vehicles per day by the design year of 2040. Trucks comprise 1 percent of this traffic. The 2010 level of service of this roadway was A. The 2040 level of service is calculated to be B. The cost to improve this route is anticipated to range from $16.6 to $43 million. A limited number of residential relocations are anticipated to be required to construct this proposed project. This is ranked as the WCHD's third priority for County Route improvements. A location map is provided in **Figure 7.10**.

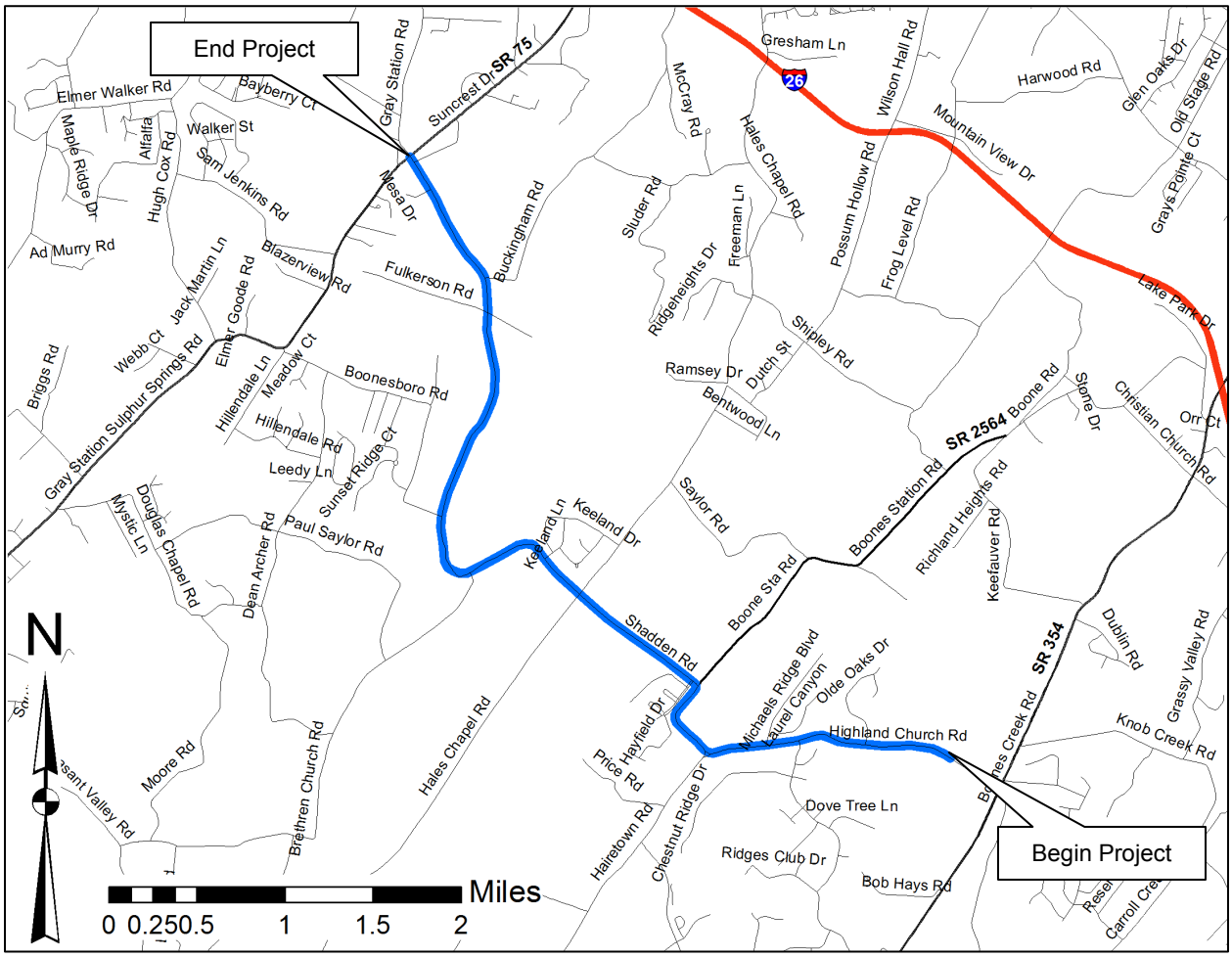
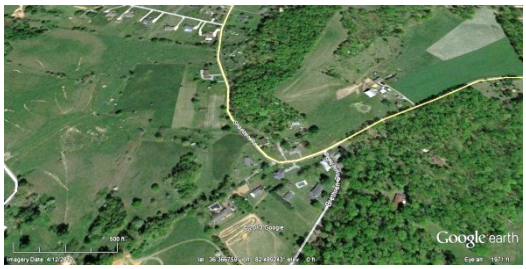


FIGURE 7.10: HIGHLAND CHURCH ROAD/SHADDEN ROAD LOCATION MAP
Source: The Corradino Group

This connection developed as Shadden Road on the west was linked with Highland Church Road on the east. Besides being very narrow, it has several major curves and sight distance concerns. Examples are provided in **Figure 7.11**. This section of the County, in particular, has parallel ridges that are difficult to go over. Together, with the proposed connector roadway from Highland Church Road to Knob Creek Road (discussed in **Section 7.1.2**), the roadway set would provide a continuous way to move southeast/northwest across the mid-county, where no such path exists today. These roads form an important mid-county east-west link between Gray and Johnson City, and connect several State Routes. There is discussion of constructing a city school near the intersection of Highland Church Road and State Route 354 in the Knob Creek area, but no firm plans. Furthermore, the Johnson City MTPO has in its plan a connector from Knob Creek Road to State Route 381, which would feed into these roadway improvements. The earliest this proposed project will be in the MTPO's TIP is 2017 due to funding constraints. This is a connectivity project designed to rationalize a set of roads that developed early in the County's history. This coordinated effort between the WCHD and Johnson City MTPO will provide a cohesive mid-county east-west route.



Shadden Road Curve at Brethren Church Road

Shadden Road Curve West of Keeland Road

Shadden Rd. Curves at Boones Station and Haretown Rd.

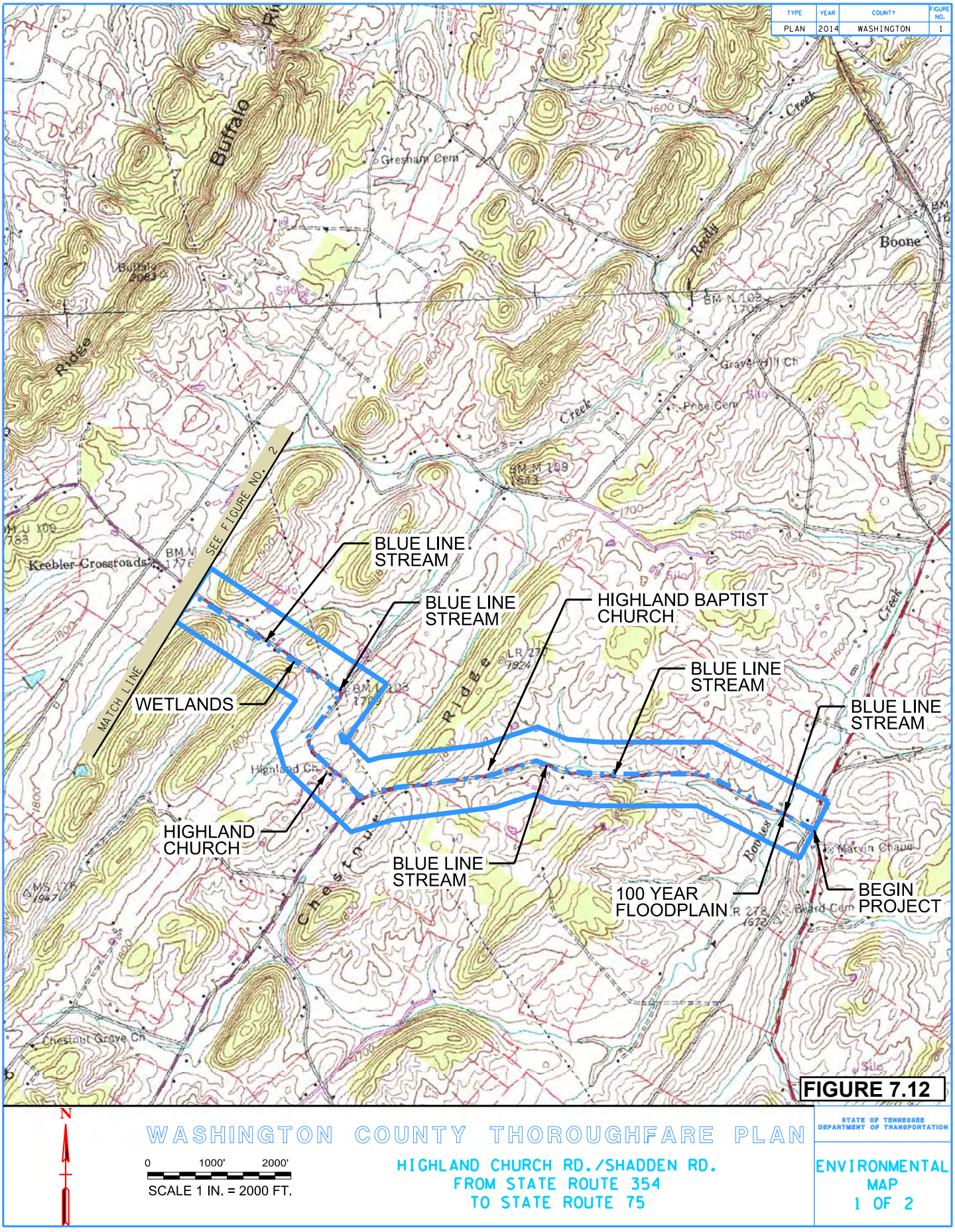
Poor Sight Distance West of Haretown Road

FIGURE 7.11: SHADDEN ROAD CURVES AND SIGHT DISTANCE EXAMPLES
Source: Google Earth Pro

There are a few environmental considerations with this proposed project. It will cross a stream nine times, as designated on USGS mapping. The proposed project also crosses two 100-year floodplains. Wetlands are located adjacent to the roadway north of Hales Chapel Road and are anticipated to be impacted with the improvements. Highland Church and Highland Baptist Church are located along the route. No school, historic property, park, or cemetery directly abuts the proposed project. A map of environmental considerations is provided in **Figure 7.12**.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that

have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, TDOT provided a GIS database of horizontal curvature and stopping sight distance. These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. The existing route has several locations where the safe operating speed of the route is more than 10 miles per hour below the posted speed limit of 35 miles per hour. This creates a safety and mobility concern along the route.



Source: The Corradino Group, USGS Map

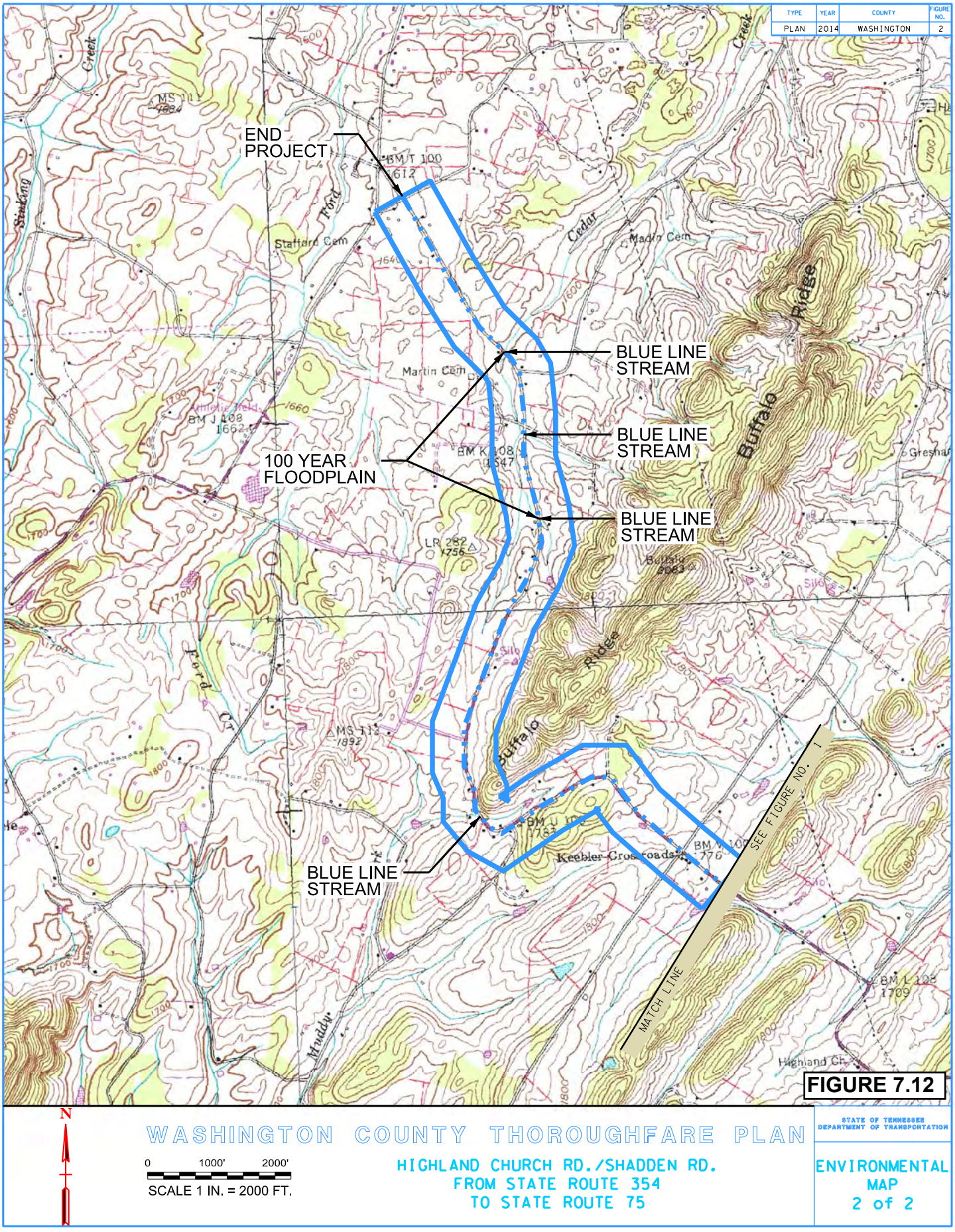


FIGURE 7.12

WASHINGTON COUNTY THOROUGHFARE PLAN

HIGHLAND CHURCH RD./SHADDEN RD.
FROM STATE ROUTE 354
TO STATE ROUTE 75

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

ENVIRONMENTAL MAP
2 of 2

Source: The Corradino Group, USGS Map

7.1.4 Old Gray Station Road

This proposed project will improve Old Gray Station Road from Buckingham Road to the Johnson City City Limits, near Old Stage Road. The existing route has nine-foot travel lanes with zero to two-foot shoulders. The proposed project will provide twelve-foot travel lanes with two-foot paved shoulders. Deficient curves will be improved. The proposed project will provide improved access between Johnson City and the Gray community. The proposed project length is 2.0 miles. The 2010 average daily traffic was 4,093 vehicles per day, forecast to increase to 5,000 vehicles per day by the design year of 2040. Trucks comprise 1 percent of this traffic. The 2010 level of service of this roadway was A. The 2040 level of service is calculated to be B. The cost to improve this route is anticipated to range from $6.9 to $17.2 million. A limited number of residential relocations are anticipated to be required to construct this proposed project. This is ranked as the WCHD's fourth priority for County Route improvements. A location map is provided in **Figure 7.13**.

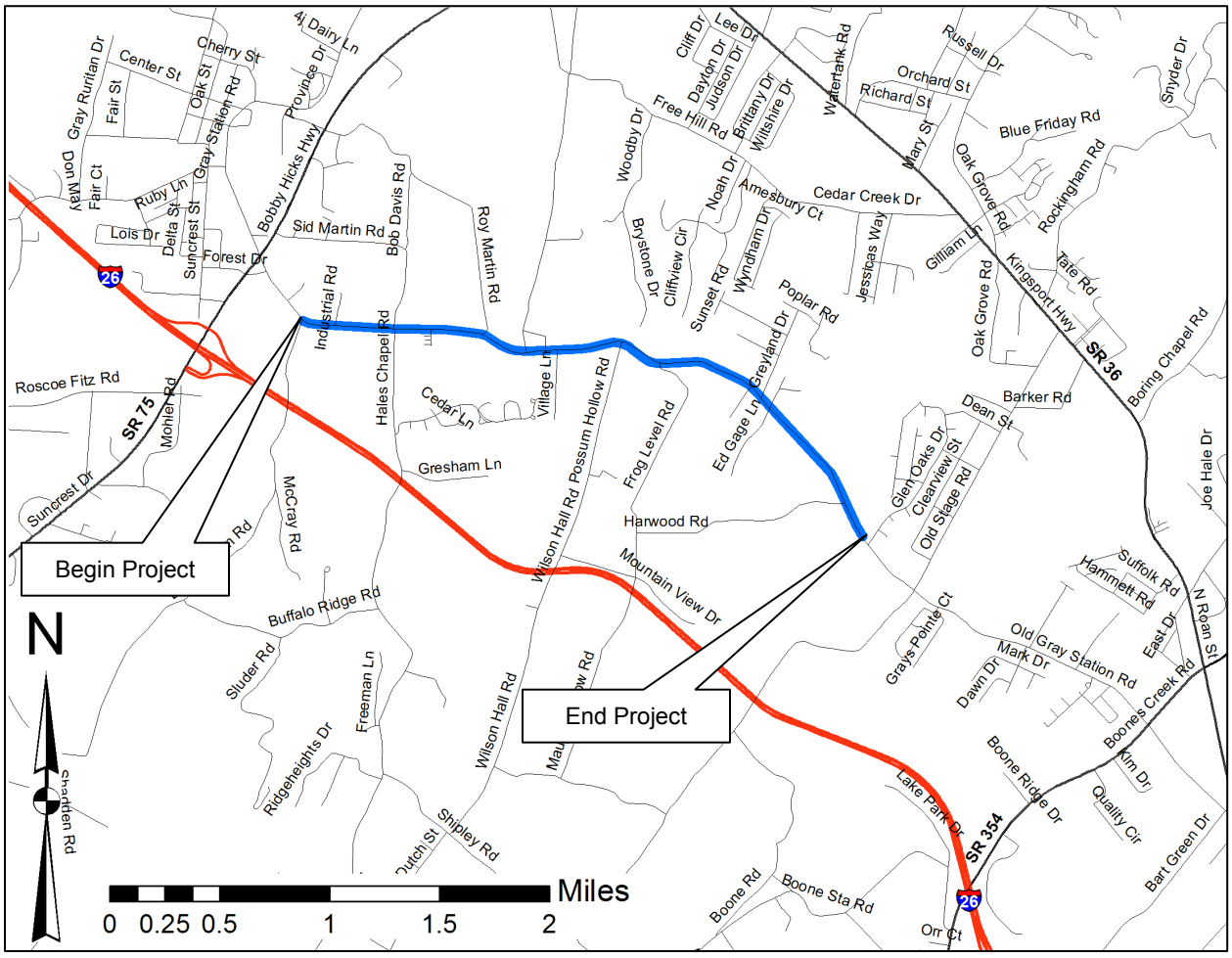


FIGURE 7.13: OLD GRAY STATION ROAD LOCATION MAP
Source: The Corradino Group

FIGURE 7.14: SUBDIVISION DEVELOPMENT ALONG OLD GRAY STATION ROAD
Source: The Google Earth Pro

FIGURE 7.15: OLD GRAY STATION ROAD NEAR SID MARTIN ROAD
Source: The Google Earth Pro

FIGURE 7.16: OLD GRAY STATION ROAD AT CSX RR TRACKS
Source: The Google Earth Pro

Traffic Analysis Zone data show this area along Gray Station Road between Gray and Johnson City will continue to develop. A number of tracts of land are zoned agricultural, but subdivisions are intermingled, and it can be reasonably speculated that land will continue to be converted to residential use (see **Figure 7.14**). This is an area where Johnson City has been active in the past annexing areas as they develop. A typical segment of Gray Station Road is shown in **Figure 7.15**. Future platting should consider how to address a proliferation of individual driveway entrances along Old Gray Station Road.

An important reason that this road is a focus of need is that it is the only continuous east-west road in this part of the County with a grade separated crossing of the CSX railroad tracks (see **Figure 7.16**). This proposed project does not call for any change to that bridge. This route also serves as a detour for I-26 when there is a traffic incident along the interstate.

This Thoroughfare Plan calls for the road to be upgraded to two twelve-foot lanes with two-foot (minimum) paved shoulders. As development expands, some sections may require three-lane construction and/or turning lanes.

There are a few environmental considerations with this proposed project. It will cross a stream five times, as designated on USGS mapping. The proposed project also crosses three 100-year floodplains. Oasis Church is located along the route. No wetland, school, historic property, park, or cemetery directly abuts the proposed project. A map of environmental considerations is provided in **Figure 7.17**.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, TDOT provided a GIS database of horizontal curvature and stopping sight distance. These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. Based on these sources, the existing route does not have a safety concern.

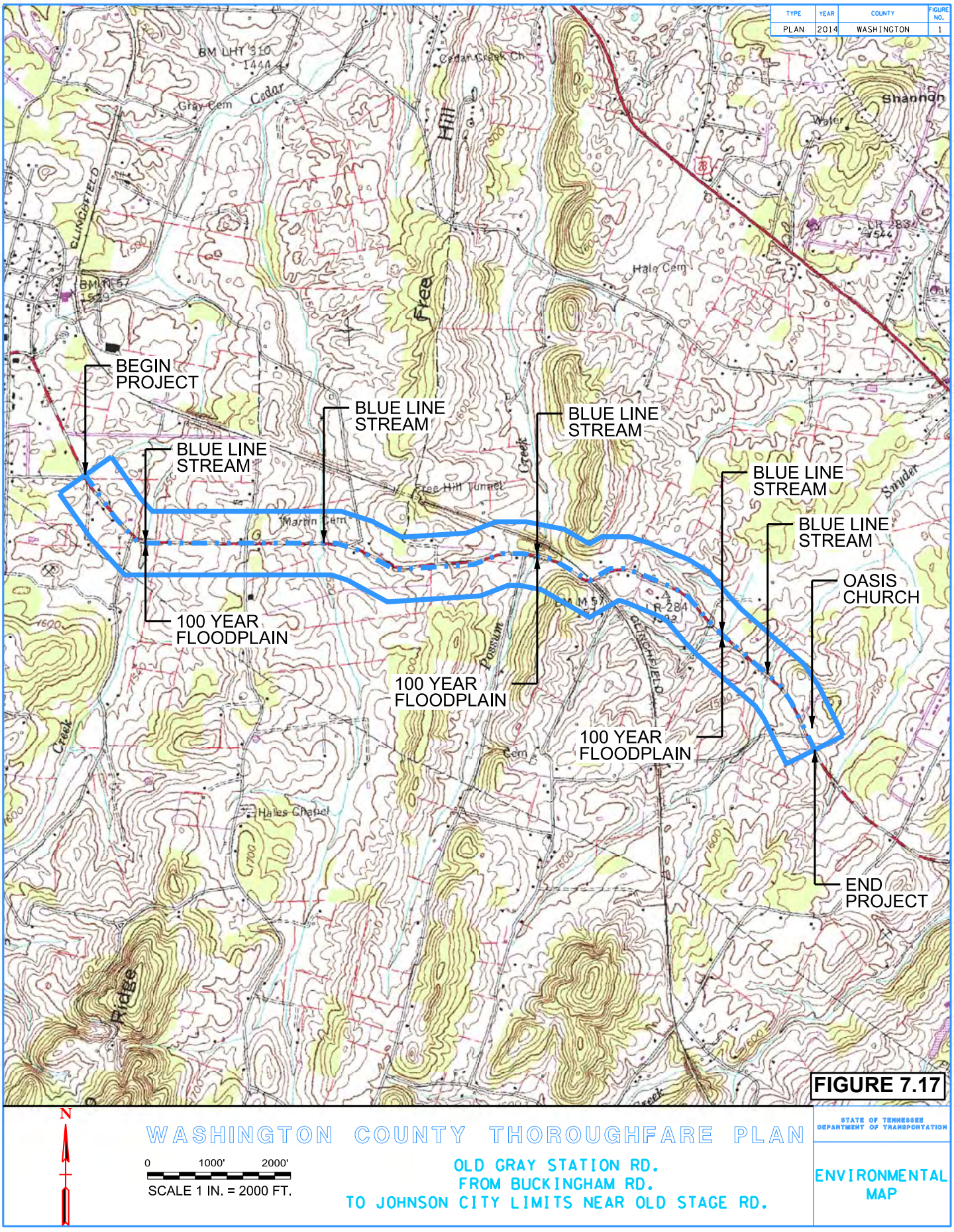


FIGURE 7.17

Source: The Corradino Group, USGS Map

7.1.5 Roy Martin Road Connector

This proposed project will construct a new connector roadway from Roy Martin Road at Johnson City's City Limits to Freehill Road. The proposed project will provide improved access within the Gray community and provide economic development opportunities. The proposed project length is 0.74 miles. The 2040 design year average daily traffic is forecast to be 4,700 vehicles per day. Trucks comprise 1 percent of this traffic. The 2040 level of service is calculated to be B. The cost to construct this route is anticipated to range from $2.3 to $9.0 million. No relocations are anticipated to be required to construct this proposed project. This is ranked as the WCHD's fifth priority for County Route improvements. A location map is provided in **Figure 7.18**.

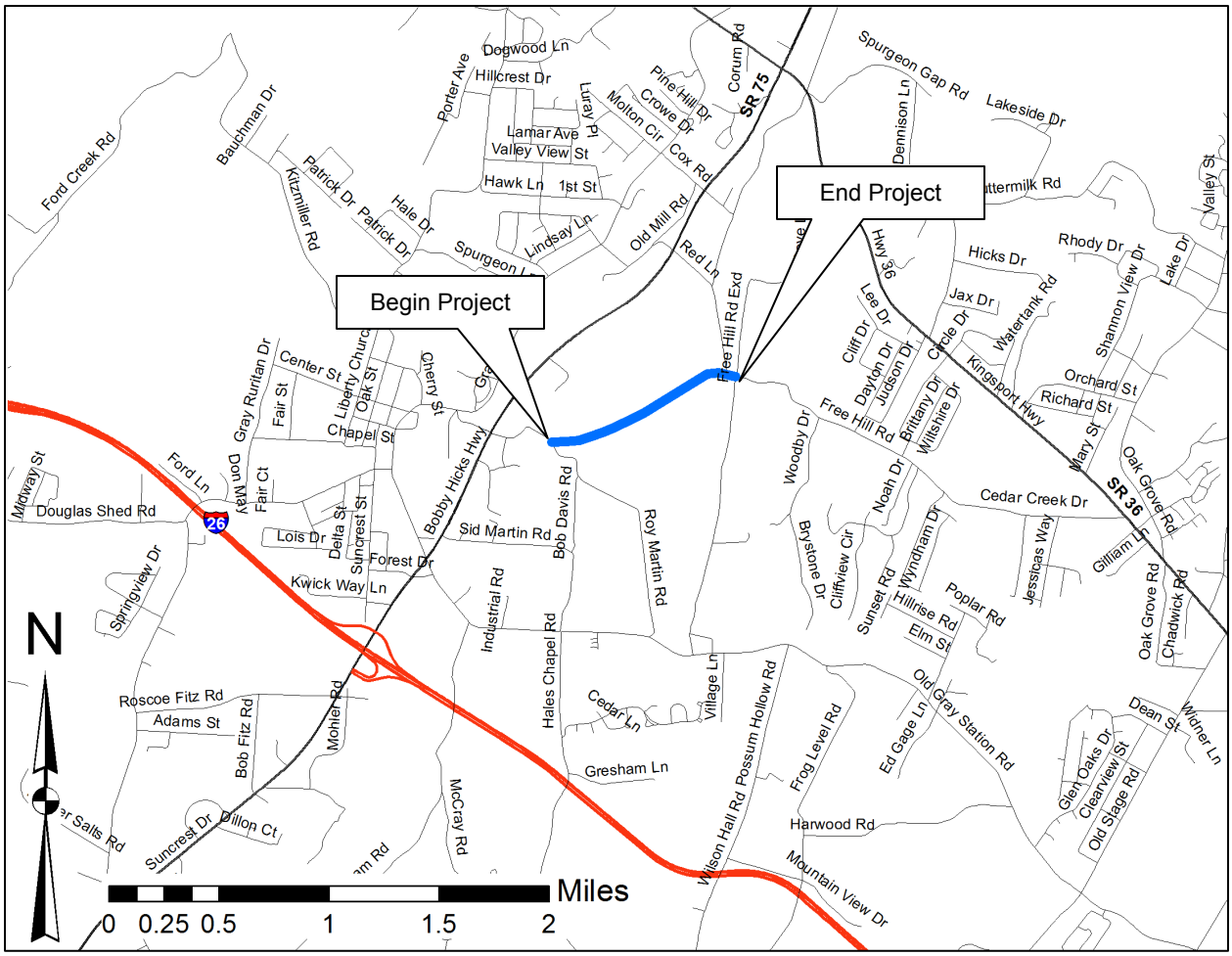


FIGURE 7.18: ROY MARTIN ROAD CONNECTOR LOCATION MAP
Source: The Corradino Group

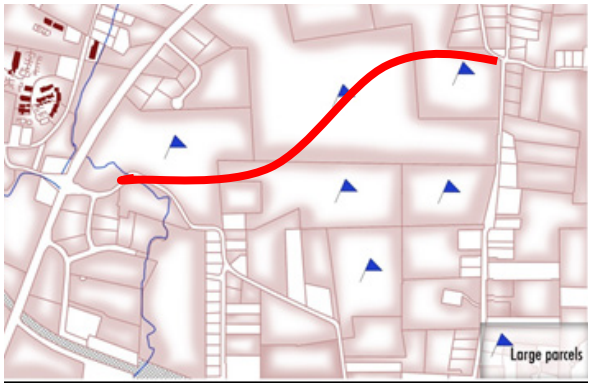


FIGURE 7.19: LARGE PARCELS NEAR ROY MARTIN ROAD
Source: ArcGIS Property Map

This new road would serve extensive development that is anticipated to occur in a large section of farmland that fronts onto State Route 75 that has been on the market. As seen in **Figure 7.19**, several large parcels are present in this area. As a new road, there are no traffic or safety issues. Rather, it is desired to get a road into position before land is subdivided and the opportunity for a continuous logical roadway link is lost.

Two adjacent proposed projects are in the JCMTPO Long Range Transportation Plan as two-lane road improvements: 1) the reconstruction of Roy Martin Road to the west between this proposed project tie-in and State Route 75; and, 2) reconstruction of Free Hill Road to the east to State Route 36. These three projects together would create a complete link between State Route 75 and State Route 36. The goal of this coordinated effort between the MTPO and the WCHD is to provide improved County linkages. The proposed Roy Martin Road Connector Project has independent utility and should not be held up by the other two proposed projects. Together, the three projects would form a 2.5 mile east-west link serving an area defined on the south by the CSX railroad tracks and on the north by State Route 36 (see **Figure 7.20**).

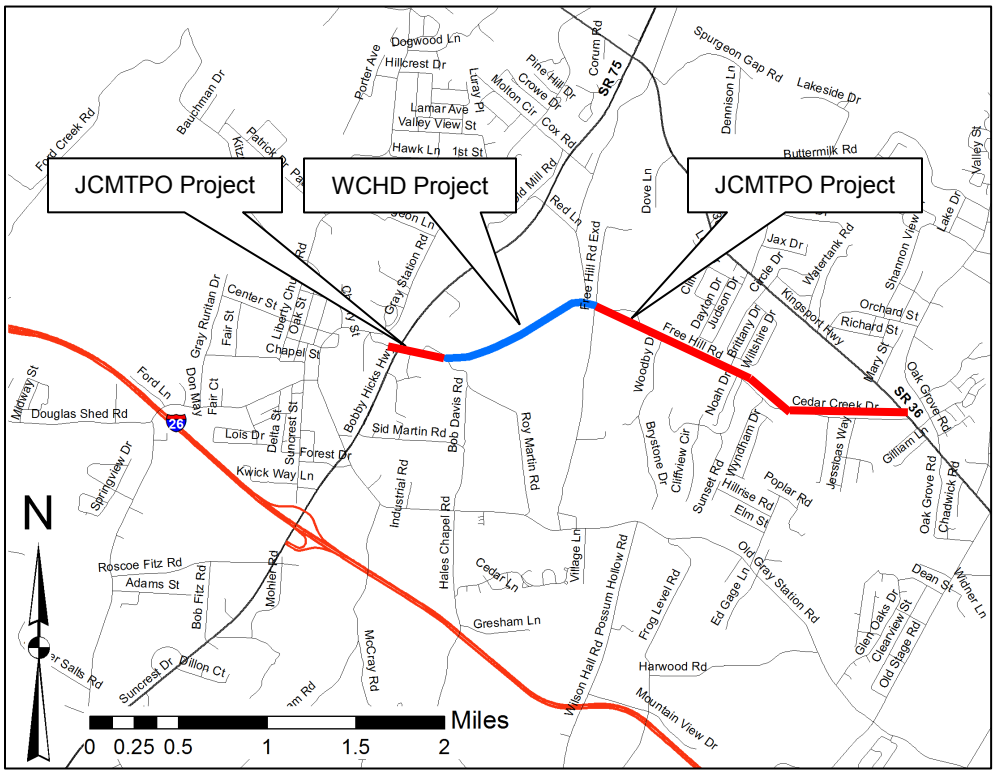
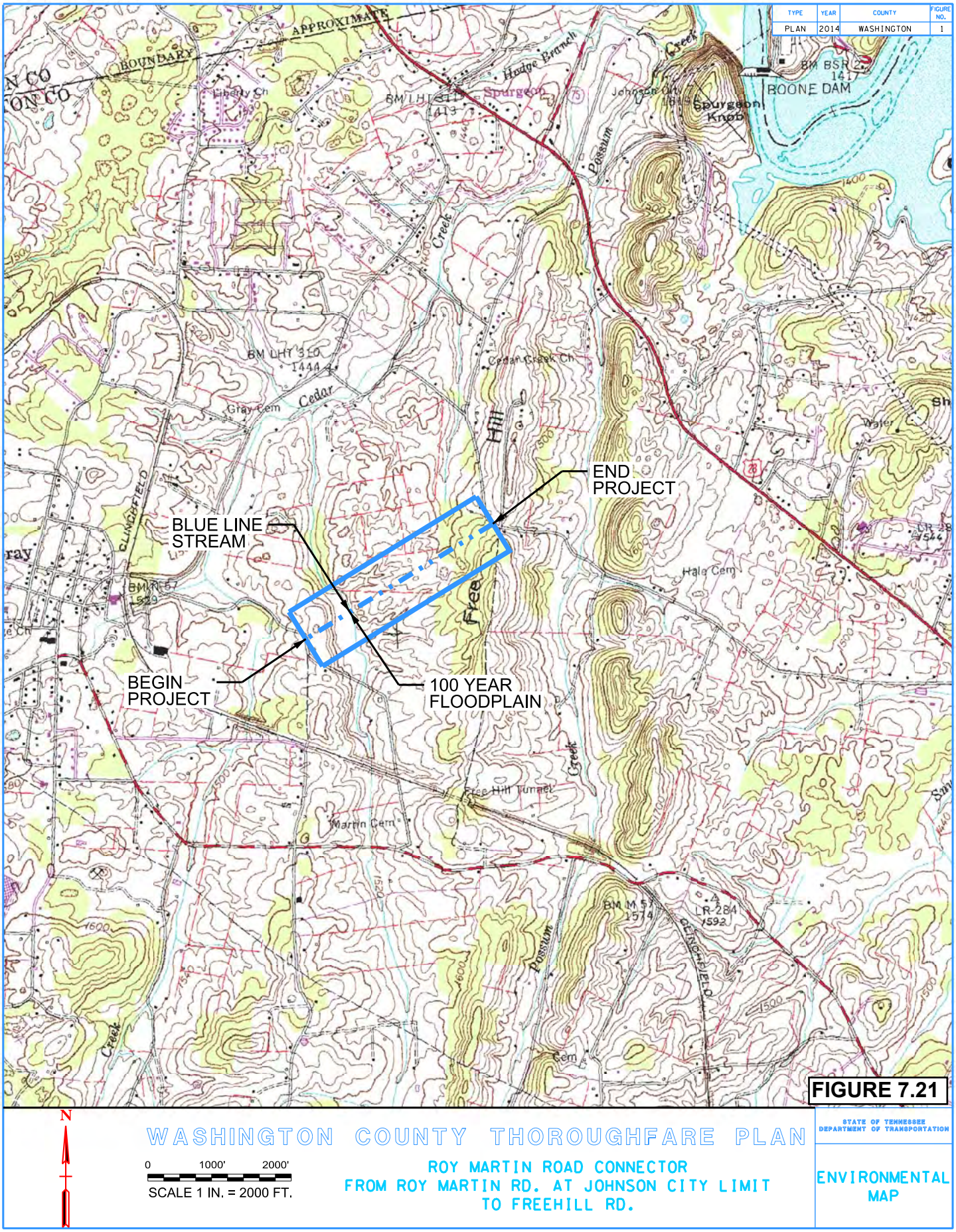


FIGURE 7.20: ROY MARTIN ROAD CONNECTOR COORDINATION
Source: The Corradino Group

There are a couple of environmental considerations with this proposed project. It will cross a stream, as designated on USGS mapping. The proposed project also crosses a 100-year floodplain. No wetland, school, historic property, park, church, or cemetery directly abuts the proposed project. A map of environmental considerations is provided in **Figure 7.21**.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, TDOT provided a GIS database of horizontal curvature and stopping sight distance. These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. There are no safety concerns with this proposed route.



Source: The Corradino Group, USGS Map

7.2 STATE ROUTES

The primary focus of the proposed State Route projects is to improve access in the south and western portions of Washington County. This area is ripe for development and currently sees considerable truck traffic as a shortcut between I-81 and I-26. Improvements to State Routes should provide twelve-foot lanes and full ten-foot paved shoulders, together with improvements to horizontal and vertical alignments. Proposed State Route projects are discussed individually in the following pages. Improvements to State Routes depend on State and Federal funding, and must be programmed through the State Transportation Improvement Program (STIP). Coordination with the First Tennessee Rural Planning Organization is required to program projects on State Routes in the unincorporated portions of Washington County. A proposed project summary table is provided for each project in **Section 7.3**.

None of the State Route projects propose adding travel lanes to existing routes. The proposed projects will provide new roadway connections, improve existing geometric deficiencies, and add shoulders. Narrow existing lane widths will be widened. This will improve safety by reducing the risk of lane-departure crashes. Geometrically deficient curves will be improved. Deficient curves limit the safe operating speed of the roadways. Curves with safe operating speeds less than the posted speed limit pose a safety concern, especially for unfamiliar drivers. Improving these curves will not only improve safety, but improve mobility by allowing the route to be safely travelled at a speed consistent with the posted speed limit. Shoulders will be widened or added. Adding shoulders where none exist will improve safety by reducing the risk of lane-departure crashes. Wide shoulders also provide a safe refuge for disabled vehicles, improving safety and mobility. Wide shoulders also allow for the safe passage of service vehicles, including mail delivery, improving mobility. Finally, shoulders of four feet or more generally provide a safe area for bicyclists and pedestrians.

7.2.1 State Route 75 (at Daniel Boone High School)

This proposed project will improve State Route 75 from Hugh Cox Road to north of Daniel Boone High School, including the approaches of Hugh Cox Road and Elmer Good Road to State Route 75. The existing route has ten-foot travel lanes with one-foot shoulders. The proposed project will straighten a deficient curve in front of the high school and provide twelve-foot lanes and ten-foot paved shoulders. The proposed project length is 0.62 miles. The 2010 average daily traffic was 8,700 vehicles per day, forecast to increase to 15,000 vehicles per day by the design year of 2040. Trucks comprise 2 percent of this traffic. The 2010 level of service of this roadway was B. The 2040 level of service is calculated to be C. The cost to improve this route is anticipated to range from $3.3 to $7.4 million. No relocations are anticipated to be required to construct this proposed project. This is ranked as the WCHD's first priority for State Route improvements. A location map is provided in **Figure 7.22**.

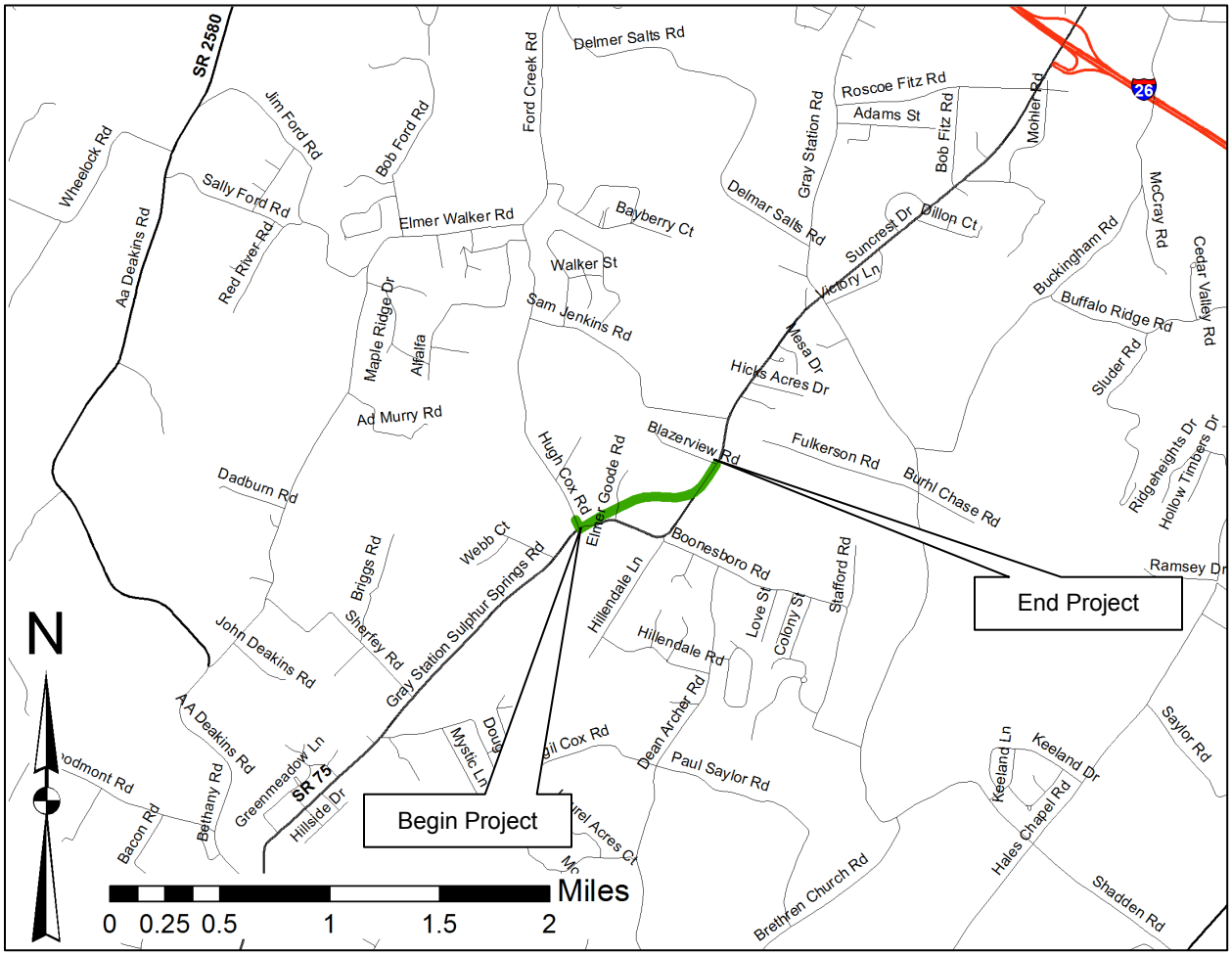


FIGURE 7.22: STATE ROUTE 75 (AT DANIEL BOONE HIGH SCHOOL) LOCATION MAP
Source: The Corradino Group

This stretch of road has been the County's top priority for a long time. This proposed project is needed to bring State Route 75 up to horizontal and vertical design standards, especially given the proximity of the Daniel Boone High School and its young drivers. There are horizontal and

vertical geometric curve deficiencies and heavy school use, including school buses. The JCMTPO Long Range Plan calls for State Route 75 to undergo safety/geometric improvements from I-26 south to Boonesboro Road (south of the high school). The WCHD includes improvements along State Route 75 from State Route 81 to Hugh Cox Road in this Thoroughfare Plan as their second priority (see **Section 7.2.2**). The three proposed projects will need to be coordinated, and when complete, will improve safety and mobility from State Route 81 to I-26. Design of the entrance to the high school is integral to this proposed project. This road section today has two ten-foot lanes and one-foot shoulders.

TDOT provided a GIS database of horizontal curvature and stopping sight distance (SSD). These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. As seen in **Figure 7.23**, the curve along State Route 75 in front of Daniel Boone High School has a safe operating speed of more than 10 miles per hour below the posted speed limit. A roadway view of curves along State Route 75 is provided in **Figure 7.24**.

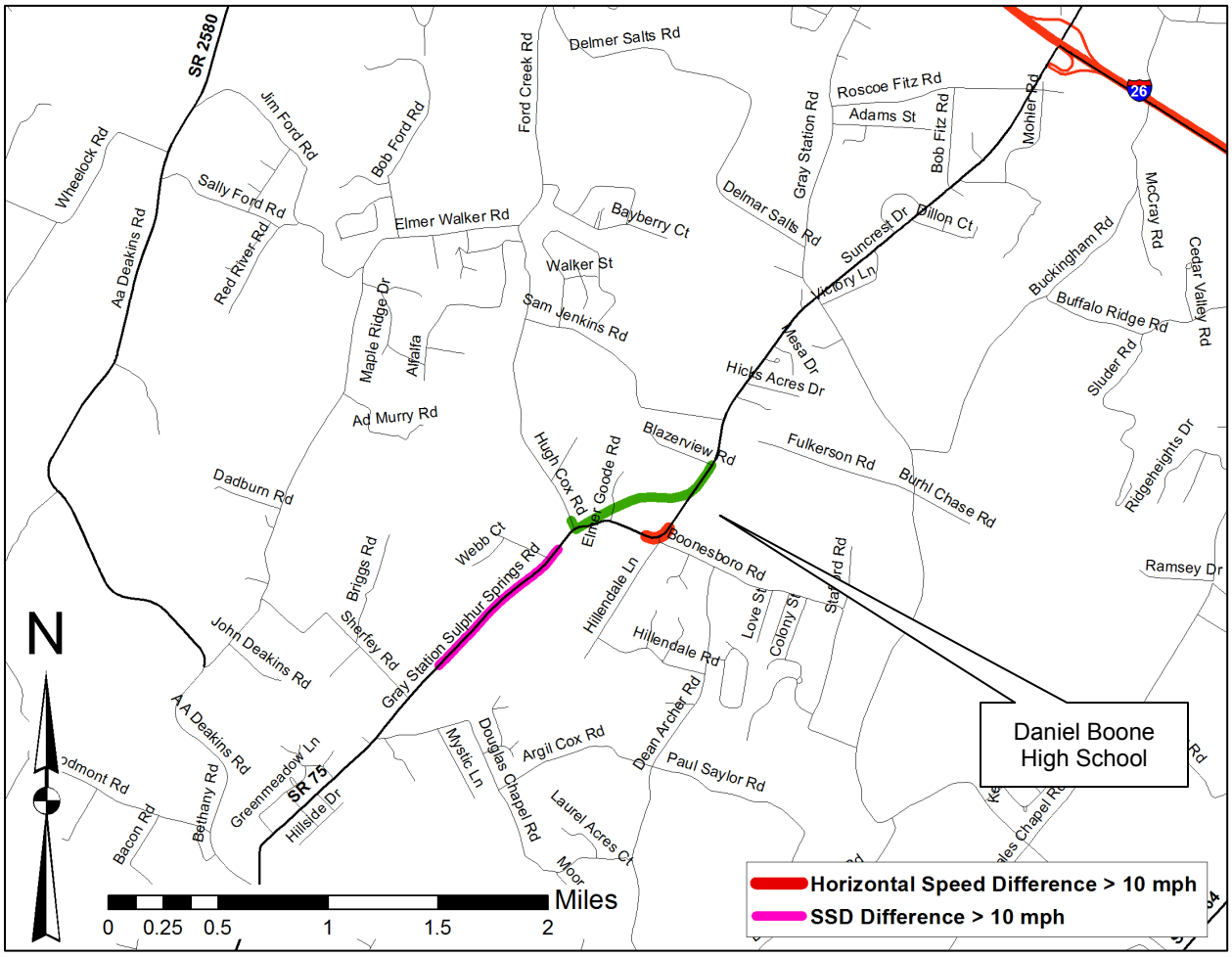


FIGURE 7.23: STATE ROUTE 75 (AT DANIEL BOONE HIGH SCHOOL) DEFICIENT CURVE & SSD MAP
Source: The Corradino Group, TDOT TRIMS Database

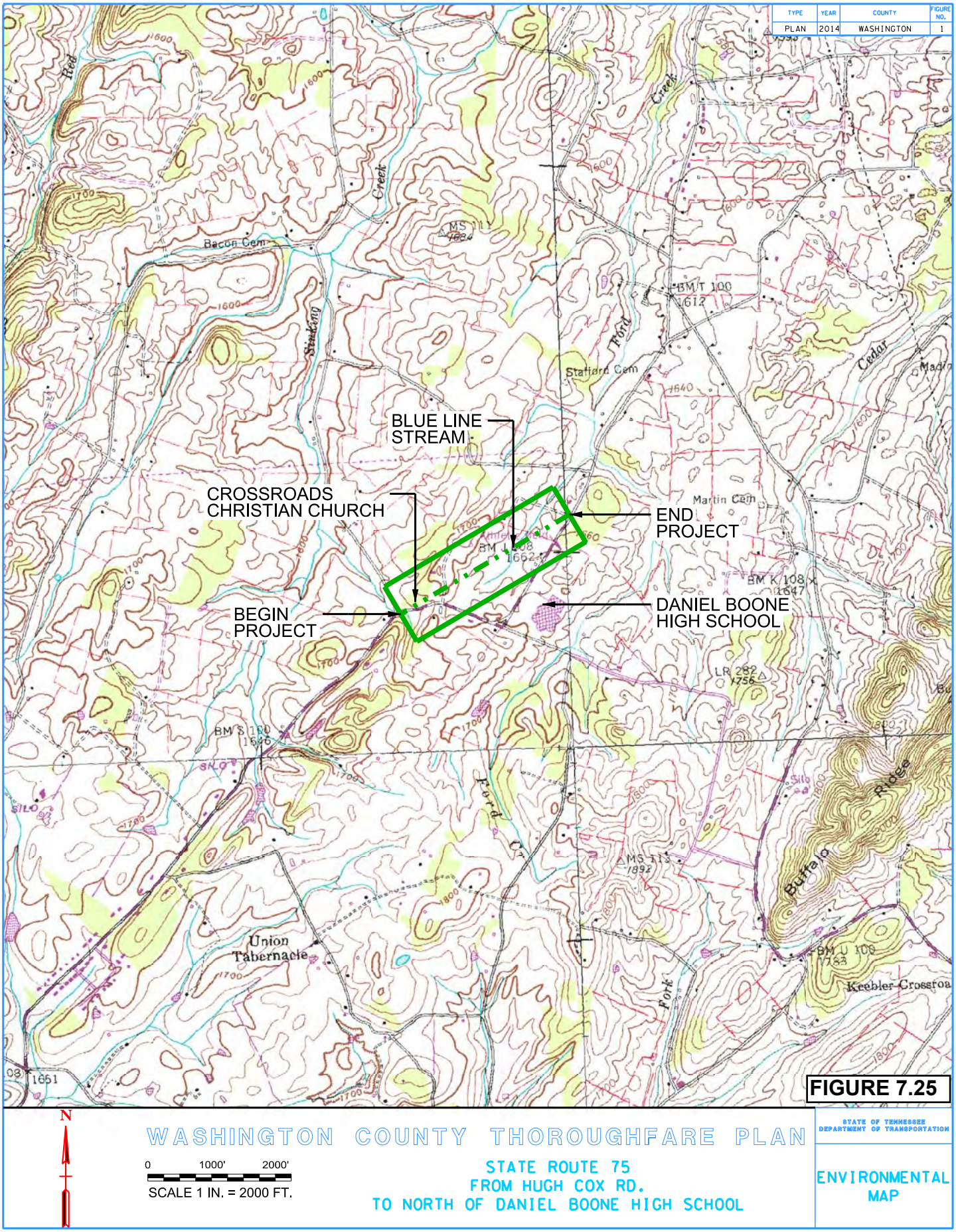
State Route 75 Northbound approaching Hugh Cox Road

State Route 75 Southbound approaching Elmer Good Road

FIGURE 7.24: SR 75 NEAR HUGH COX ROAD
Source: Google Earth Pro

There are a few environmental considerations with this proposed project. It will cross a stream, as designated on USGS mapping. The Crossroads Christian Church is located adjacent to State Route 75 south of Hugh Cox Road. Daniel Boone High School and its associated ball fields are located adjacent to the proposed project. No 100-year floodplain, wetland, historic property, park, or cemetery property directly abut the proposed project. A map of environmental considerations is provided in **Figure 7.25**.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, as discussed previously, TDOT provided a GIS database of horizontal curvature and stopping sight distance with safe operating speeds more than 10 miles per hour below the posted speed limit. Based upon these data, the existing route has locations with a safe operating speed more than 10 miles per hour below the posted speed limit, and therefore has safety concerns.



Source: The Corradino Group, USGS Map

7.2.2 State Route 75 (from State Route 81 to Hugh Cox Road)

This proposed project will improve State Route 75 from State Route 81 to Hugh Cox Road. The existing route has ten-foot travel lanes with one-foot shoulders. The proposed project will provide twelve-foot travel lanes and ten-foot shoulders. Deficient curves will be improved. The proposed project will provide improved access between the Gray community and the southwest portion of Washington County. The proposed project will serve as an extension of improvements that have been constructed along State Route 75 to the north, into Johnson City. The proposed project length is 4.95 miles. The 2010 average daily traffic was 5,600 vehicles per day, forecast to increase to 10,000 vehicles per day by the design year of 2040. Trucks comprise 3 percent of this traffic. The 2010 level of service of this roadway was B. The 2040 level of service is calculated to be C. The cost to improve this route is anticipated to range from $27.5 to $53.9 million. Residential relocations are anticipated to be required to construct this proposed project. This is ranked as the WCHD's second priority for State Route improvements. A location map is provided in **Figure 7.26**.

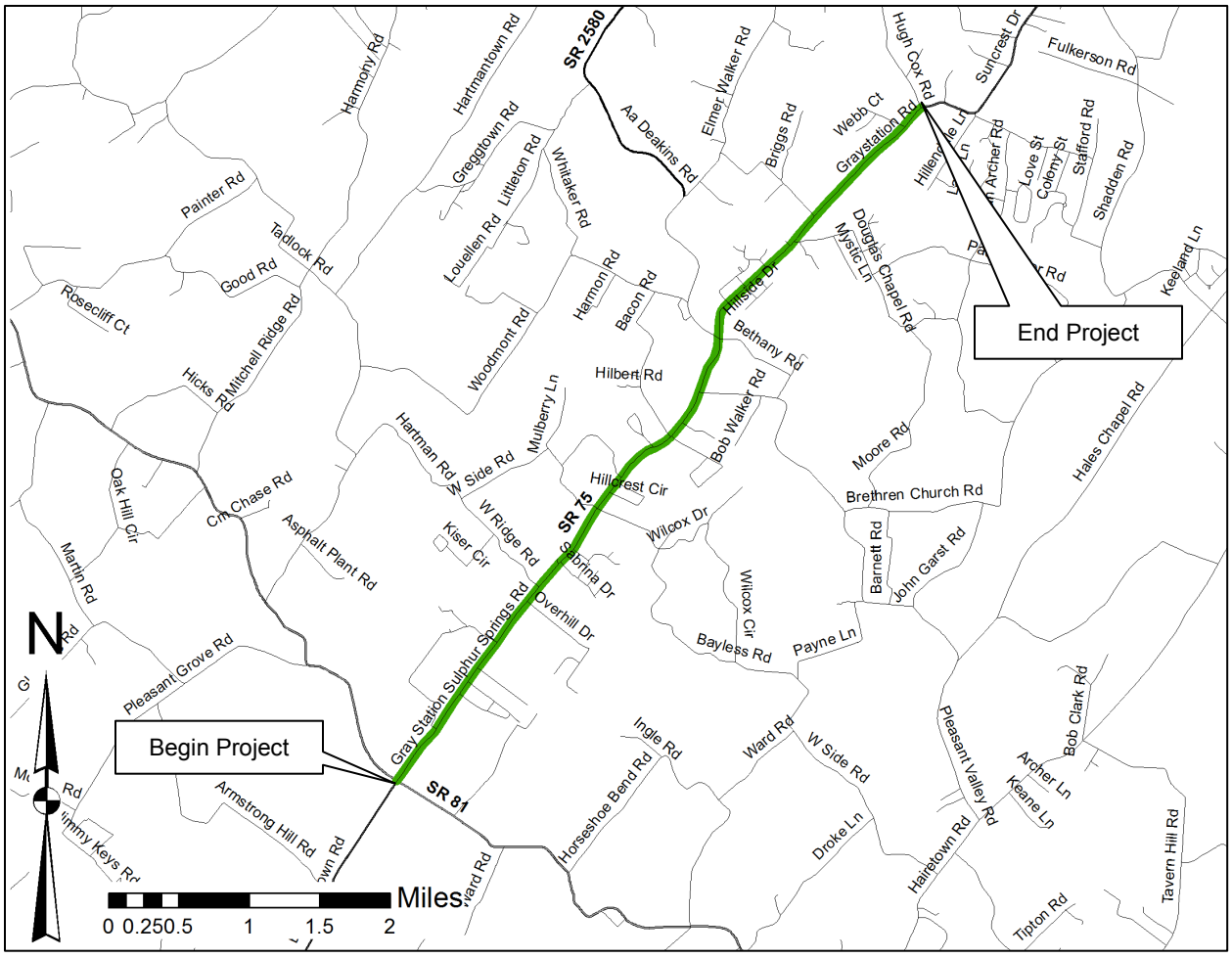


FIGURE 7.26: STATE ROUTE 75 (FROM STATE ROUTE 81 TO HUGH COX ROAD) LOCATION MAP
Source: The Corradino Group

This 4.95-mile long proposed project follows the valley of Clear Creek from State Route 81 through Sulphur Springs to Hugh Cox Road. State Route 75 continues past the Daniel Boone High School towards Gray. It continues north, providing service to the commercial development around I-26 and eventually to the Tri-Counties Airport and other points north. So, State Route 75 is a very important access corridor. The JCMTPO Long Range Plan calls for State Route 75 to undergo safety/geometric improvements from Boonesboro Road (near Hugh Cox Road) north to I-26. The WCHD includes improvements along State Route 75 from Hugh Cox Road to north of Boonesboro Road (north of Daniel Boone High School) in this Thoroughfare Plan as their first priority (see **Section 7.2.1**). The three proposed projects will need to be coordinated, and when complete, will improve safety and mobility from State Route 81 to I-26.

TDOT provided a GIS database of horizontal curvature and stopping sight distance (SSD). These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. As seen in **Figure 7.27**, there is a curve and areas of stopping sight distance with safe operating speed of more than 10 miles per hour below the posted speed limit.

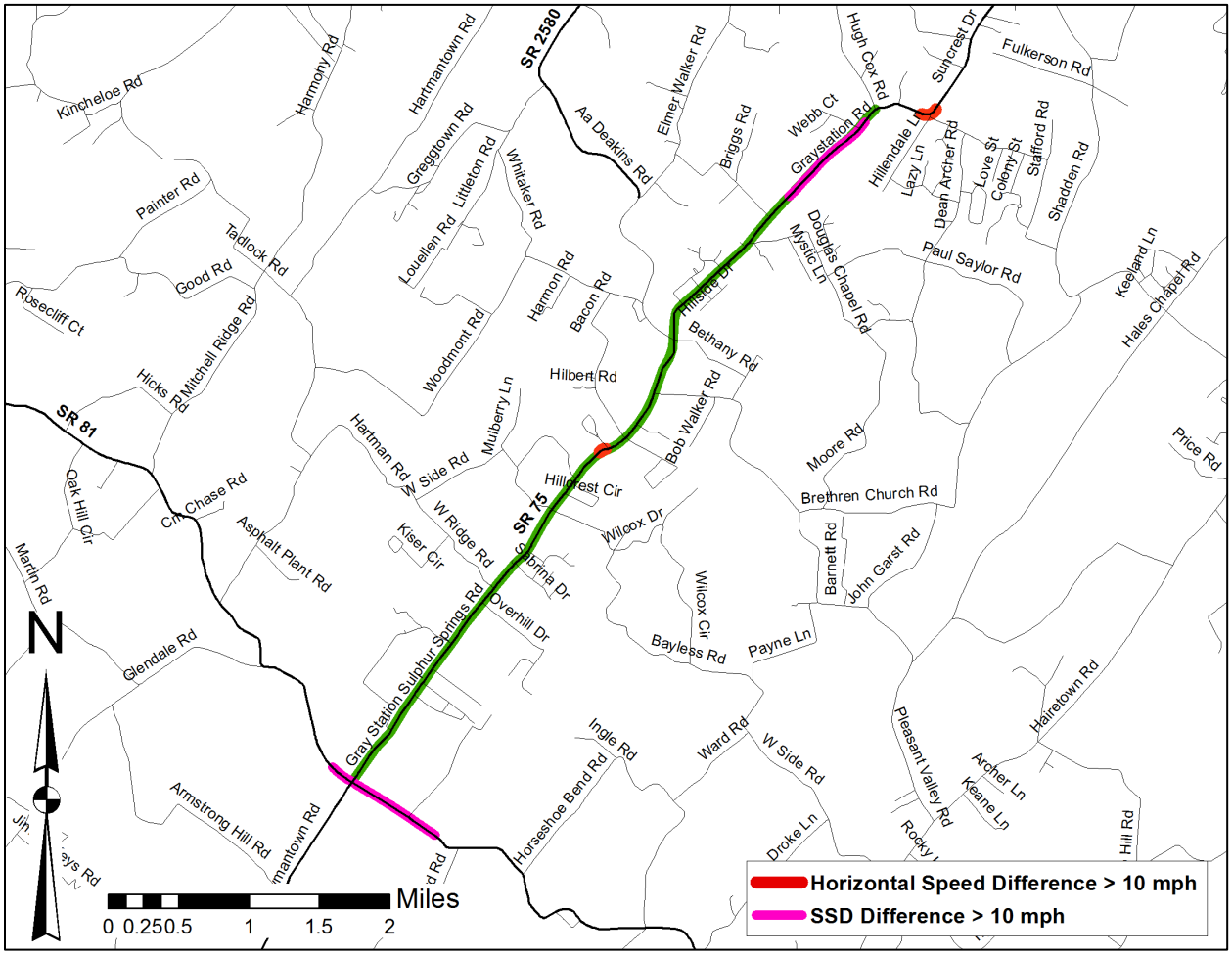


FIGURE 7.27: STATE ROUTE 75 DEFICIENT CURVE & SSD MAP
Source: The Corradino Group, TDOT TRIMS Database

This proposed project passes through the Sulphur Springs community. In Sulphur Springs there is poor access control, with ill-defined separation between the roadway and adjacent driveways/parking areas. The right-of-way is very narrow, with some sections only thirty-feet wide. Sulphur Springs is home to the National Register of Historic Places (NRHP) listed Sulphur Springs Methodist Campground. A cemetery and elementary school are also located adjacent to State Route 75 in Sulphur Springs. Roadway improvements will likely need to be modified through this community to avoid impacts to these community resources. Images of State Route 75 within Sulphur Springs are provided in **Figure 7.28**.

State Route 75 Narrow Right-of-Way

State Route 75 Ill-Defined Pavement

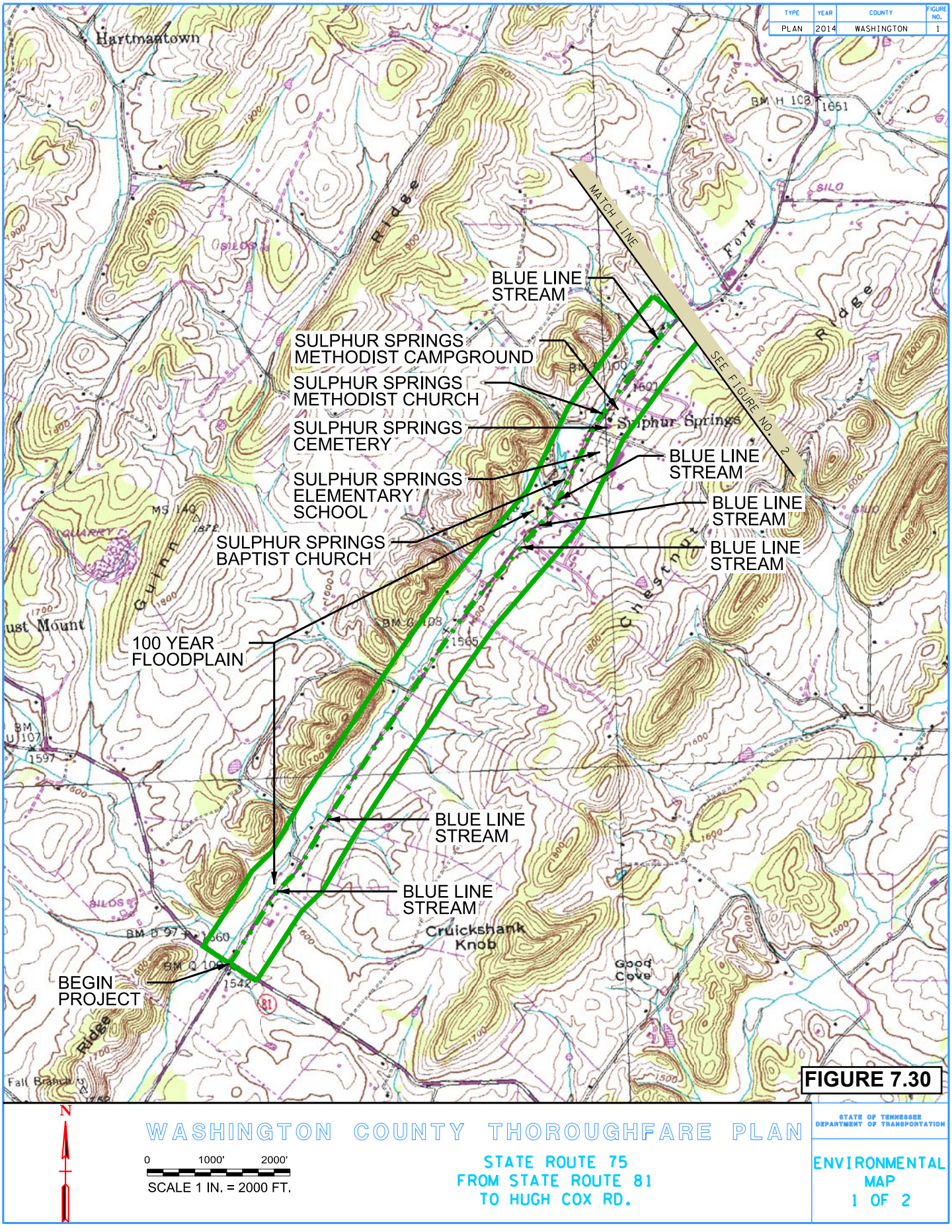
FIGURE 7.28: SR 75 IN SULPHUR SPRINGS
Source: Google Earth Pro

FIGURE 7.29: STATE ROUTE 75 CURVE
Source: Google Earth Pro

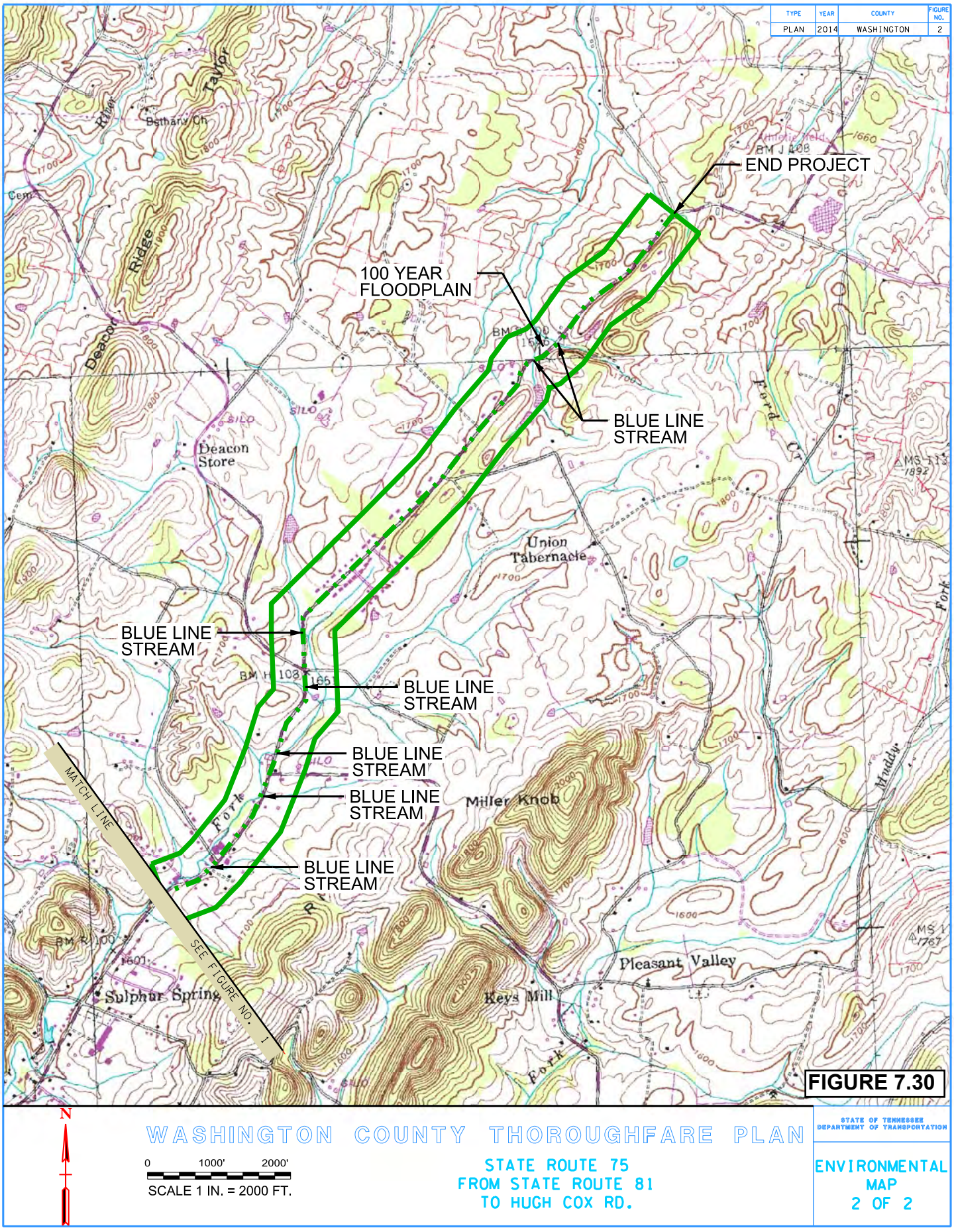
The curve where the difference between the posted speed and the safe operating speed due to horizontal curvature exceeds 10 mph is located north of Sulphur Springs. Compared to many Washington County roads, State Route 75 is relatively straight. But, as **Figure 7.29** shows, minor straightening at this location would be beneficial, especially where driveways and ill-defined pavement crowd the road.

There are environmental considerations with this proposed project. It will cross a stream thirteen times, as designated on USGS mapping. The proposed project is adjacent to one 100-year floodplain, and crosses another. The Sulphur Springs Elementary School is located adjacent to the route, as is the NRHP listed Sulphur Springs Methodist Campground, the Sulphur Springs Cemetery, the Sulphur Springs Baptist Church and the Sulphur Springs Methodist Church. No wetland or park directly abuts the proposed project. A map of environmental considerations is provided in **Figure 7.30**.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, as discussed previously, TDOT provided a GIS database of horizontal curvature and stopping sight distance with safe operating speeds more than 10 miles per hour below the posted speed limit. Based upon these data, the existing route has locations with a safe operating speed more than 10 miles per hour below the posted speed limit, and therefore has safety concerns.



Source: The Corradino Group, USGS Map



Source: The Corradino Group, USGS Map

7.2.3 State Route 107

This proposed project will improve State Route 107 from east of Jackson Lane to State Route 81. The existing route has twelve-foot travel lanes with two-foot shoulders. The proposed improvements will construct ten-foot paved shoulders. Deficient curves will be improved. With the proposed improvements, State Route 107 will have ten-foot paved shoulders for its entirety in Washington County. The proposed project will improve access between I-81 and I-26. The proposed project length is 5.98 miles. The 2010 average daily traffic was 3,900 vehicles per day, forecast to increase to 10,000 vehicles per day by the design year of 2040. Trucks comprise 6 percent of this traffic. The 2010 level of service of this roadway was A. The 2040 level of service is calculated to be A. The cost to improve this route is anticipated to range from $17.3 to $19.6 million. No relocations are anticipated to be required to construct this proposed project. This is ranked as the WCHD's third priority for State Route improvements. A location map is provided in **Figure 7.31**.

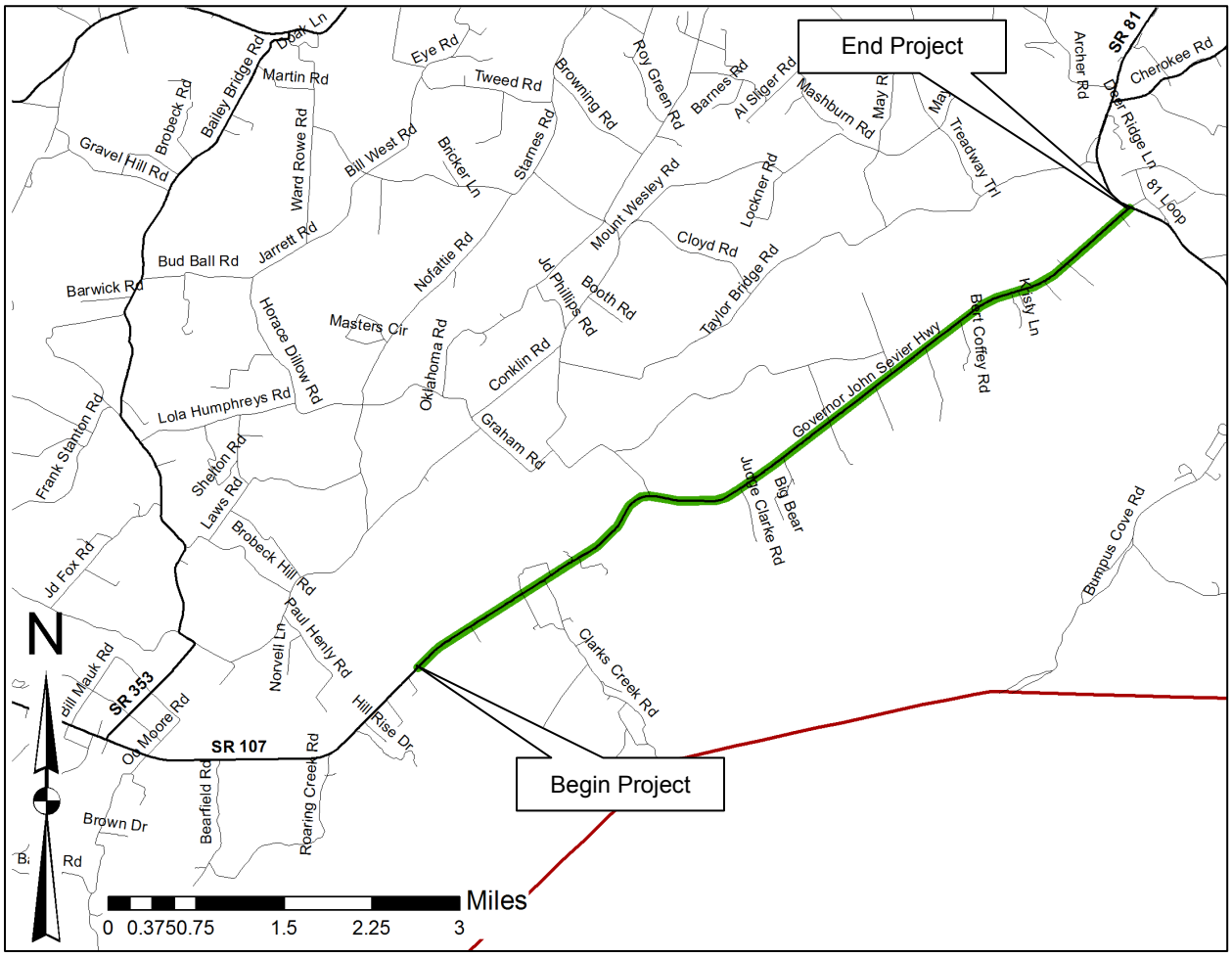


FIGURE 7.31: STATE ROUTE 107 LOCATION MAP
Source: The Corradino Group

This proposed project would bring all of State Route 107 in Washington County to a uniform typical section. It is all twelve-foot lanes today, but this proposed project would upgrade the section from east of Jackson Lane to State Route 81 from two-foot shoulders to ten-foot paved shoulders (see **Figure 7.32**). The area surrounding State Route 107 is good vegetable farming land and sees truck traffic related to farming. It also gets truck traffic cutting from I-81 through Greenville on US 11E, then to State Route 107 to State Route 81 south to Unicoi and I-26. State Route 81 is not suited for heavy trucks. Nonetheless, State Route 107 can be improved, at a reasonable cost, and should be due to the existing truck traffic and anticipated development. This is the primary access to the southwest quadrant of the county, which is expected to grow.

FIGURE 7.32: STATE ROUTE 107 SHOULDER TRANSITIONS
Source: Google Earth Pro

TDOT provided a GIS database of horizontal curvature and stopping sight distance (SSD). These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. As seen in **Figure 7.33**, two locations along State Route 107 in this section show stopping sight distance speed differential issues, one at the curve midway through this section and one at the eastbound approach to State Route 81.

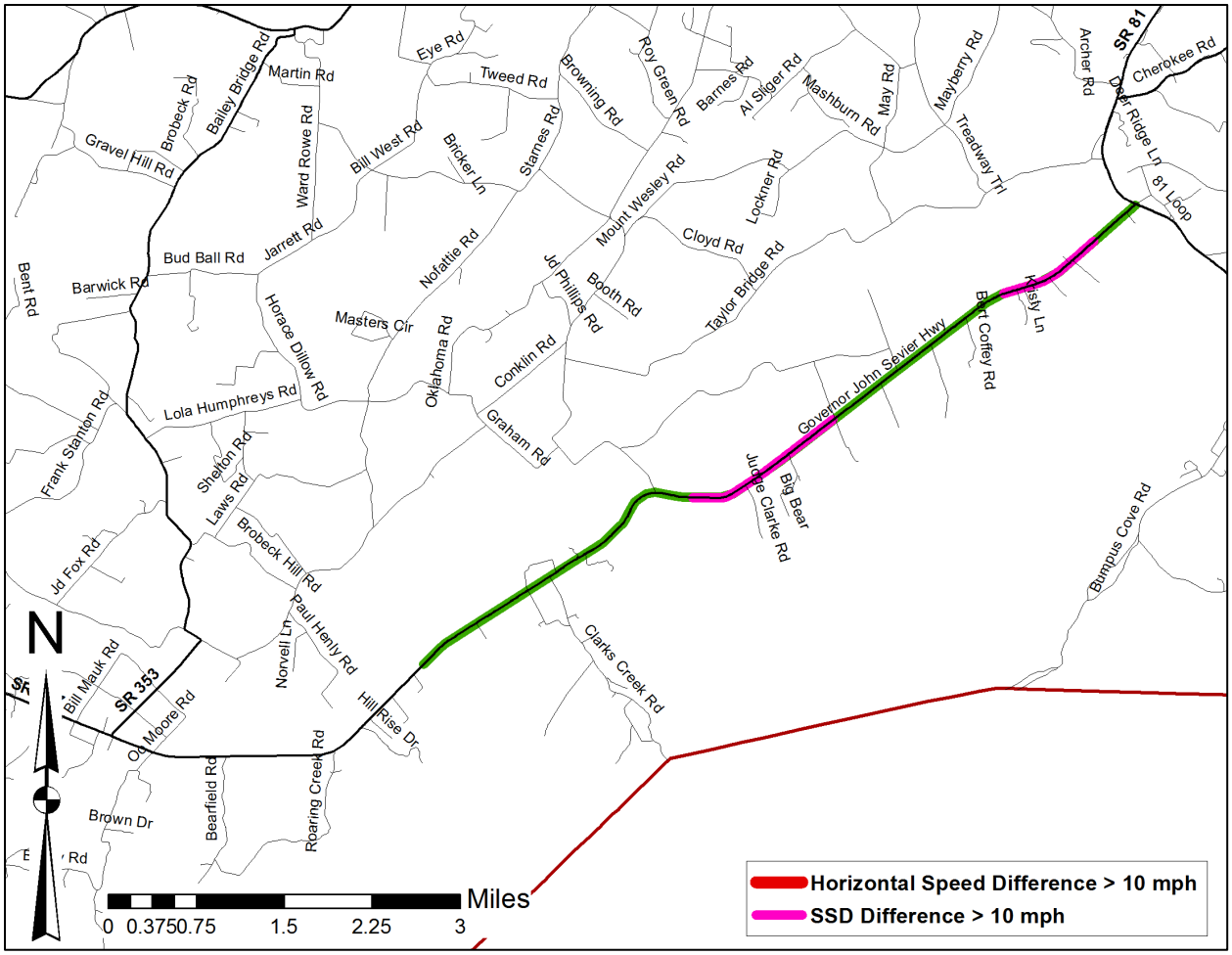


FIGURE 7.33: STATE ROUTE107 DEFICIENT CURVE & SSD MAP
Source: The Corradino Group, TDOT TRIMS Database

There are a few environmental considerations with this proposed project. It will cross a stream twenty-two times, as designated on USGS mapping. The proposed project crosses a 100-year floodplain. The Nolichucky Baptist Church is located adjacent to the route. No wetland, school, historic property, park, or cemetery directly abuts the proposed project. A map of environmental considerations is provided in **Figure 7.34**. Additionally, utilities are located in relatively close proximity to the roadway. Improving the shoulders will require utility relocations.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, as discussed previously, TDOT provided a GIS database of horizontal curvature and stopping sight distance with safe operating speeds more than 10 miles per hour below the posted speed limit. Based upon these data, the existing route has locations with a safe operating speed more than 10 miles per hour below the posted speed limit, and therefore has safety concerns.

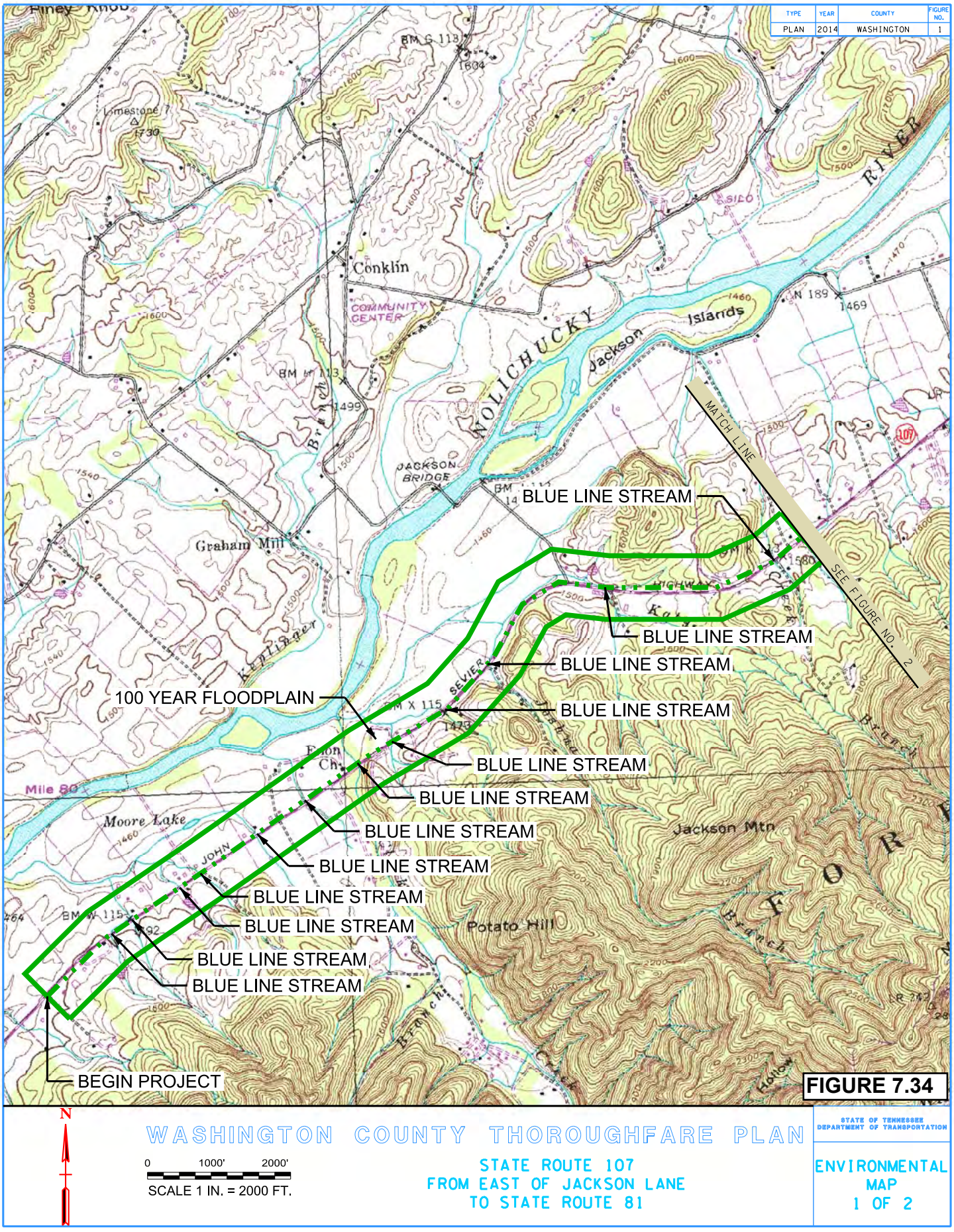
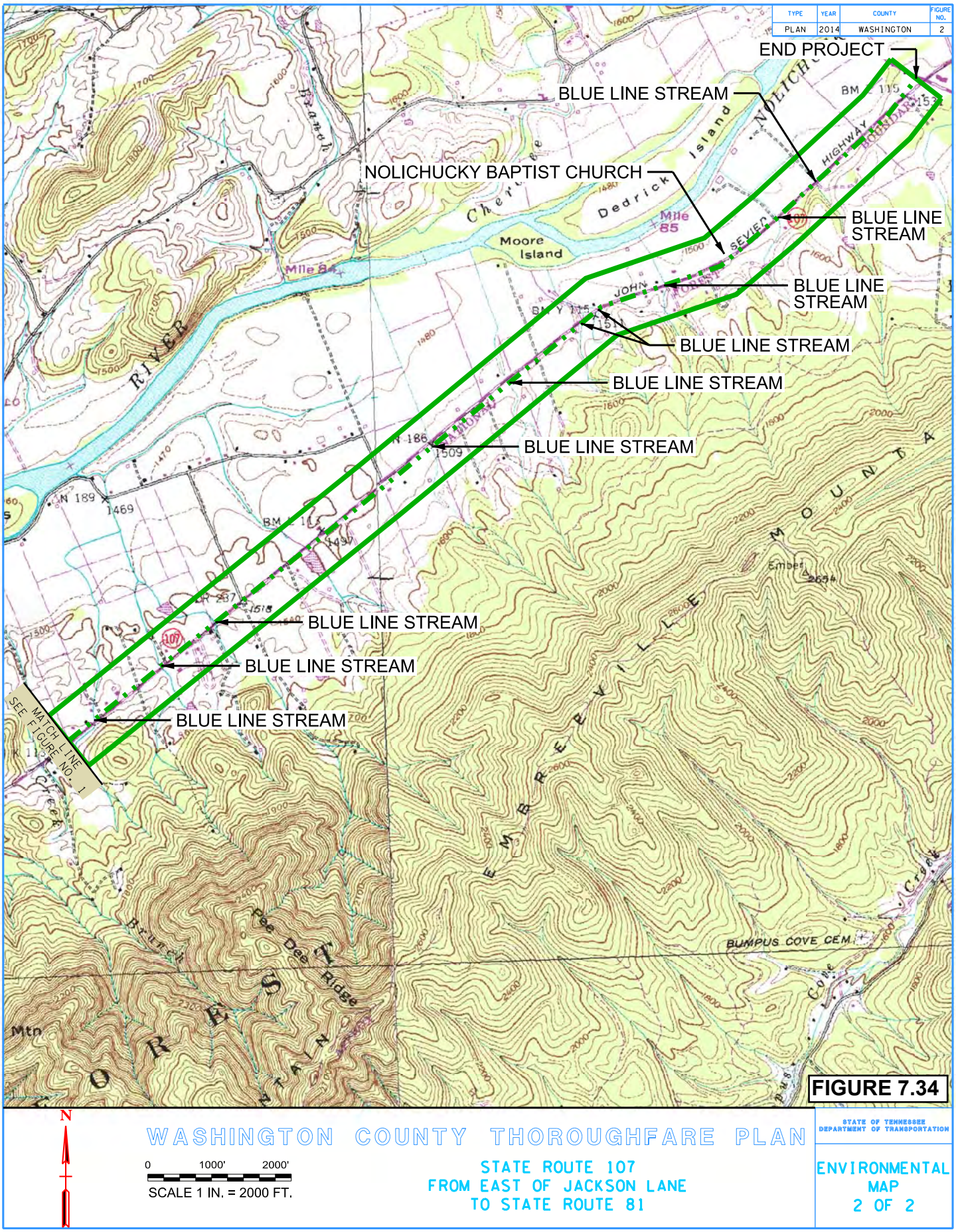


FIGURE 7.34

Source: The Corradino Group, USGS Map



Source: The Corradino Group, USGS Map

7.2.4 State Route 81 (from State Route 107 to Jonesborough)

This proposed project will improve State Route 81 from State Route 107 to the Jonesborough City Limits, near Ridgecrest Road. The existing route has ten to twelve-foot travel lanes with one to nine-foot shoulders. The proposed project will provide twelve-foot travel lanes and ten-foot paved shoulders. Deficient curves will be improved. The proposed project will provide improved access between Jonesborough and Erwin. The proposed project length is 4.32 miles. The 2010 average daily traffic was 3,200 vehicles per day, forecast to increase to 10,000 vehicles per day by the design year of 2040. Trucks comprise 3 percent of this traffic. The 2010 level of service of this roadway was A. The 2040 level of service is calculated to be A. The cost to improve this route is anticipated to range from $24.7 to $51.1 million. Residential relocations are anticipated to be required to construct this proposed project. This is ranked as the WCHD's fourth priority for State Route improvements. A location map is provided in **Figure 7.35**.

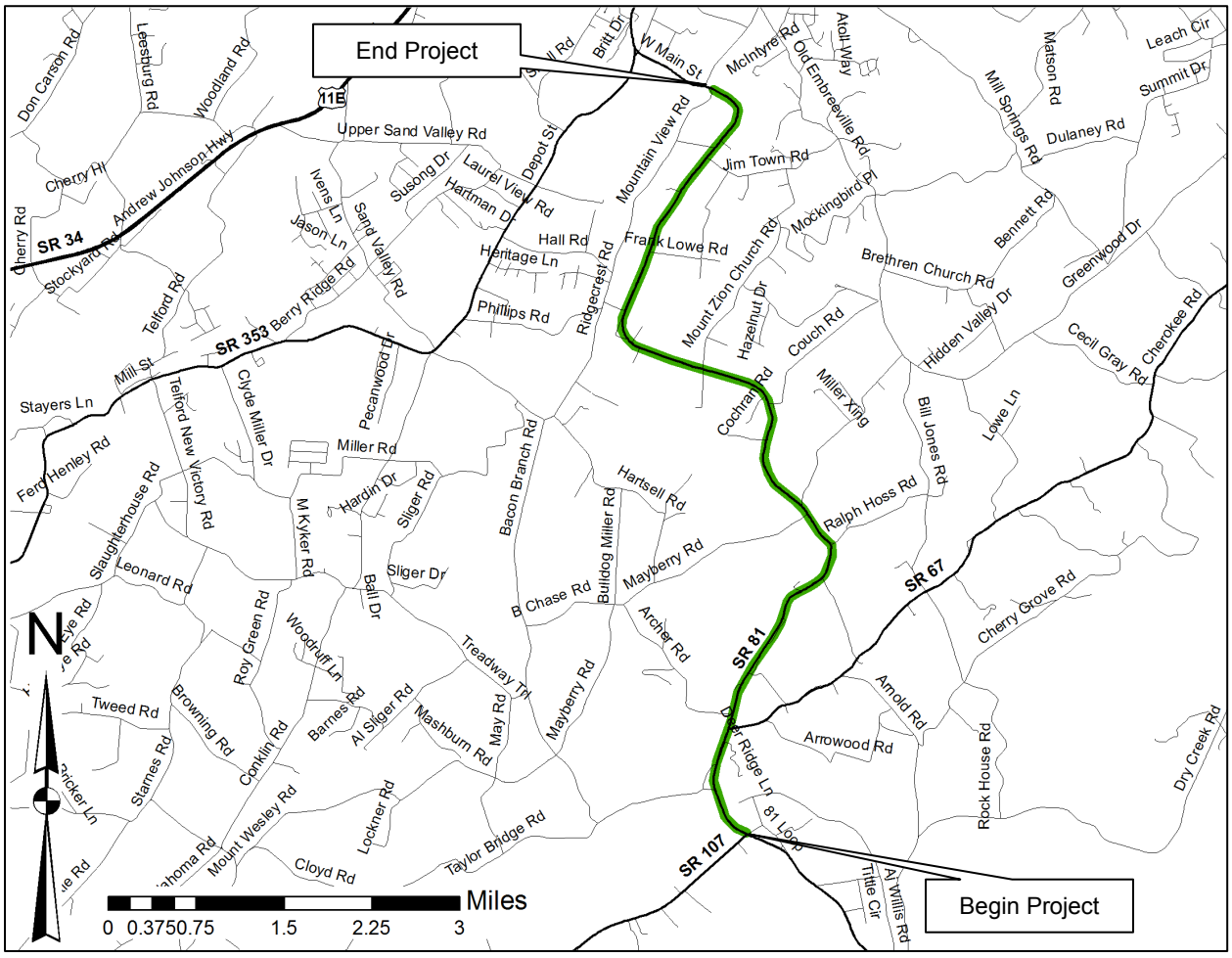


FIGURE 7.35: STATE ROUTE 81 (FROM STATE ROUTE 107 TO JONESBOROUGH) LOCATION MAP
Source: The Corradino Group

Together with State Route 81 north of Jonesborough, and State Route 81 from State Route 107 to the Unicoi County line, this road forms the only north-south link across the County apart from I-26. While not as curvy as State Route 81 north of Jonesborough this road section has narrow lanes and shoulders. The northern half of this road section has ten-foot lanes and the southern section has twelve-foot lanes. The north third has one-foot shoulders, the next third two to three-foot shoulders, and the southern third four to nine-foot shoulders. The proposed project would provide twelve-foot lanes and ten-foot paved shoulders.

This section of State Route 81 serves trips to the south County and beyond and provides access to Lamar Elementary School. Approximately 1,500 feet of State Route 81 has been improved at the elementary school, with a left-turn lane added southbound to the school. The surrounding area is expected to develop by local officials. This section crosses the Nolichucky River, but the bridge does not need replacement.

TDOT provided a GIS database of horizontal curvature and stopping sight distance (SSD). These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. As seen in **Figure 7.36**, three locations along State Route 81 in this section show stopping sight distance speed differential issues.

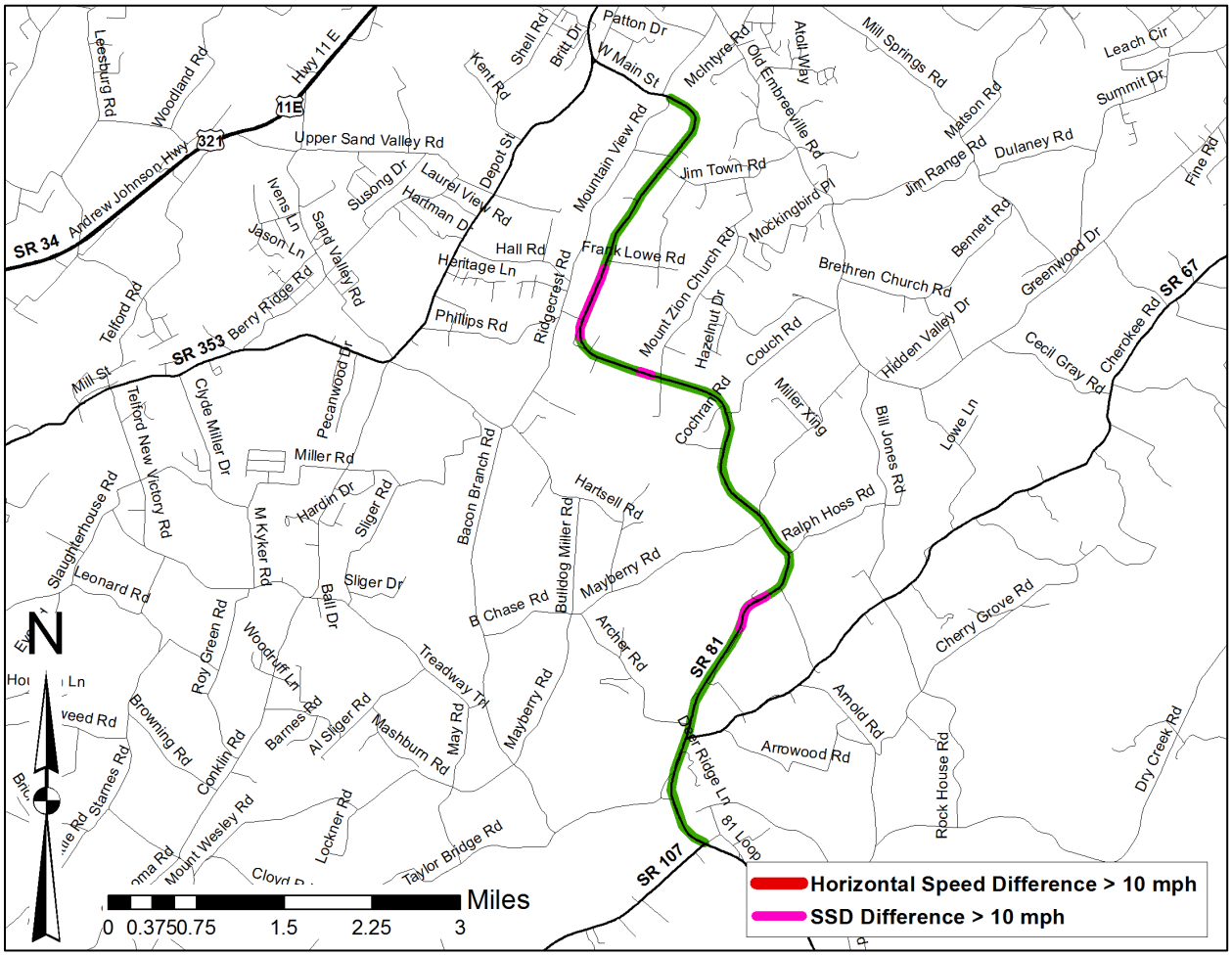
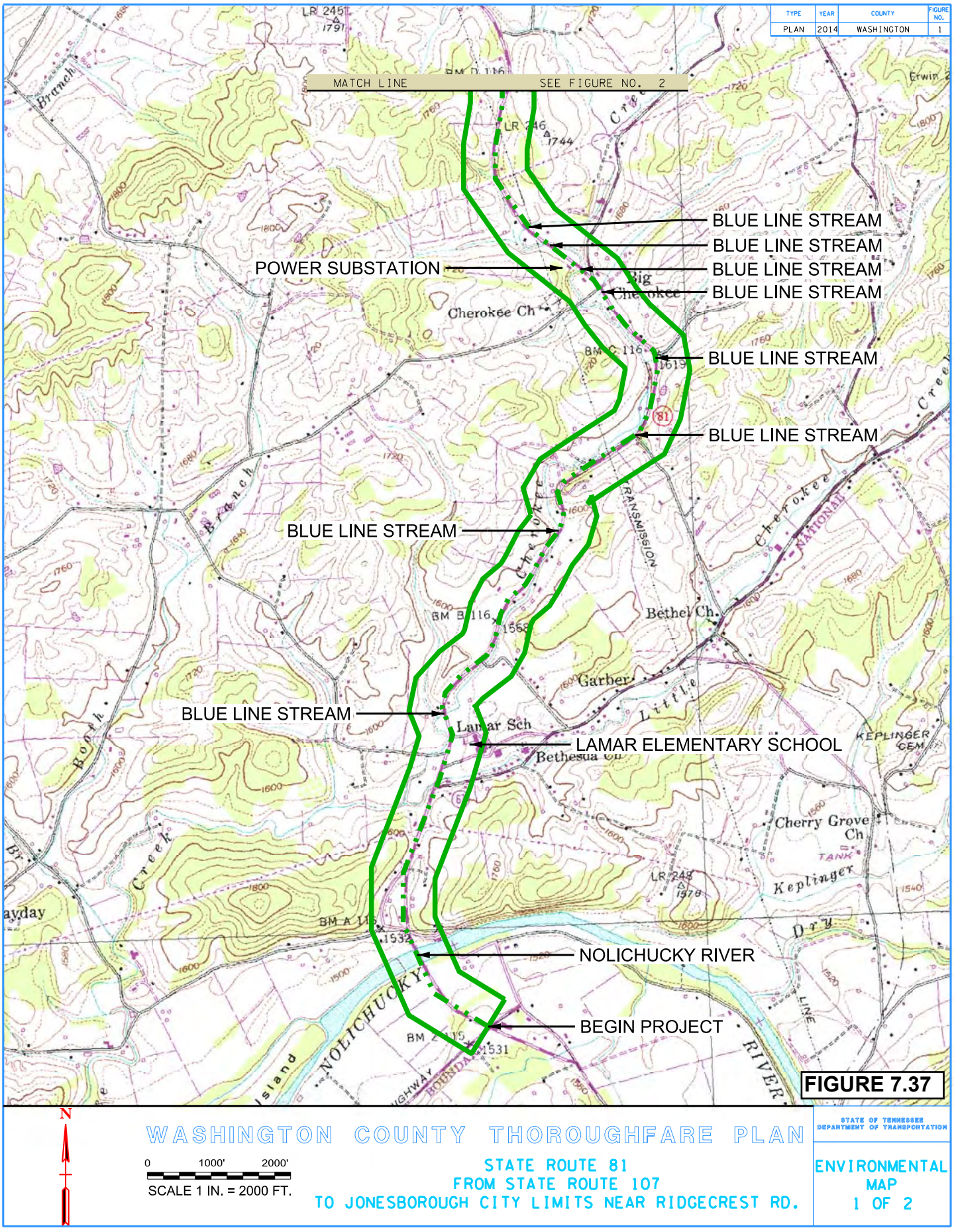


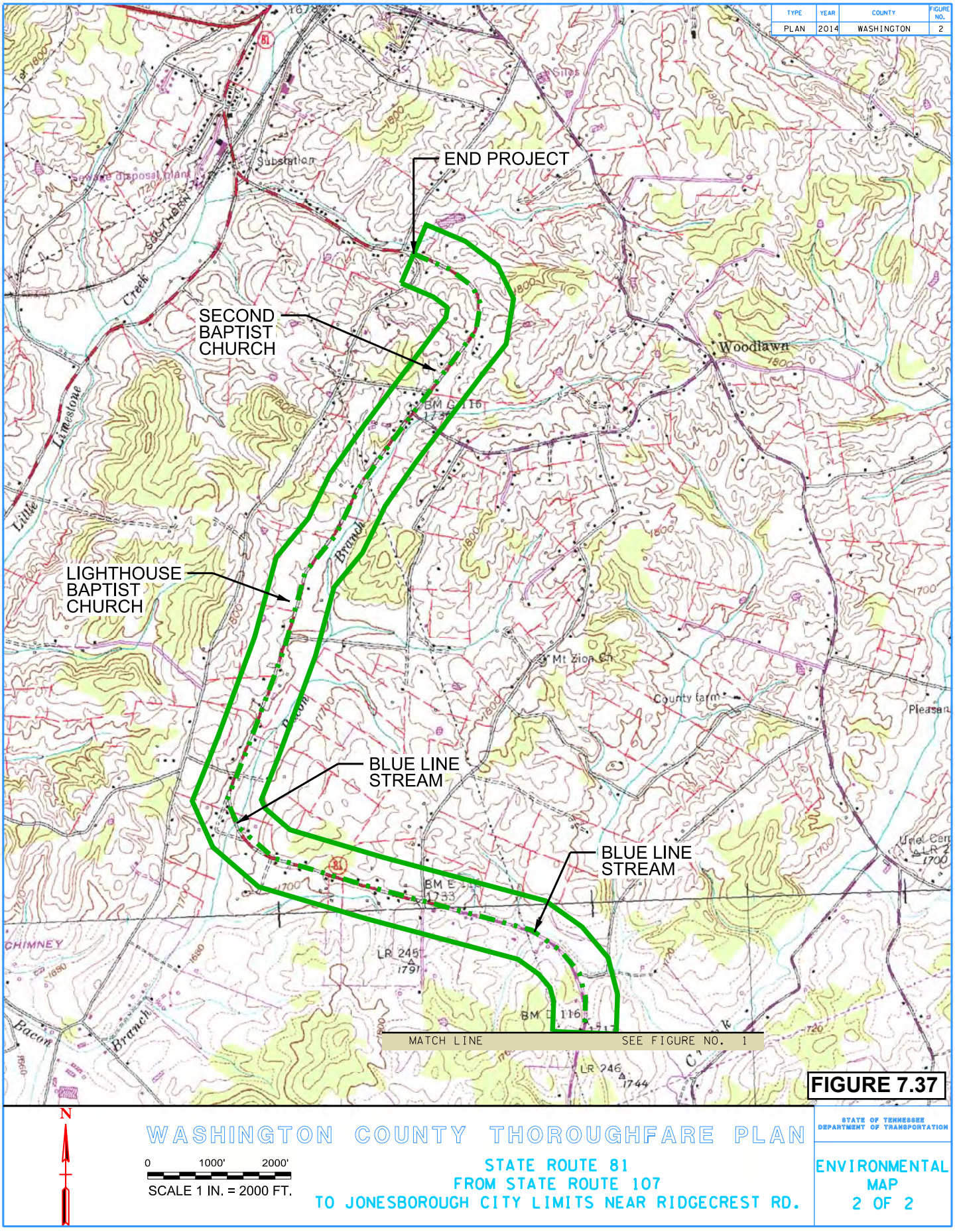
FIGURE 7.36: STATE ROUTE81 DEFICIENT CURVE & SSD MAP
Source: The Corradino Group, TDOT TRIMS Database

There are a few environmental considerations with this proposed project. It will cross a stream ten times, as designated on USGS mapping. Lamar Elementary School is located adjacent to the route. Lighthouse Baptist Church and Second Baptist Church are located adjacent to the route. No 100-year floodplain, wetland, historic property, park, or cemetery directly abuts the proposed project. A map of environmental considerations is provided in **Figure 7.37**. Additionally, a power sub-station is located adjacent to the roadway. The route crosses the Nolichucky River.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, as discussed previously, TDOT provided a GIS database of horizontal curvature and stopping sight distance with safe operating speeds more than 10 miles per hour below the posted speed limit. Based upon these data, the existing route has locations with a safe operating speed more than 10 miles per hour below the posted speed limit, and therefore has safety concerns.



Source: The Corradino Group, USGS Map



Source: The Corradino Group, USGS Map

7.2.5 State Route 81 (from Jonesborough to I-81)

This proposed project will improve State Route 81 from the Jonesborough north city limits near Ben Gamble Road to the four-lane section of the route near I-81. This proposed project includes a short segment of State Route 93 at the northern terminus. The existing route has ten to twelve-foot travel lanes with one to three-foot shoulders. The proposed project will provide twelve-foot travel lanes and ten-foot paved shoulders. Deficient curves will be improved. The proposed project will provide improved access between Jonesborough and I-81. The proposed project length is 11.20 miles. The 2010 average daily traffic was 3,600 vehicles per day, forecast to increase to 15,000 vehicles per day by the design year of 2040. Trucks comprise 6 percent of this traffic. The 2010 level of service of this roadway was B. The 2040 level of service is calculated to be C. The cost to improve this route is anticipated to range from $60.2 to $132.4 million. Residential relocations are anticipated to be required to construct this proposed project. This is ranked as the WCHD's fifth priority for State Route improvements. A location map is provided in **Figure 7.38**.

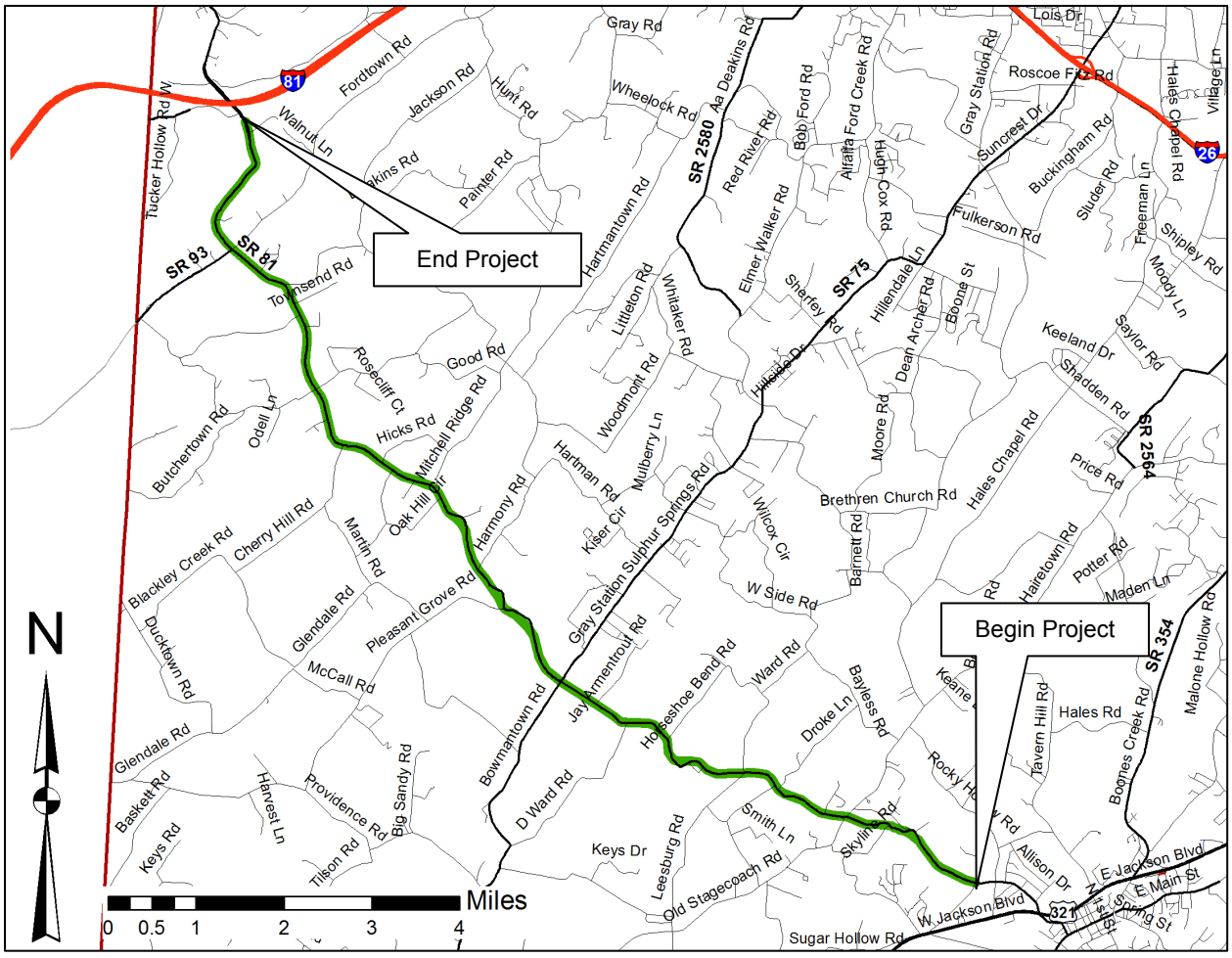


FIGURE 7.38: STATE ROUTE 81 (FROM JONESBOROUGH TO I-81) LOCATION MAP
Source: The Corradino Group

State Route 81 is the only route from Jonesborough to I-81. The only travel alternatives are to go north on State Route 354 to I-26 and thence to I-81, or over a lengthy route to the south via State Route 34 (US 11E) through Greeneville. The Washington County Industrial Park on State Route 34 and the trucks that serve it also rely on State Route 81. Farm equipment commonly uses this road to get from field to field. Mail is delivered to the many dwellings fronting the roads. School buses stop through its length.

Existing lane widths vary between ten and twelve feet. Shoulders are greater than three feet for only a short distance near Ward Road. The proposed project would provide twelve-foot lanes and ten-foot paved shoulders.

TDOT provided a GIS database of horizontal curvature and stopping sight distance (SSD). These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. As seen in **Figure 7.39**, there are over fifty locations along this section of State Route 81 that show horizontal curve and/or stopping sight distance speed differential issues. It is posted at 45 mph, but that speed cannot be safely achieved for approximately half of its distance. There are only four short passing zones.

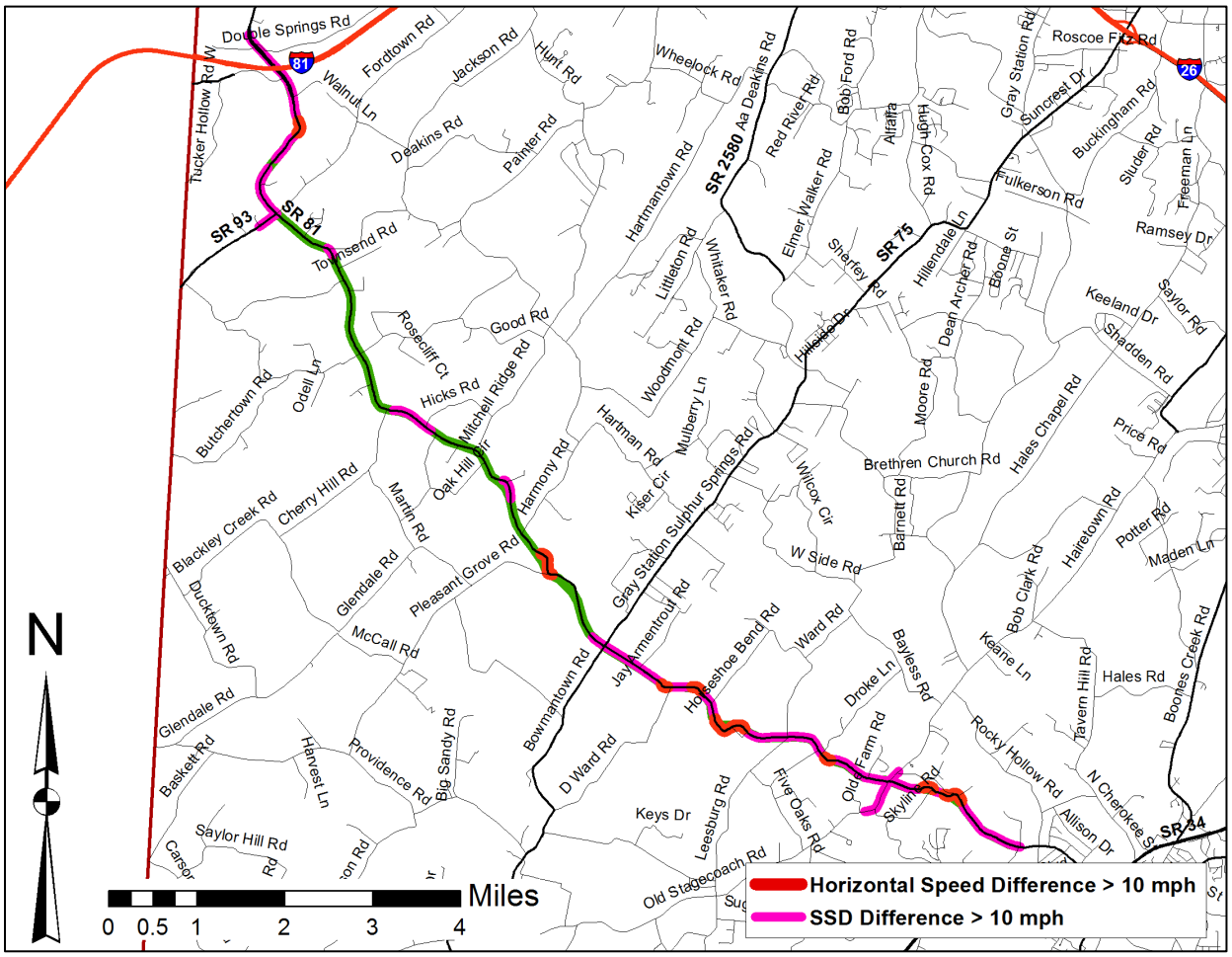


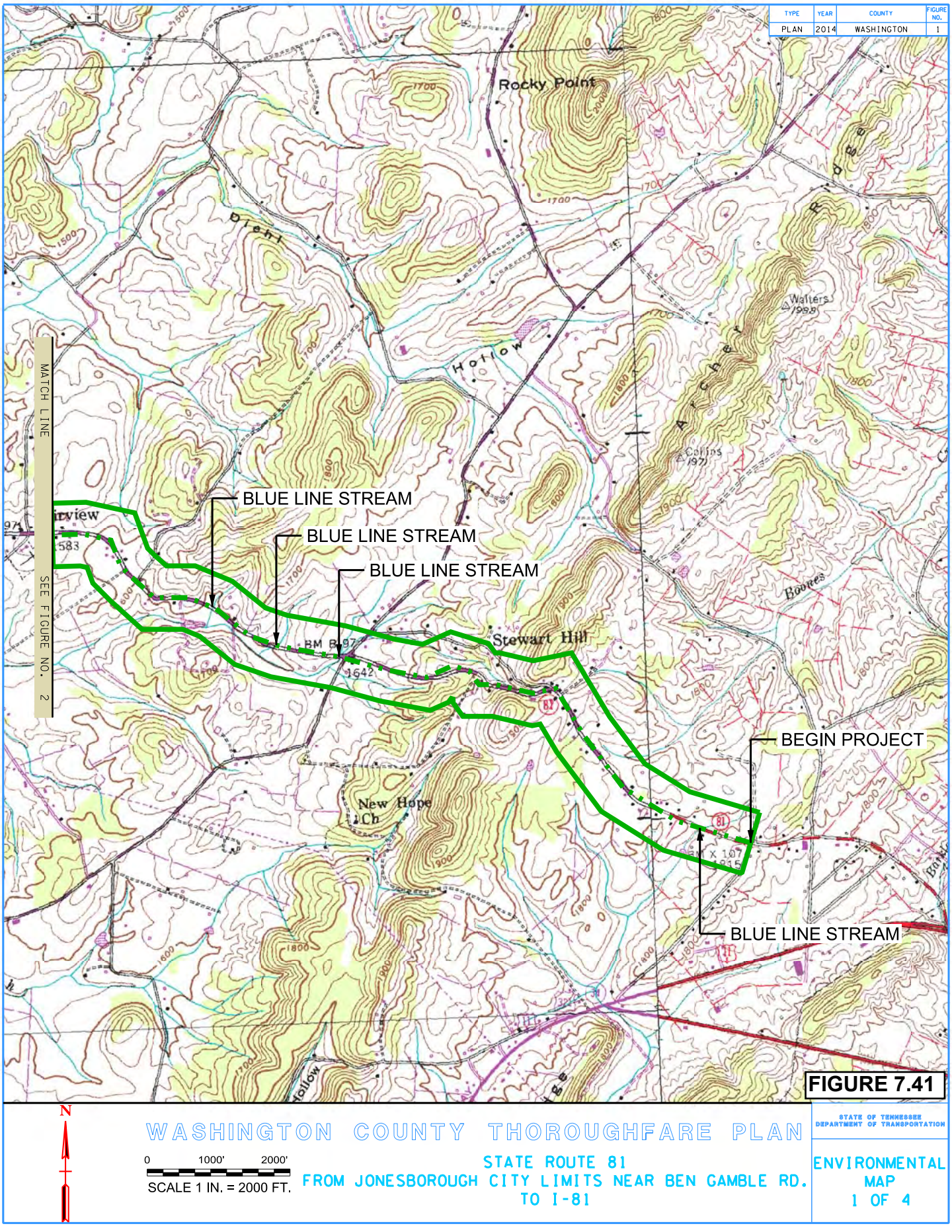
FIGURE 7.39: STATE ROUTE81 DEFICIENT CURVE & SSD MAP
Source: The Corradino Group, TDOT TRIMS Database

FIGURE 7.40: STATE ROUTE 81 CURVES
Source: Google Earth Pro

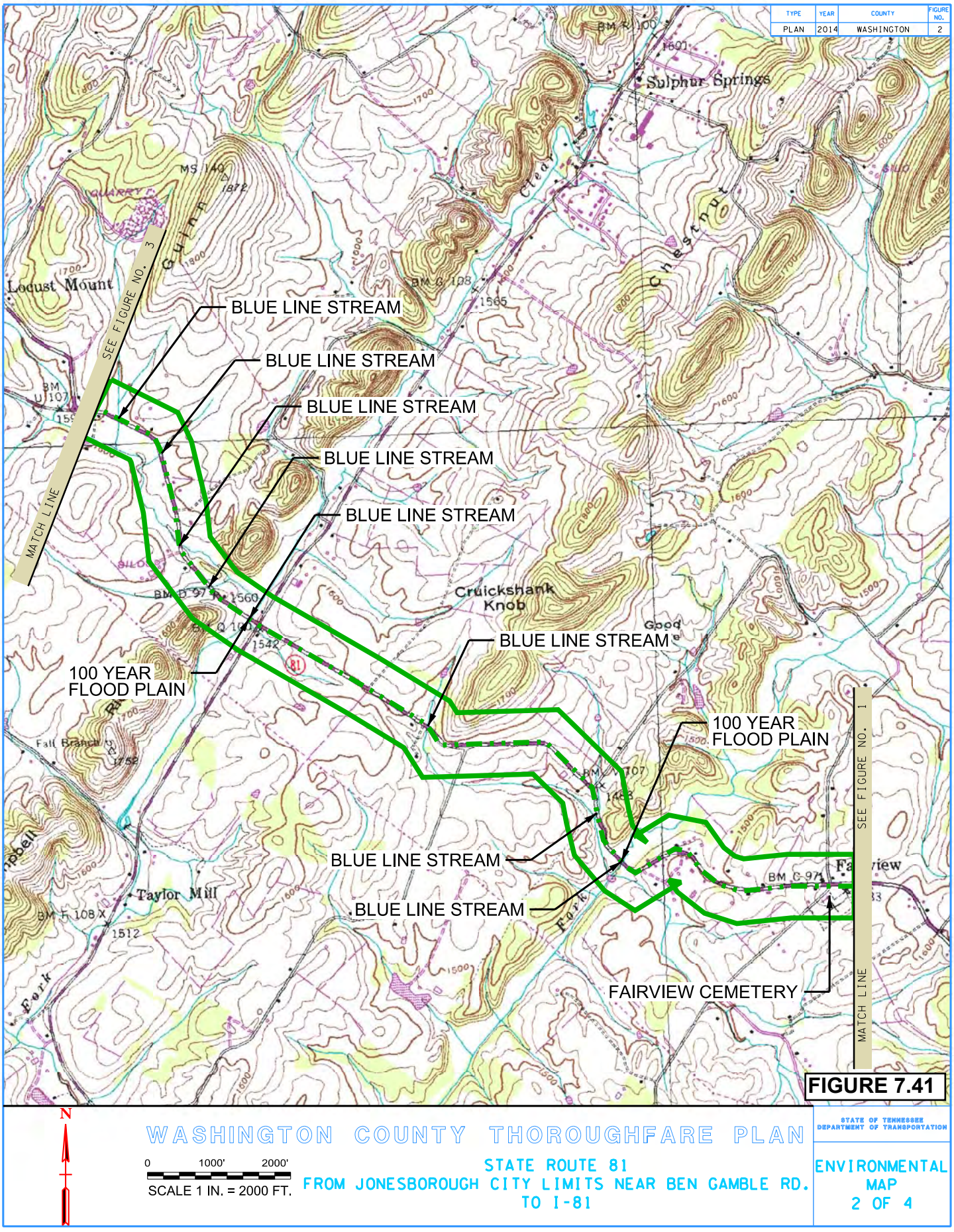
A sample of curves and poor sight distance locations along State Route 81 is provided in **Figure 7.40**.

There are a few environmental considerations with this proposed project. It will cross a stream twenty times, as designated on USGS mapping. The proposed project crosses two 100-year floodplains. Oak Hill Baptist Church is located adjacent to the route. Fairview Cemetery and Oak Hill Cemetery are located adjacent to the route. No wetland, school, historic property, or park directly abuts the proposed project. A map of environmental considerations is provided in **Figure 7.41**.

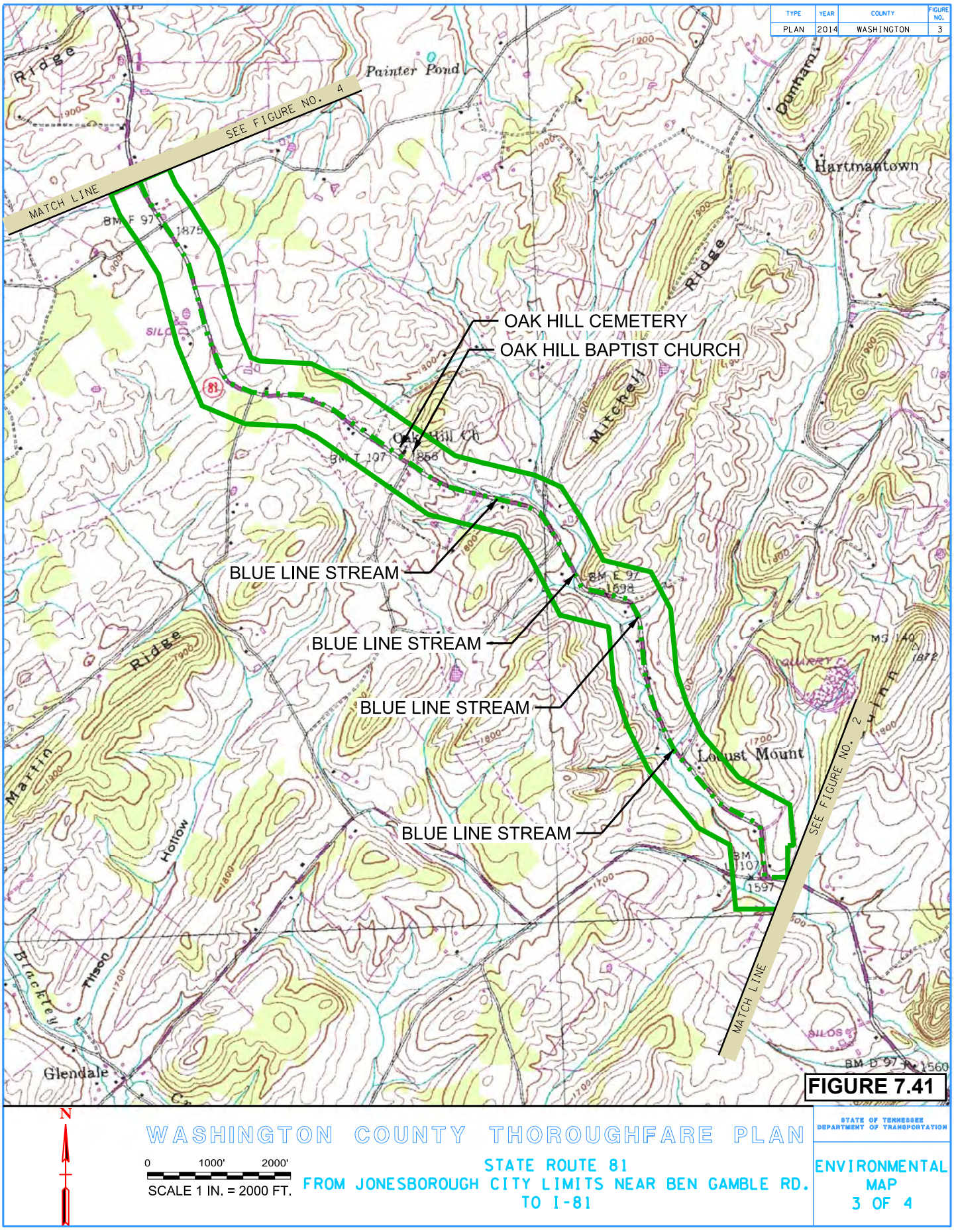
Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, as discussed previously, TDOT provided a GIS database of horizontal curvature and stopping sight distance with safe operating speeds more than 10 miles per hour below the posted speed limit. Based upon these data, the existing route has locations with a safe operating speed more than 10 miles per hour below the posted speed limit, and therefore has safety concerns.



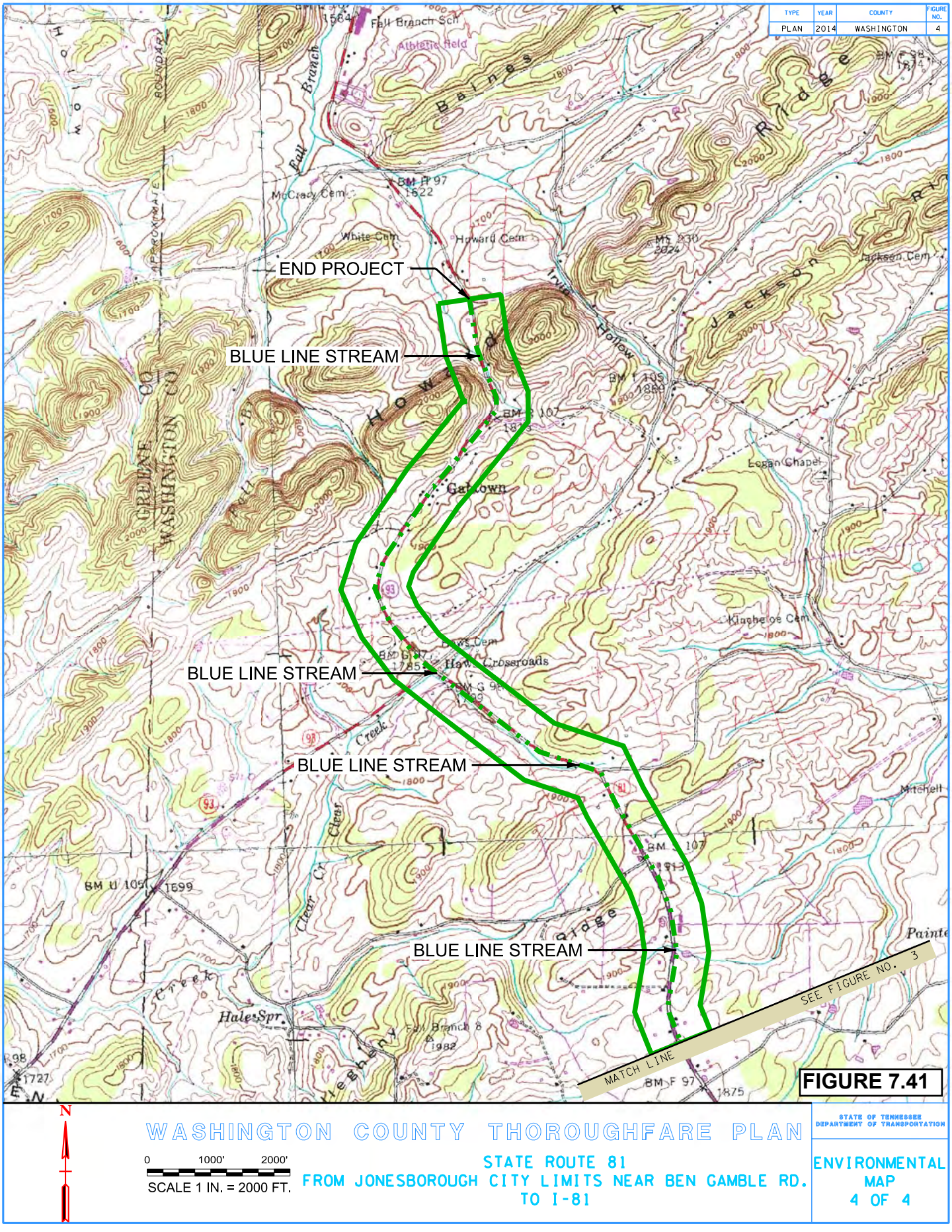
Source: The Corradino Group, USGS Map



Source: The Corradino Group, USGS Map



Source: The Corradino Group, USGS Map



Source: The Corradino Group, USGS Map

7.2.6 State Route 81 (from Unicoi County to the Nolichucky River)

This proposed project will improve State Route 81 from Unicoi County to the Nolichucky River. The existing route has ten- to twelve-foot travel lanes with one- to ten-foot shoulders. The proposed improvements will provide twelve-foot travel lanes and ten-foot paved shoulders. The proposed project will provide improved access between Jonesborough and Erwin. The proposed project length is 1.49 miles. The 2010 average daily traffic was 4,400 vehicles per day, forecast to increase to 5,000 vehicles per day by the design year of 2040. Trucks comprise 3 percent of this traffic. The 2010 level of service of this roadway was A. The 2040 level of service is calculated to be A. The cost to improve this route is anticipated to range from $7.4 to $17.6 million. No relocations are anticipated to be required to construct this proposed project. This is ranked as the WCHD's sixth priority for State Route improvements. A location map is provided in **Figure 7.42**.

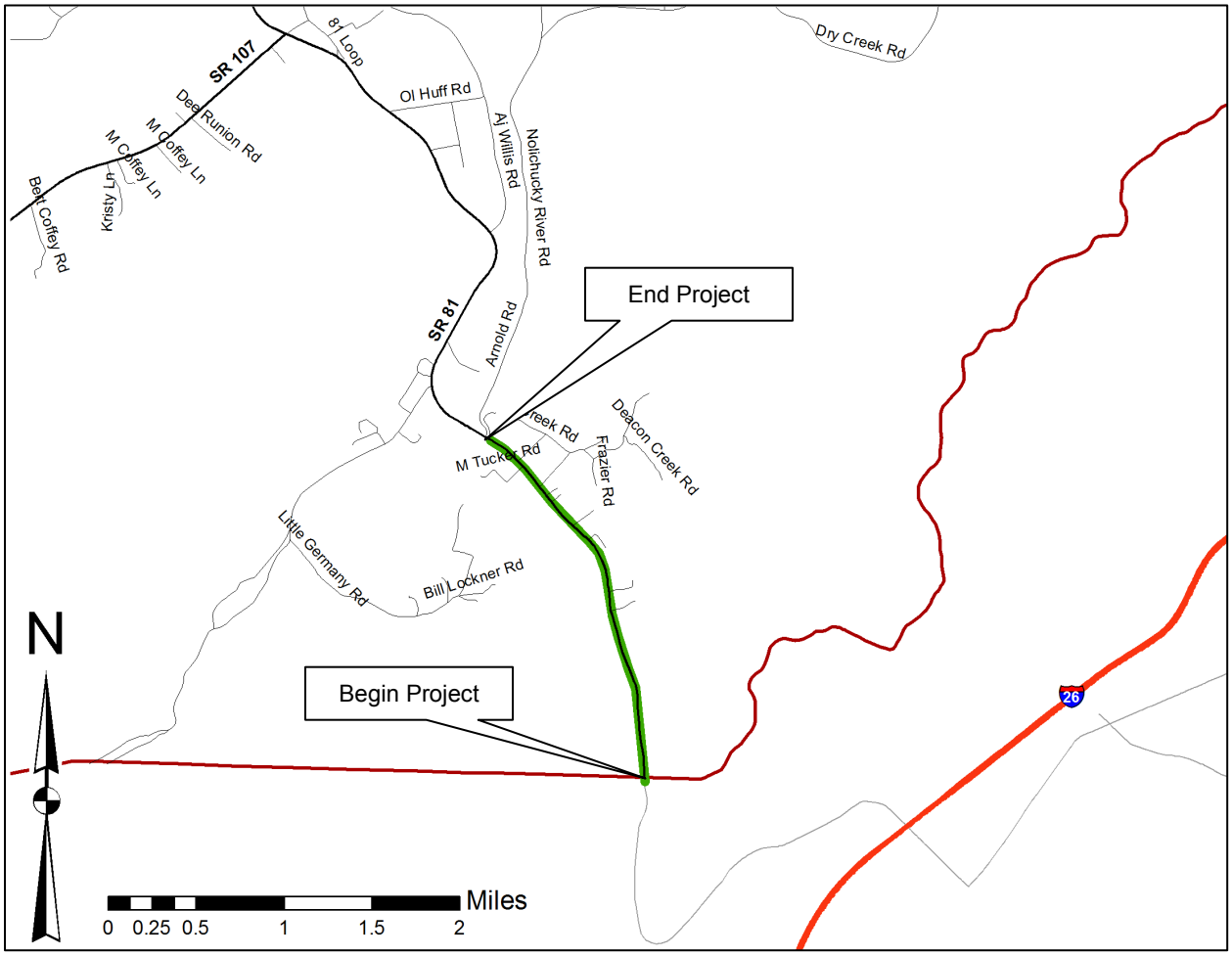


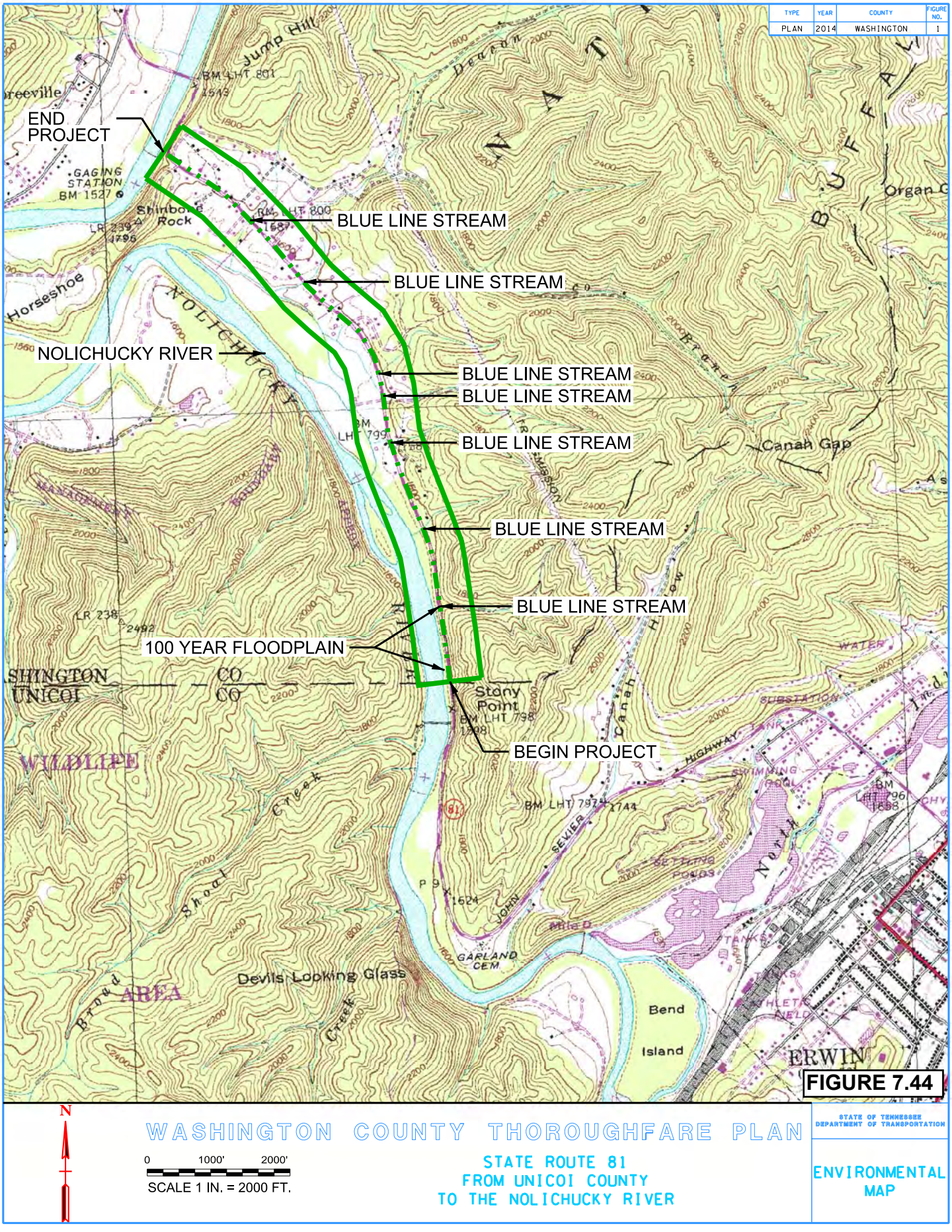
FIGURE 7.42: STATE ROUTE 81 (FROM UNICOI COUNTY TO NOLICHUCKY RIVER) LOCATION MAP
Source: The Corradino Group

State Route 81 connects Washington County to Unicoi County. It serves travel from the Greenville area to I-26 in Unicoi County. It also provides access to the Town of Erwin. This road sees considerable truck traffic going between State Route 107, State Route 81, and I-26. The road is constrained due to topography and proximity to the Nolichucky River (see **Figure 7.43**).

FIGURE 7.43: STATE ROUTE 81 TERRAIN
Source: Google Earth Pro

There are a few environmental considerations with this proposed project. It will cross a stream seven times, as designated on USGS mapping. The proposed project abuts a 100-year floodplain at its southern terminus. No wetlands are anticipated to be impacted with the improvements. No school, historic property, church, or cemetery directly abuts the proposed project. A map of environmental considerations is provided in **Figure 7.44**. The proposed project is bordered on one side by a mountain and the other by the Nolichucky River.

Locations in Washington County that are under study by TDOT for safety concerns were presented in **Section 5.0: Safety Analysis** of this plan. Locations in Washington County that have a crash rate higher than 3x the statewide average were also provided by TDOT and are presented in **Section 5.0**. Finally, TDOT provided a GIS database of horizontal curvature and stopping sight distance. These data were mapped and compared to the posted speed limit along the routes in Washington County. Those locations with safe operating speeds more than 10 miles per hour below the posted speed limit were mapped in Technical Memorandum #1 and are considered in this plan to be a safety concern. Based on these sources, State Route 81 does not have a safety concern. However, a Transportation Planning Report for State Route 81 in this area (approved by TDOT June 21, 2010, and initiated by the First Tennessee Rural Planning Organization) found the actual crash rate to exceed the statewide average rate by approximately 2x in many locations.



Source: The Corradino Group, USGS Map

7.3 PROPOSED PROJECT SUMMARY TABLES

Summary tables of each proposed project discussed in this thoroughfare plan are provided for quick reference in **Tables 7.1** through **7.11**.

The primary focus of the proposed County Route projects is to improve traffic operations within and around the fast growing Gray community. Gray, and its surrounding area just north of Johnson City along I-26, has experienced some of the largest increases in population and employment in the county in the last ten years. The proposed County Route projects will provide improved connectivity and safety in this area. The proposed projects typically parallel I-26. These improved routes will become more attractive to motorists for local trips, which will reduce traffic along I-26, improving regional mobility.

The primary focus of the proposed State Route projects is to improve access in the south and western portions of Washington County. Large parcels of developable land are present in this area. The area currently has considerable agriculture-related traffic due to the plentiful farmland and produce stands present in the area. Furthermore, there is potential in the south county for growth due to the presence of the Washington County Industrial Park, to which sewer and water lines have been extended. The industrial park is located just west of Jonesborough along State Route 34. The industrial park accesses I-81 via State Route 81.

In addition to the potential for future growth in the south and western portions of Washington County, several of the State Routes recommended for improvement are utilized as shortcuts between I-81 and I-26, including traffic heading to Jonesborough and Erwin. These routes include State Route 34 (US 11E), State Route 107, and State Route 81. Several of these routes have considerable truck traffic. Geometrically, many segments of these routes are not adequate for truck traffic due to tight curves, narrow lanes, and narrow shoulders.

None of the projects propose adding travel lanes to existing routes. The proposed projects will provide new roadway connections, improve existing geometric deficiencies, and add shoulders. Narrow existing lane widths will be widened. This will improve safety by reducing the risk of lane-departure crashes. Geometrically deficient curves will be improved. Deficient curves limit the safe operating speed of the roadways. Curves with safe operating speeds less than the posted speed limit pose a safety concern, especially for unfamiliar drivers. Improving these curves will not only improve safety, but improve mobility by allowing the route to be safely travelled at a speed consistent with the posted speed limit. Shoulders will be widened or added. Adding shoulders where none exist will improve safety by reducing the risk of lane-departure crashes. Wide shoulders provide a safe refuge for disabled vehicles, improving safety and mobility. Wide shoulders also allow for the safe passage of service vehicles, including mail delivery, improving mobility. Finally, shoulders of four feet or more generally provide a safe area for bicyclists and pedestrians.

TABLE 7.1: OLD GRAY STATION ROAD/CENTER STREET/RURITAN DRIVE

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
1C	Old Gray Station Road/Center Street/Ruritan Drive	0.34 miles	County ☒ State Route ☐

DESCRIPTION

This proposed project will improve Old Gray Station Road/Center Street/Ruritan Drive from State Route 75 to Center Street. The existing route has ten-foot travel lanes with no shoulders and no turn lanes. The proposed project will provide twelve-foot travel lanes. A two-way center left-turn lane will be constructed along Old Gray Station Road. The proposed project will provide improved access to the Washington County Fairgrounds and Ruritan ball fields.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $7,701,000 To: $12,608,000	New Alignment ☐ Improve Existing Alignment ☒	2010 AADT: 5,944 2040 AADT: 10,000 % Trucks: 1%	2010: B 2040: B

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☐	☒

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☐	☒
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☐	☒
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☒	☐
Adjacent to a Church	☐	☒
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☒	☐

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☒	☐
Commercial	☒	☐
Non-Profit	☐	☒

PROJECT MAP

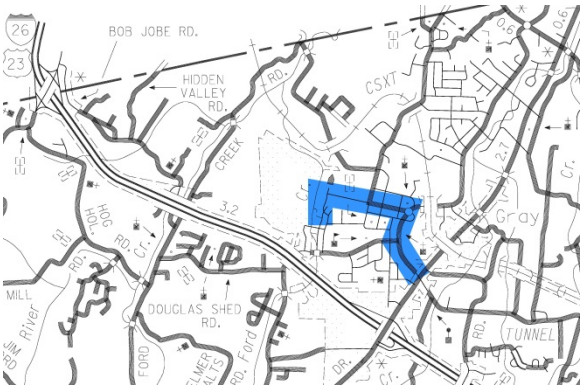


TABLE 7.2A: HIGHLAND CHURCH ROAD/KNOB CREEK ROAD CONNECTOR – OPTION A

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
2C	Highland Church Road/Knob Creek Road Connector	0.40 miles	County ☒ State Route ☐

DESCRIPTION

This proposed project will construct a new connector roadway from State Route 354 to Knob Creek Road. The proposed project will provide improved access between Johnson City and the Gray community.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $1,227,000 To: $3,353,000	New Alignment ☒ Improve Existing Alignment ☐	2010 AADT: N/A 2040 AADT: 10,000 % Trucks: 1%	2010: N/A 2040: B

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☐	☒

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☐	☒
Within 100-Year Flood Plain	☐	☒
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☐	☒
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☐	☒
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☐	☒

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☐	☒
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

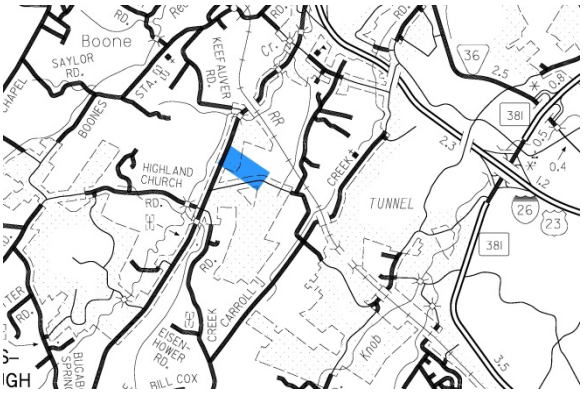


TABLE 7.2B: HIGHLAND CHURCH ROAD/KNOB CREEK ROAD CONNECTOR – OPTION B

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
2C	Highland Church Road/Knob Creek Road Connector	0.43 miles	County ☒ State Route ☐

DESCRIPTION

This proposed project will construct a new connector roadway from Highland Church Road to State Route 354. The proposed project will provide improved access between Johnson City and the Gray community.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $1,311,00 To: $3,604,000	New Alignment ☒ Improve Existing Alignment ☐	2010 AADT: N/A 2040 AADT: 10,000 % Trucks: 1%	2010: N/A 2040: B

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☐	☒

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☒	☐
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☐	☒
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☐	☒
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☐	☒

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☐	☒
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

TABLE 7.3: HIGHLAND CHURCH ROAD/SHADDEN ROAD

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
3C	Highland Church Road/Shadden Road	4.99 miles	County ☒ State Route ☐

DESCRIPTION

This proposed project will improve Highland Church Road/Shadden Road from State Route 354 to State Route 75. The existing route has nine-foot travel lanes with zero to one-foot shoulders and several curves that must be navigated slowly. The proposed project will provide twelve-foot travel lanes and provide two-foot minimum paved shoulders. Deficient curves will be improved. The proposed project will provide improved access between Johnson City and the Gray community.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $16,641,000 To: $43,038,000	New Alignment ☐ Improve Existing Alignment ☒	2010 AADT: 1,243 2040 AADT: 10,000 % Trucks: 1%	2010: A 2040: A to B

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☒	☐

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☒	☐
Wetland Impacts (Anticipated)	☒	☐
Adjacent to a School	☐	☒
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☒	☐
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☐	☒

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☒	☐
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

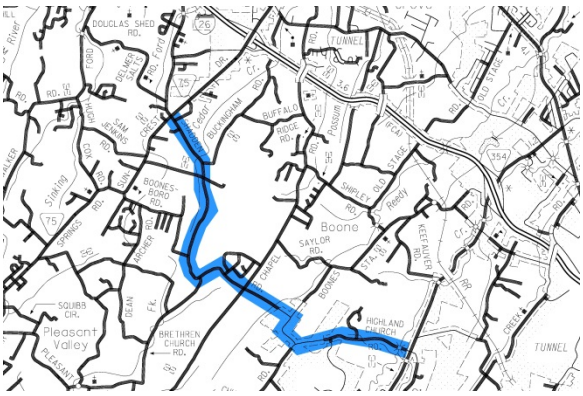


TABLE 7.4: OLD GRAY STATION ROAD

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
4C	Old Gray Station Road	2.00 miles	County ☒ State Route ☐

DESCRIPTION

This proposed project will improve Old Gray Station Road from Buckingham Road to the Johnson City City Limits, near Old Stage Road. The existing route has nine-foot travel lanes with zero to two-foot shoulders. The proposed project will provide twelve-foot travel lanes with two-foot paved shoulders. Deficient curves will be improved. The proposed project will provide improved access between Johnson City and the Gray community.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $6,939,000 To: $17,249,000	New Alignment ☐ Improve Existing Alignment ☒	2010 AADT: 4,093 2040 AADT: 5,000 % Trucks: 1%	2010: A 2040: A to B

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒
Is the:		
• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☐	☒

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☒	☐
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☐	☒
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☒	☐
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☐	☒

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☒	☐
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

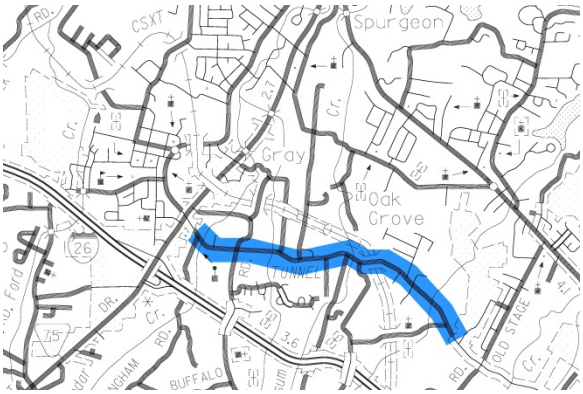


TABLE 7.5: ROY MARTIN ROAD CONNECTOR

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
5C	Roy Martin Road Connector	0.74 miles	County ☒ State Route ☐

DESCRIPTION

This proposed project will construct a new connector roadway from Roy Martin Road at Johnson City's City Limits to Freehill Road. The proposed project will provide improved access within the Gray community and provide economic development opportunities.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $2,255,000 To: $8,991,000	New Alignment ☒ Improve Existing Alignment ☐	2010 AADT: N/A 2040 AADT: 4,707 % Trucks: 1%	2010: N/A 2040: B

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☐	☒

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☒	☐
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☐	☒
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☐	☒
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☐	☒

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☐	☒
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

TABLE 7.6: STATE ROUTE 75 (AT DANIEL BOONE HIGH SCHOOL)

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
1S	State Route 75	0.62 miles	County ☐ State Route ☒

DESCRIPTION

This proposed project will improve State Route 75 from Hugh Cox Road to north of Daniel Boone High School. The existing route has ten-foot travel lanes with one-foot shoulders. The proposed project will straighten a deficient curve in front of the high school and provide twelve-foot lanes and ten-foot paved shoulders.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $3,279,000 To: $7,437,000	New Alignment ☒ Improve Existing Alignment ☐	2010 AADT: 8,686 2040 AADT: 15,000 % Trucks: 2%	2010: B 2040: C

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☒	☐

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☐	☒
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☒	☐
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☒	☐
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☐	☒

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☐	☒
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

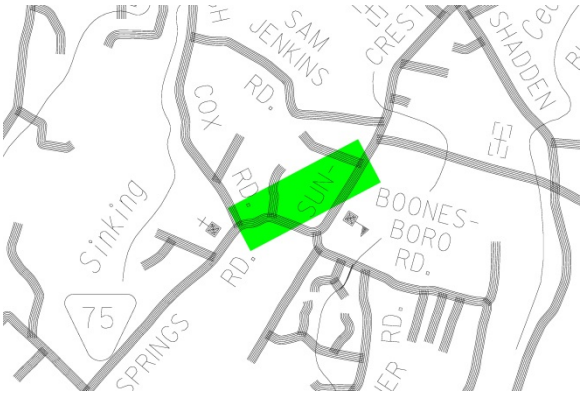


TABLE 7.7: STATE ROUTE 75 (FROM STATE ROUTE 81 TO HUGH COX ROAD)

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
2S	State Route 75	4.95 miles	County ☐ State Route ☒

DESCRIPTION

This proposed project will improve State Route 75 from State Route 81 to Hugh Cox Road. The existing route has ten-foot travel lanes with one-foot shoulders. The proposed project will provide twelve-foot travel lanes and ten-foot shoulders. Deficient curves will be improved. The proposed project will provide improved access between the Gray community and the southwest portion of Washington County. The proposed project will serve as an extension of improvements that have been constructed along State Route 75 to the north, into Johnson City.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $27,489,000 To: $53,902,000	New Alignment ☐ Improve Existing Alignment ☒	2010 AADT: 5,581 2040 AADT: 10,000 % Trucks: 3%	2010: A to B 2040: A to C

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☒	☐

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☒	☐
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☒	☐
Adjacent to a Historic Property	☒	☐
Adjacent to a Park	☐	☒
Adjacent to a Church	☒	☐
Adjacent to a Cemetery	☒	☐
Other Environmental Considerations	☐	☒

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☒	☐
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

TABLE 7.8: STATE ROUTE 107

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
3S	State Route 107	5.98 miles	County ☐ State Route ☒

DESCRIPTION

This proposed project will improve State Route 107 from east of Jackson Lane to State Route 81. The existing route has twelve-foot travel lanes with two-foot shoulders. The proposed improvements will construct ten-foot paved shoulders. Deficient curves will be improved. With the proposed improvements, State Route 107 will have ten-foot paved shoulders for its entirety in Washington County. The proposed project will improve access between I-81 and I-26.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $17,346,000 To: $19,644,000	New Alignment ☐ Improve Existing Alignment ☒	2010 AADT: 3,900 2040 AADT: 10,000 % Trucks: 6%	2010: A 2040: A

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☒	☐

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☒	☐
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☐	☒
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☒	☐
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☐	☒

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☐	☒
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

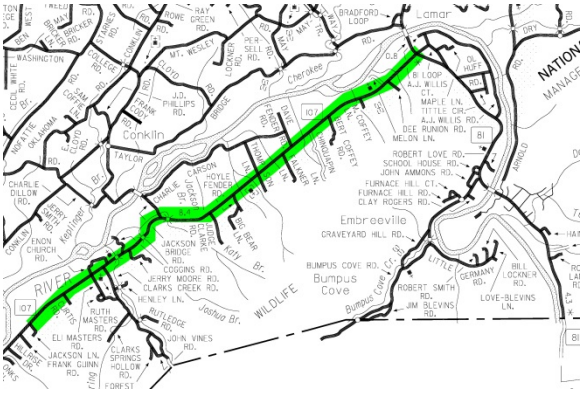


TABLE 7.9: STATE ROUTE 81 (FROM STATE ROUTE 107 TO JONESBOROUGH)

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
4S	State Route 81	4.32 miles	County ☐ State Route ☒

DESCRIPTION

This proposed project will improve State Route 81 from State Route 107 to the Jonesborough City Limits, near Ridgecrest Road. The existing route has ten to twelve-foot travel lanes with one to nine-foot shoulders. The proposed project will provide twelve-foot travel lanes and ten-foot paved shoulders. Deficient curves will be improved. The proposed project will provide improved access between Jonesborough and Erwin.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $24,653,000 To: $51,056,000	New Alignment ☐ Improve Existing Alignment ☒	2010 AADT: 3,232 2040 AADT: 10,000 % Trucks: 3%	2010: A 2040: A

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☒	☐

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☐	☒
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☒	☐
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☒	☐
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☒	☐

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☒	☐
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

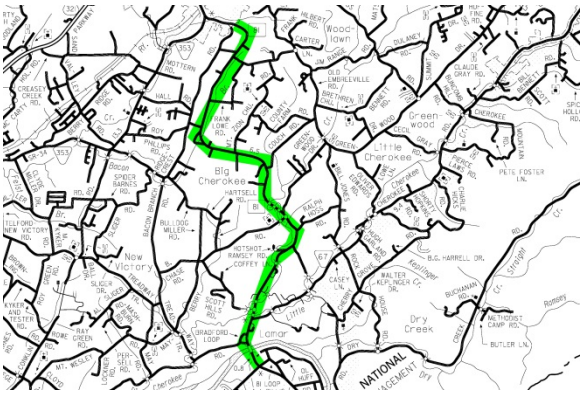


TABLE 7.10: STATE ROUTE 81 (FROM JONESBOROUGH TO I-81)

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
5S	State Route 81	11.20 miles	County ☐ State Route ☒

DESCRIPTION

This proposed project will improve State Route 81 from the Jonesborough City Limits near Ben Gamble Road to I-81. The existing route has ten to twelve-foot travel lanes with one to three-foot shoulders. The proposed project will provide twelve-foot travel lanes and ten-foot paved shoulders. Deficient curves will be improved. The proposed project will provide improved access between Jonesborough and I-81.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $60,151,000 To: $132,368,000	New Alignment ☐ Improve Existing Alignment ☒	2010 AADT: 3,589 2040 AADT: 15,000 % Trucks: 6%	2010: A to B 2040: A to C

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☐	☒
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☒	☐

ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☒	☐
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☐	☒
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☒	☐
Adjacent to a Cemetery	☒	☐
Other Environmental Considerations	☐	☒

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☒	☐
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP

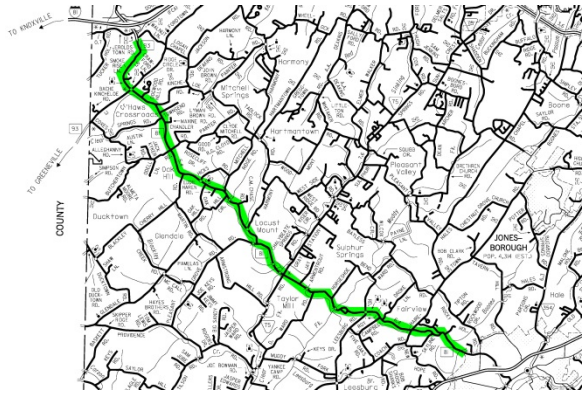


TABLE 7.11: STATE ROUTE 81 (FROM UNICOI COUNTY TO THE NOLICHUCKY RIVER)

PROJECT ID	ROUTE NAME	ROUTE LENGTH	ROUTE TYPE
6S	State Route 81	1.49 miles	County ☐ State Route ☒

DESCRIPTION

This proposed project will improve State Route 81 from Unicoi County to the Nolichucky River. The existing route has ten to twelve-foot travel lanes with one to ten-foot shoulders. The proposed improvements will construct twelve-foot travel lanes and ten-foot paved shoulders. The proposed project will provide improved access between Jonesborough and Erwin.

COST ESTIMATE RANGE	CONSTRUCTION TYPE	TRAFFIC	LOS
From: $7,405,000 To: $17,610,000	New Alignment ☐ Improve Existing Alignment ☒	2010 AADT: 4,440 2040 AADT: 5,000 % Trucks: 3%	2010: A 2040: A

SAFETY

Higher than statewide average crash rate noted in a:

	Yes	No
TPR	☒	☐
RSAR	☐	☒
Local Road Safety Project Study	☐	☒

Is the:

• Crash rate 3x statewide avg.?	☐	☒
• Posted speed higher than the curve & SSD speed?	☐	☒

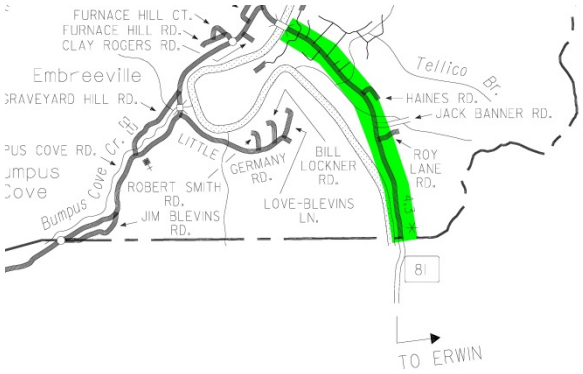
ENVIRONMENTAL CONSIDERATIONS

	Yes	No
Crosses USGS Blue-Line Stream	☒	☐
Within 100-Year Flood Plain	☒	☐
Wetland Impacts (Anticipated)	☐	☒
Adjacent to a School	☐	☒
Adjacent to a Historic Property	☐	☒
Adjacent to a Park	☐	☒
Adjacent to a Church	☐	☒
Adjacent to a Cemetery	☐	☒
Other Environmental Considerations	☒	☐

ANTICIPATED RELOCATIONS

	Yes	No
Residential	☐	☒
Commercial	☐	☒
Non-Profit	☐	☒

PROJECT MAP



8.0 COST ESTIMATES

The construction cost estimates for the Washington County Thoroughfare Plan include acquisition of additional right-of-way, utility relocation, engineering, and general roadway construction. The costs were developed to a planning-level with two methodologies.

The first method utilized TDOT's Long Range Planning Cost-Per-Mile Spreadsheet, developed by TDOT using bid data from previous roadway construction project lettings. Factors are applied to base cost-per-mile data to adjust for the number of lanes being constructed, terrain, and adjacent land uses. The cost estimates provided with this methodology are generally higher than with the second methodology utilized.

The second cost estimate methodology utilized TDOT's average unit price (AUP) for construction materials. The AUP database is maintained by TDOT's Construction Division and is available to the public. Planning-level quantity calculations were developed by Corradino on a per-mile basis for the different roadway improvement types proposed here. These improvement types include improving existing two-lane roadways, widening existing two-lane roadways to three lanes, constructing new two-lane roadways on new alignment, and improving shoulders along an existing route. Right-of-way acquisition needs and relocations for each route were estimated based upon a windshield survey level-of-accuracy.

The Cost-per-Mile Spreadsheet consistently predicts higher construction costs than the AUP cost estimate methodology.

Concerning improvements to local roadways, savings can be expected compared to those estimated, if Federal funds are not utilized. This is especially true if WCHD constructs the improvements.

The Washington County Highway Department has identified eleven roadway improvement projects for inclusion in the Washington County Thoroughfare Plan. Five of the proposed projects are County road improvement projects and six are proposed improvements to State Routes. The eleven proposed roadway improvement projects are listed, in rank order, in **Table 8.1: Construction Cost Estimate Summary**. A range of estimated construction cost is provided for each proposed project. It is estimated that improvements to County routes will cost between $35 and $85 million and that improvements to State Routes will cost between $140 and $282 million in year 2015 dollars.

Full cost estimates and the methods used to develop them are provided in **APPENDIX C.**

TABLE 8.1: CONSTRUCTION COST ESTIMATE SUMMARY

County Roads

ID	Route	Length (Miles)	Estimated Cost (2015)	
			From	To
1C	Old Gray Station Road/Center Street/Ruritan Drive	1.38	**$ 7,701,000**	**$ 12,608,000**
2C	Highland Church Road/Knob Creek Road Connector - Option A	0.40	**$ 1,227,000**	**$ 3,353,000**
2C	Highland Church Road/Knob Creek Road Connector - Option B	0.43	**$ 1,311,000**	**$ 3,604,000**
3C	Highland Church Road/Shadden Road	4.99	**$ 16,641,000**	**$ 43,038,000**
4C	Old Gray Station Road	2.00	**$ 6,939,000**	**$ 17,249,000**
5C	Roy Martin Road Connector	0.74	**$ 2,255,000**	**$ 8,991,000**
Total County Roads:		9.94	**$ 34,763,000**	**$ 85,490,000**

State Routes

ID	Route	Length (Miles)	Estimated Cost (2015)	
			From	To
1S	State Route 75 (at Daniel Boone High School)	0.62	**$ 3,279,000**	**$ 7,437,000**
2S	State Route 75 (from State Route 81 to Hugh Cox Road)	4.95	**$ 27,489,000**	**$ 53,902,000**
3S	State Route 107	5.98	**$ 17,346,000**	**$ 19,644,000**
4S	State Route 81 (from State Route 107 to Jonesborough)	4.32	**$ 24,653,000**	**$ 51,056,000**
5S	State Route 81 (from Jonesborough to I-81)	11.20	**$ 60,151,000**	**$132,368,000**
6S	State Route 81 (from Unicoi County to the Nolichucky River)	1.49	**$ 7,405,000**	**$ 17,610,000**
Total State Routes:		28.56	**$140,323,000**	**$282,017,000**

Source: The Corradino Group (Calculated 2013, Updated 2014)

9.0 IMPLEMENTATION

WCHD maintains approximately 800 miles of County roads. As one of only three county highway departments in Tennessee with its own asphalt plant, the WCHD has the staff and equipment to provide drivers with safe roads, in good repair. All through-roads and the majority of dead-end roads in Washington County are recently paved. WCHD intends to continue its tradition of service to the public by anticipating highway needs over the coming decades. That is why WCHD sought to develop this study.

The County roads identified in this report will be addressed as local resources become available. The total cost for these proposed County Road projects ranges from $35 to $85 million, if state and/or federal funds are utilized for these projects. The cost is expected to be considerably less if WCHD constructs the projects.

With respect to State Routes, Washington County falls within the First Tennessee Rural Planning Organization (RPO). The purpose of the RPOs is to involve local officials in multi-modal transportation planning through a structured process. The goal is to ensure quality, competence, and fairness in the transportation decision-making process.

Tennessee Long Range Transportation Plan states that Rural Planning Organizations will:

- Serve as a forum for public input regarding local, regional and state transportation issues.
- Ensure that all local officials with transportation responsibilities are included in the state's transportation planning process.
- Identify regional transportation goals.
- Work with TDOT to develop transportation plans based on comprehensive land use plans, growth plans and strategic planning efforts.
- Partner with other local organizations and build on existing planning processes.

This Thoroughfare Plan has taken into account these principles. The WCHD will work with the First Tennessee Rural Planning Organization to advance the projects listed in **Table 8.1** and coordinate with the Johnson City Metropolitan Transportation Planning Organization, if there is an interface with proposed projects in their Transportation Improvement Program and Long Range Transportation Plan. Projects that utilize state or federal funds must be included on the cost-feasible Tennessee State Transportation Improvement Program before funds can be allocated to advance a project. Then, if federal money is involved, the requirements of the National Environmental Policy Act, and other environmental laws and regulations, must be met.

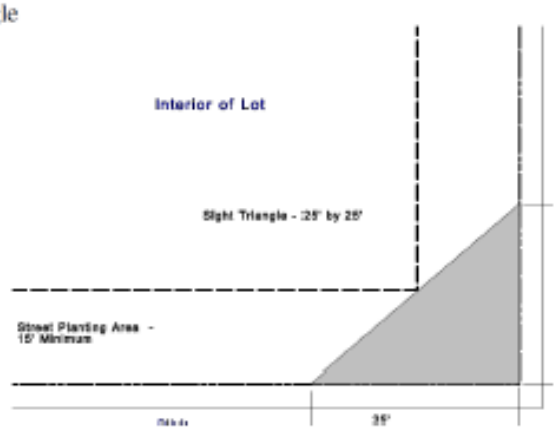
APPENDIX A

WASHINGTON COUNTY ZONING ORDINANCE- ACCESS CONTROL

Section 503 Loading Areas. All nonresidential uses shall provide an area outside of the public right-of-way sufficient for loading and unloading goods. The size and number of loading areas should be based on the particular use.

504. Vision Clearance. No fence, wall, shrubbery, sign or other obstruction to vision between the height of three feet and fifteen feet above the center line grades of the intersecting streets and/or drives shall be permitted within twenty feet of the intersection of the rights-of-way lines of streets, or of streets and railroads.

Sight Triangle



505. Design, Construction and Maintenance of Off-Street Parking and Unloading Lots.

505.1. Clearly defined driveways used for ingress and egress shall be confined to and shall not exceed thirty feet in width, exclusive of curb returns. Unless otherwise approved by the planning commission, there shall be one point of ingress and egress to each parking or unloading lot unless the lot is shared between two or more uses.

505.2. All areas devoted to permanent off-street parking and loading and unloading as required under this section shall be of a sealed surface construction and maintained in such a manner that no dust will result from continuous use.

505.3. Parking and loading and unloading lots shall be well drained to eliminate surface water.

505.4. Landscaping requirements are in accordance with Appendix A, *Landscape Manual*.

506. Access Control. In order to promote the safety of the motorist and pedestrian and to minimize traffic congestion and conflict by reducing the points of contact, the following regulations shall apply.

506.1. A point of access, i. e., a drive or other opening for vehicles onto a street shall not exceed thirty (30) feet in width.

506.2. There shall be no more than two (2) points of access to any one (1) public street on a lot of less than 400 feet but more than 100 feet in width. Lots less than one hundred(100) feet in width shall have no more than one (1) point of access to any one (1) public street.

506.3. No point of access shall be allowed within twenty-five (25) feet of the right-of-way of any public street intersection.

506.4. Where sidewalks exist, the area existing between the street and an interior parking space or driveway parallel to the street shall have a curb at least six (6) inches in height and six inches (6) inches in width separating the parking area from the sidewalk to prevent encroachment of vehicles onto the sidewalk area.

506.5. No curbs on county streets or rights-of-way shall be cut or altered without written approval of the Washington County Highway Department. Written approval shall be submitted in order to obtain any permits from the Zoning Office.

506.6. Cases requiring variances relative to this action, and hardships not caused by the property owner, shall be heard and acted upon by the Board or Zoning Appeals with a recommendation from the Public Works Committee, provided, further, that no curb cuts for off-street automobile storage or parking space shall be permitted where the arrangement would require that vehicles back directly into a public street.

506.7. Access control on property abutting state or federal highways shall be governed by official regulations of the Tennessee Department of Transportation, Division of Highways or the provisions of this resolution, whichever is higher.

507. Alcoholic Beverages. The retail sale of beverages having an alcoholic content of less than five (5) percent by weight and the retail sale of beverages having an alcoholic content of more than five (5) percent by weight and requiring for their sale a license issued by the Tennessee Alcoholic Beverage Commission shall be permitted only in Business District that permits the sale of retail goods, (B-2, B-3, &B-4) No such sale, however, shall be permitted until all state laws have been complied with and approval has been received from the Washington County Beer Board or other such board as designated by the Washington County Board of Commissioners.

508. Mobile Home Parks. Except for the A-1 General Agriculture District and the R-3 Residential District, mobile homes will be permitted only in approved mobile home parks. Each mobile home park shall be subject to the density provisions of the district in which it is located. A mobile home park is any plot of ground containing a minimum of two acres upon which two or more mobile homes unless otherwise provided for in this resolution, are located or are intended to be located, but does not include sites where unoccupied mobile homes are on display for sale. The following property development standards shall apply for all mobile home parks:

508.1. Mobile Home Park Definitions. A detached single family dwelling unit with all the following characteristics:

508.1.1. Designed for long-term occupancy, and containing sleeping accommodations, a flush toilet, a tub or shower bath, and kitchen facilities, with plumbing and electrical connections provided for attachment to outside systems.

508.1.2. Designed to be transported after fabrication on its own wheels, or on flatbed or other trailers or detachable wheels.

APPENDIX B

WCHD Driveway Permit Application and Procedures

WASHINGTON COUNTY HIGHWAY DEPARTMENT
608 Depot Street Jonesborough, TN 37659
Phone: 423/753-1714 Fax 423/753-1710

CONSTRUCTION PERMIT

Issued to: _____ Permit No: _____

Phone No.: Cell _____ Home _____ Work _____

Location: _____

Type of Construction:

_____ Installation of water line or water tap _____

_____ Installation of sewer line or sewer tap _____

_____ Installation of cable _____

_____ Lateral cut - FT _____ _____

_____ Maintenance construction _____

_____ Curb cut or Driveway cut _____

_____ Install tile _____

The above construction must conform to the rules and regulations as was passed by the Washington County Commission.

Date: _____ By: _____
Washington County Highway Department

____Tom McCurry, Blk #1 Foreman
423-257-4870
____Benton Slemons, Blk #2 Foreman
423-753-1722
____Donny Willis, Blk #3 Foreman
423-753-1724
____James McCray, Blk #4 Foreman
423-477-1555

Rec'd. by _____

Print Name: _____

Work Hrs: Mon-Fri 7:30-4pm DST: Mon-Thurs 6:30-5 pm

Contractor & Utilities Information:

*Contractor/Utility District must be liable for any damages to private or county property. Installation must be two (2) feet from edge of pavement. Installation closer than 24 in. to pavement must be back filled with stone.
* Lines must be installed min. of three (3) feet in depth, refill & compact as much as possible, remove all stumps, large rocks and etc. from right of way.
* Shoulders that have stone need to be replaced with at least three (3) inches deep of crusher run stone.
* All lateral connections must be bored unless permitted by the County Road Superintendent. If necessary for open cut -- it must be three (3) feet deep and back filled with #57 stone and compacted.
* Repave with hot mix a minimum of three (3) inches deep -- Return all fences, etc. to their originality.
* All ditches and banks disturbed must be strawed, sowed in grass and returned to original condition within 14 days.
* Contractor is responsible for all erosion control.

PROCEDURES FOR CONSTRUSTION & PLACEMENT OF DRIVEWAYS AND MAILBOXES

These instructions are to assist the contractor and general public as to the correct manner of installing a driveway and mailboxes according to the subdivision and planning regulations of Washington County. Placing and refusing to remove obstructions upon the right-of-way of a County road is a Class C misdemeanor. TENN. CODE ANN. § 54-7-2.

Anytime work is to be done on the County right-of-way, a permit must be obtained from the Washington County Highway Department before work is to begin. This includes a curb cut, tile installation, permanent mailboxes, underground utilities, above ground utilities, etc., anything placed on the County right-of-way.

MAILBOXES AND OTHER STRUCTURES

Only breakaway mailboxes will be allowed on the County right-of-way. Permanent, brick, masonry, or any other non-break away mailbox, driveway entrance columns, fencing etc. must be on private property, not on the County right-of-way. They are considered to be permanent structures and cannot be placed on the County's right-of-way. Property owners must provide access to a mailbox whether it is a breakaway mailbox on right-of-way or a permanent structure placed on the property as shown in drawings.

Brick and/or masonry mailboxes in subdivisions with curbs and a speed limit of 20 mph or less may be placed 12" from the backside of the curb, with permit only. Roads with speed limit greater than 20 mph (with curb or without curb must be off the right-of-way.

DRIVEWAYS

A driveway must be constructed with the pamphlet in order to conform with the established regulations. The purpose for these regulations is to prevent water problems for the County and property owners.

ILLUSTRIATIONS

Illustration 1B must have 6" to 8" of fall from the property line to edge of County pavement. This prevents water flowing down the private driveway. Must have crown in center (2" to 4") so water will flow into ditch and not County road.

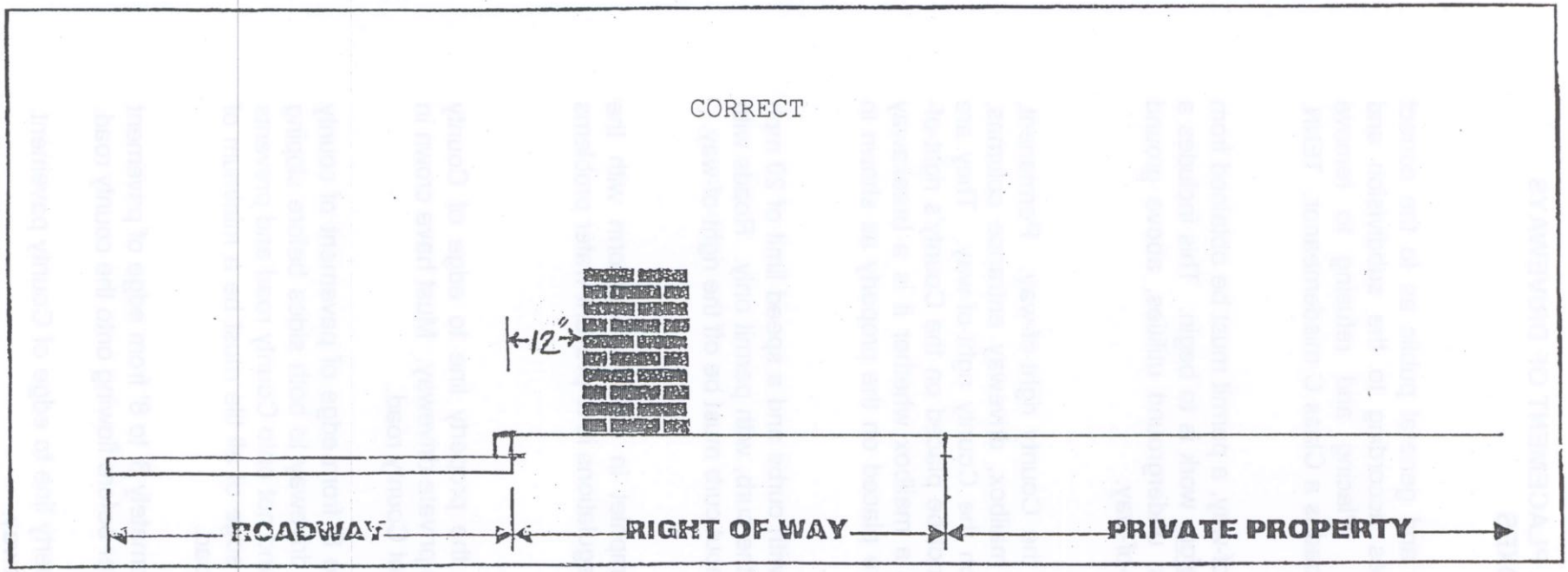
Illustration 1A must be flat for approximately 6' to 8' from edge of pavement of county road and have 3" to 5" of crown from center of driveway to both sides before sloping upward. This allows water to flow into ditch line and not onto County road and prevents cars from dragging on the pavement. The front edge of all tile must be a minimum of three foot (3') from edge of pavement of County road.

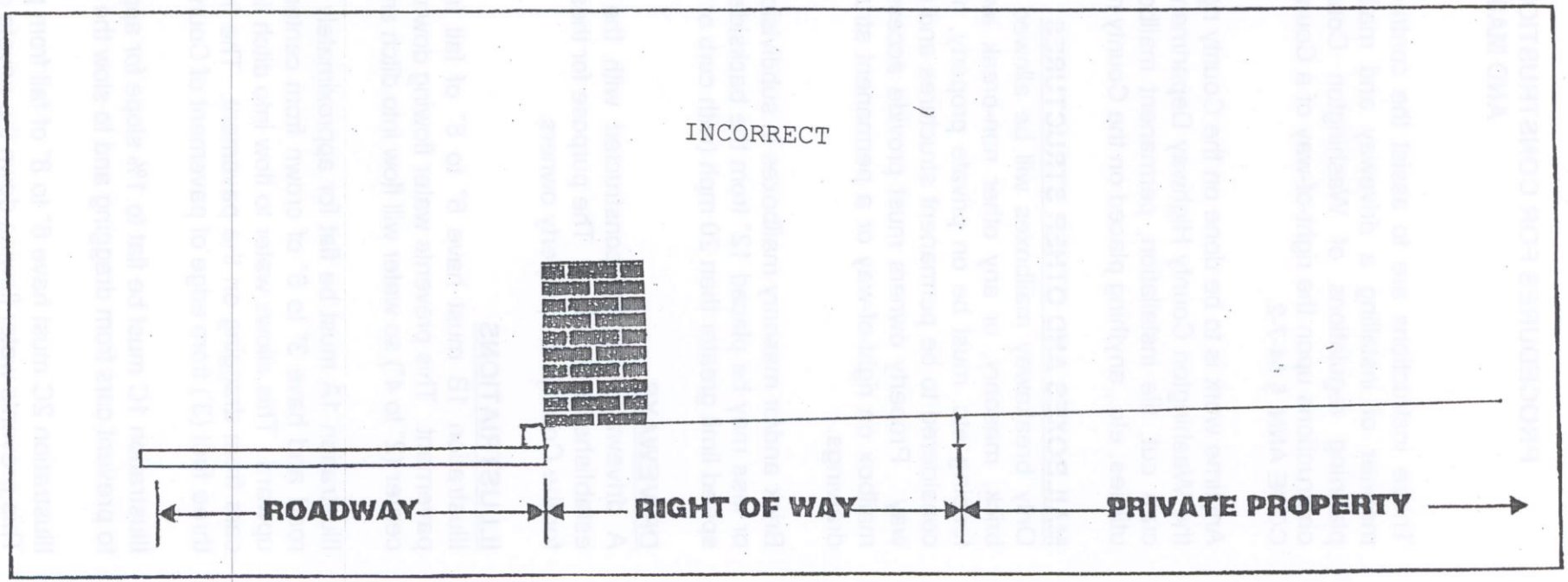
Illustration 1C must be flat to 1% slope for approximately 6' to 8' from edge of pavement to prevent cars from dragging and to slow the water before flowing onto the county road.

Illustration 2C must have 6" to 8" of fall from property line to edge of County pavement. This prevents water flowing down the private driveway.

PERMANENT STRUCTURE

For streets with curbs and speed limit of 20 MPH or less

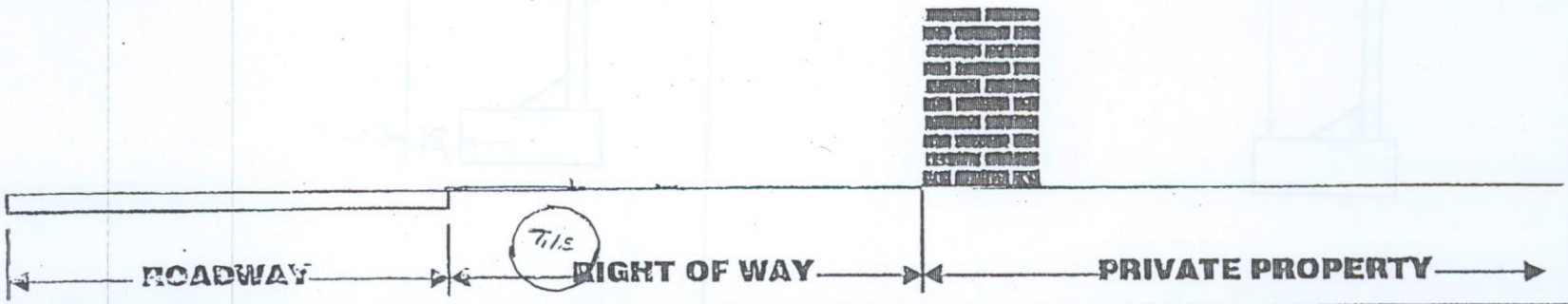




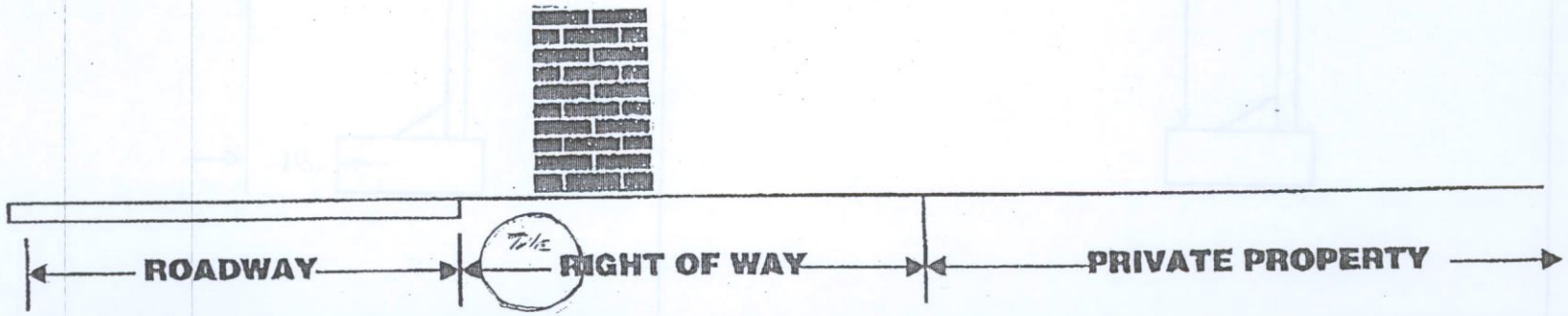
PERMANENT STRUCTURE

Ditched Street

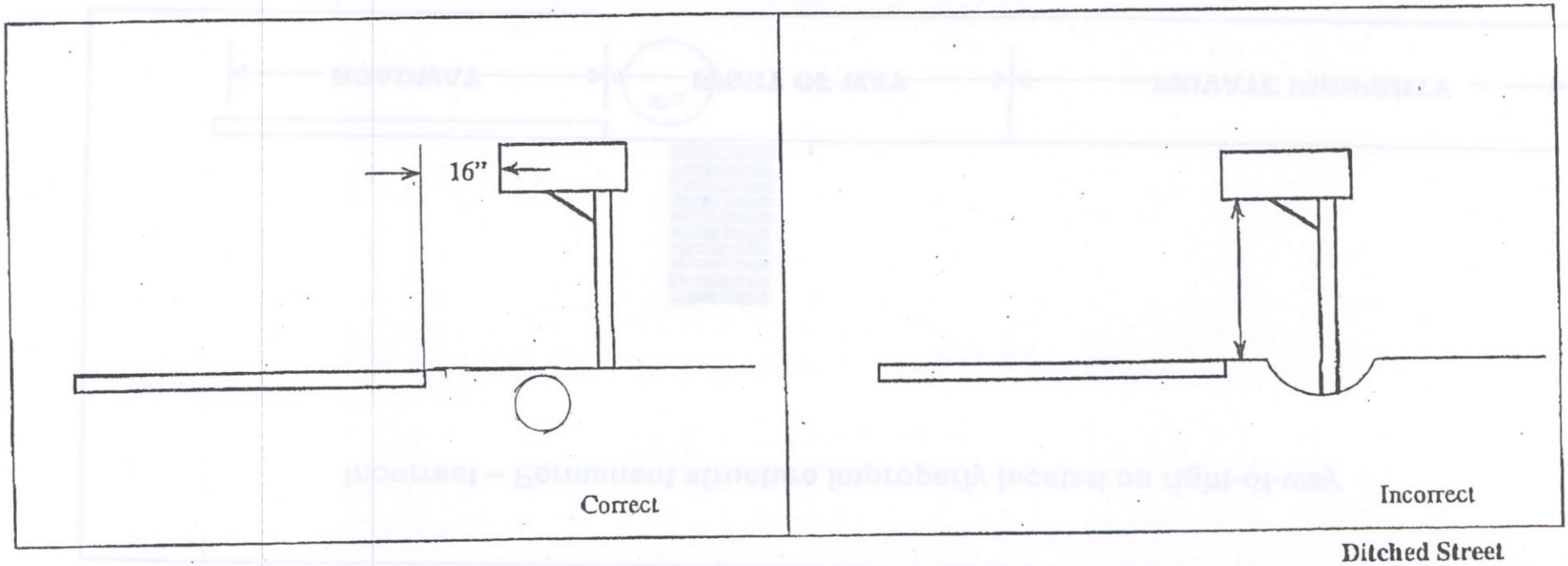
Correct – Structure located on private property



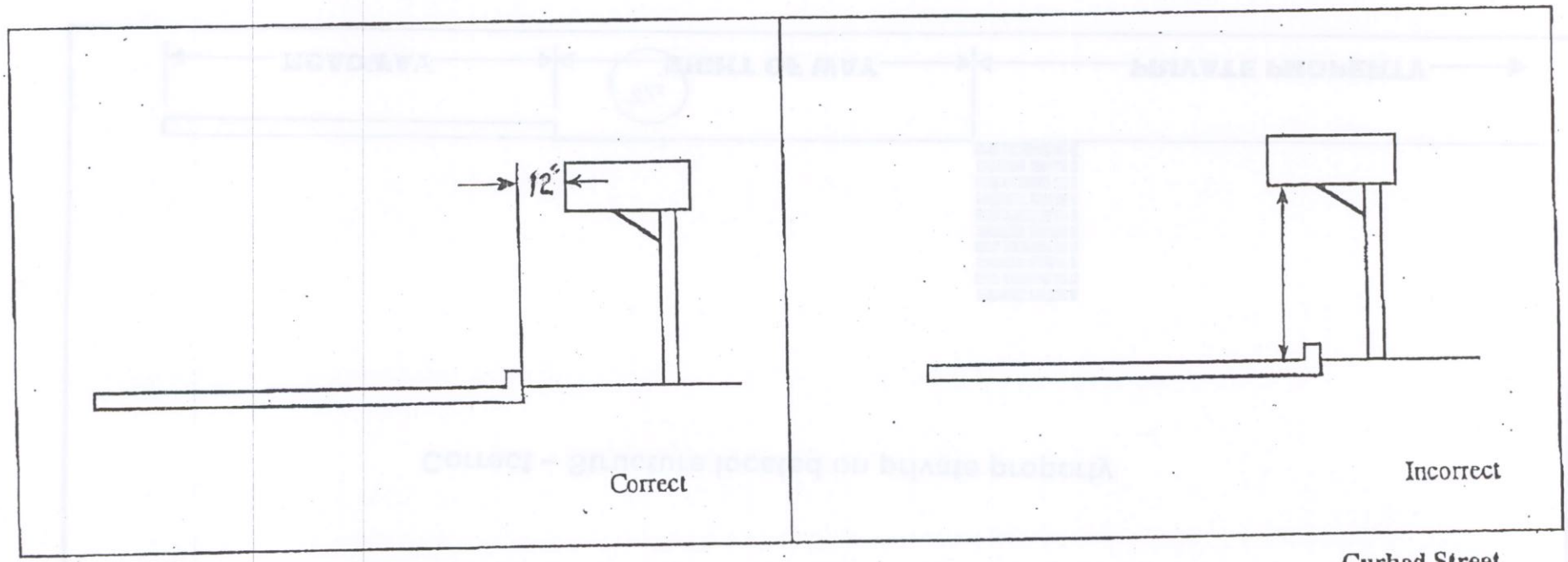
Incorrect – Permanent structure improperly located on right-of-way



BREAKAWAY DESIGN

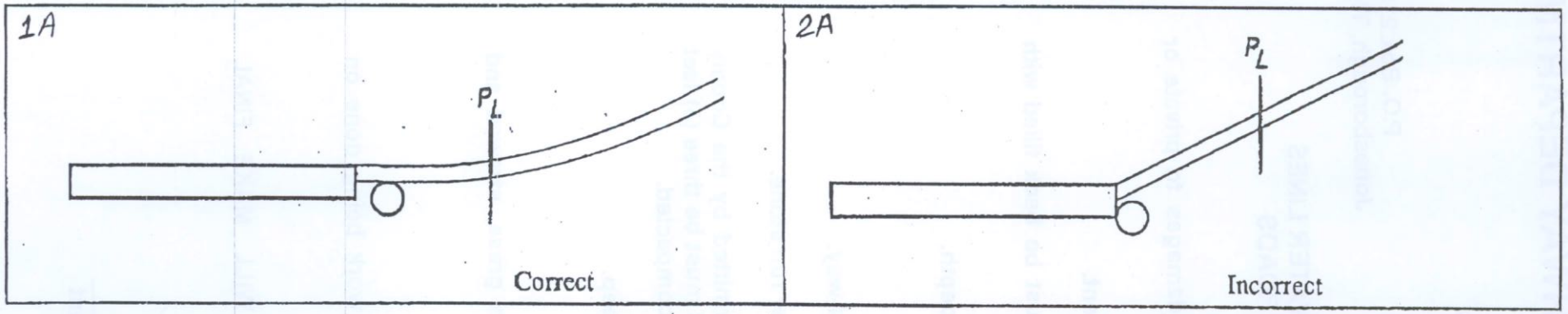


Ditched Street

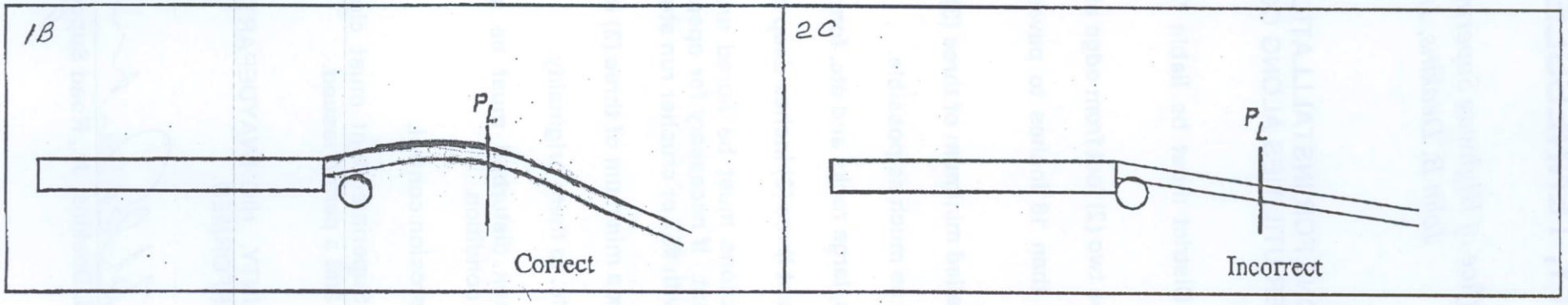


Curbed Street

Ditched Street

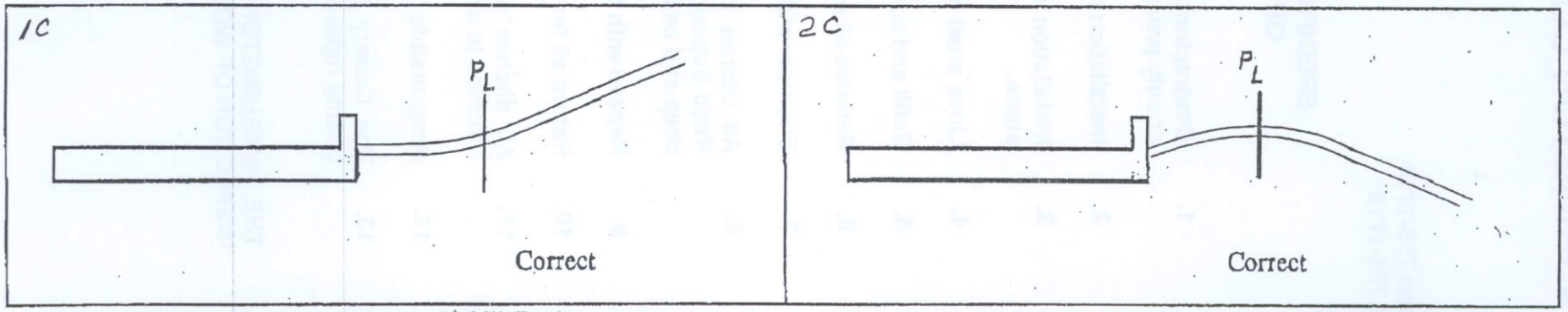


Uphill Grade



Downhill Grade

Curbed Street



Uphill Grade

Down Hill Grade

WASHINGTON COUNTY, TENNESSEE HIGHWAY DEPARTMENT

Office of Highway Superintendent
John B. Deakins, Jr.

Phone 753-1714
FAX 753-1718

P.O. Box 219
Jonesborough, TN 37659

SPECIFICATIONS FOR INSTALLLATION OF WATER LINES OR OTHER UTILITIES ALONG COUNTY ROADS

1. Contractor/Utility District must be liable for any damages to private or county property.
2. Installation must be two (2) feet from edge of pavement.
3. Installation closer than 18 inches to pavement must be back filled with stone.
4. Lines must be installed minimum of three (3) feet in depth.
5. Refill and compact as much as possible.
6. Remove all stumps, large rocks and etc. form right-of-way.
7. Shoulder with at least three (3) inches deep of crusher run stone.
8. All laterals connections must be bored unless permitted by the County Road Superintendent. If necessary for open cut – it must be three (3) feet deep and back fill with #57 or crusher run stone and compacted.
9. Repave with hot mix a minimum of three (3) inches deep.
10. Return all fences, etc. to there originality.
11. All ditches and bank disturbed must be sewed in grass, strawed and returned to original condition.
12. Responsible for all erosion control.
13. The County Road Superintendent must clear any work being done on county right-of-way and a permit issued.

THE WASHINGTON COUNTY HIGHWAYDEPARTMENT WILL MAKE FINAL INSPECTION OF WORK PERFORMED.

John B. Deakins, Jr., Road Superintendent

APPENDIX C

COST ESTIMATE CALCULATIONS

WASHINGTON COUNTY THOROUGHFARE PLAN COST ESTIMATE APPENDIX

The construction cost estimates for the Washington County Thoroughfare Plan include the cost to acquire additional right-of-way, relocate utilities, engineering costs, and general roadway construction. The costs were developed to a planning-level with two methodologies.

The first method utilized the Tennessee Department of Transportation's Long Range Planning Cost-Per-Mile Spreadsheet. The Cost-Per-Mile Spreadsheet was developed by TDOT with bid data from previous roadway construction project lettings. Factors are applied to base cost per mile data to adjust for the number of lanes being constructed, terrain, and adjacent land uses. The cost estimates provided with this methodology are generally higher than with the second methodology utilized.

The second cost estimate methodology utilized TDOT's average unit price (AUP) for construction materials. The AUP for construction materials database is maintained by TDOT's Construction Division and is available to the public. Planning-level quantity calculations were developed by Corradino on a per-mile basis for the different roadway improvement types proposed in the Washington County Thoroughfare Plan. These improvement types included improving existing two-lane roadways, widening existing two-lane roadways to three-lane roadways, constructing new two-lane roadways on new alignment, and improving shoulders along an existing route. Right-of-way acquisition needs and relocations for each route were estimated based upon a windshield survey level-of-accuracy.

The range of estimated cost reported in the Washington County Thoroughfare Plan are the range in cost estimated utilizing the two methodologies discussed above. The Cost-per-Mile Spreadsheet consistently predicts higher construction costs than the AUP cost estimate methodology.

Concerning improvements to local roadways, savings can be expected compared to those estimated if federal funds are not utilized. This is especially true if county highway forces are utilized to construct the improvements.

TABLE A-1: CONSTRUCTION COST ESTIMATE SUMMARY – UPDATED FOR INFLATION IN 2014 (3.6% PER YEAR)

County Roads

ID	Route	Length (Miles)	Estimated Cost (2015)	
			From	To
1C	Old Gray Station Road/Center Street/Ruritan Drive	1.38	**$ 7,701,000**	**$ 12,608,000**
2C	Highland Church Road/Knob Creek Road Connector - Option A	0.40	**$ 1,227,000**	**$ 3,353,000**
2C	Highland Church Road/Knob Creek Road Connector - Option B	0.43	**$ 1,311,000**	**$ 3,604,000**
3C	Highland Church Road/Shadden Road	4.99	**$ 16,641,000**	**$ 43,038,000**
4C	Old Gray Station Road	2.00	**$ 6,939,000**	**$ 17,249,000**
5C	Roy Martin Road Connector	0.74	**$ 2,255,000**	**$ 8,991,000**
Total County Roads:		9.94	**$ 34,763,000**	**$ 85,490,000**

State Routes

ID	Route	Length (Miles)	Estimated Cost (2015)	
			From	To
1S	State Route 75 (at Daniel Boone High School)	0.62	**$ 3,279,000**	**$ 7,437,000**
2S	State Route 75 (from State Route 81 to Hugh Cox Road)	4.95	**$ 27,489,000**	**$ 53,902,000**
3S	State Route 107	5.98	**$ 17,346,000**	**$ 19,644,000**
4S	State Route 81 (from State Route 107 to Jonesborough)	4.32	**$ 24,653,000**	**$ 51,056,000**
5S	State Route 81 (from Jonesborough to I-81)	11.20	**$ 60,151,000**	**$132,368,000**
6S	State Route 81 (from Unicoi County to the Nolichucky River)	1.49	**$ 7,405,000**	**$ 17,610,000**
Total State Routes:		28.56	**$140,323,000**	**$282,017,000**

TABLE A-2: CONSTRUCTION COST ESTIMATE SUMMARY – ORIGINAL CALCULATION

County Roads

ID	Route	Length (Miles)	Estimated Cost	
			From	To
1	Old Gray Station Road/Center Street/Ruritan Drive	1.38	**$ 7,433,000**	**$ 12,170,000**
2	Old Gray Station Road - Buckingham Road east to the Johnson City limits	2.00	**$ 6,698,000**	**$ 16,650,000**
3	Shadden Road/Highland Church Road – SR 75 to SR 354	4.99	**$ 16,063,000**	**$ 41,542,000**
4	Highland Church Road and Knob Creek Road – Realign Intersection	0.43	**$ 1,265,000**	**$ 3,479,000**
5	New Road – Roy Martin Road to intersection of Cedar Creek Road and Free Hill Road	0.74	**$ 2,177,000**	**$ 8,679,000**
Total County Roads:		9.54	**$ 33,636,000**	**$ 82,520,000**

State Routes

ID	Route	Length (Miles)	Estimated Cost	
			From	To
6	SR 75 - SR 81 to Hugh Cox Road through Sulphur Springs	4.95	**$ 26,534,000**	**$ 52,029,000**
7	SR 75 - Hugh Cox Road to north of Daniel Boone High School, including Hugh Cox Road approach	0.62	**$ 3,165,000**	**$ 7,179,000**
8	SR 81 - I-81 to Jonesborough north city limit	11.20	**$ 58,061,000**	**$127,768,000**
9	SR 81 – Jonesboro south city limit to SR 107	4.32	**$ 23,796,000**	**$ 49,282,000**
10	SR 81 - Nolichucky River to near Unicoi County line	1.49	**$ 7,148,000**	**$ 16,998,000**
11	SR 107 – East of SR 353 to SR 81	5.98	**$ 16,743,000**	**$ 18,961,000**
Total State Routes:		28.56	**$135,447,000**	**$272,217,000**

Source: The Corradino Group (Calculated 2013)

1.0 TDOT LONG RANGE PLANNING COST-PER-MILE SPREADSHEET METHODOLOGY

1.0 TDOT COST-PER MILE SPREADSHEET COST SUMMARY

County Roads

ID	Route	Length (Miles)	COST (Cost per Mile Methodology)		
			ROW	Construction, Utilities, Contingency, & PE	Total
1	Old Gray Station Road/Center Street/Ruritan Drive	1.38	$ 1,489,000	$ 10,681,000	**$ 12,170,000**
2	Old Gray Station Road - Buckingham Road east to the Johnson City limits	2.00	$ 1,850,000	$ 14,800,000	**$ 16,650,000**
3	Shadden Road/Highland Church Road – SR 75 to SR 354	4.99	$ 4,615,000	$ 36,927,000	**$ 41,542,000**
4	Highland Church Road and Knob Creek Road – Realign Intersection	0.43	$ 265,000	$ 3,214,000	**$ 3,479,000**
5	New Road – Roy Martin Road to intersection of Cedar Creek Road and Free Hill Road	0.74	$ 456,000	$ 8,223,000	**$ 8,679,000**
Total County Roads:					**$ 82,520,000**

State Routes

ID	Route	Length (Miles)	COST (Cost per Mile Methodology)		
			ROW	Construction, Utilities, Contingency, & PE	Total
6	SR 75 - SR 81 to Hugh Cox Road through Sulphur Springs	4.95	$ 7,629,000	$ 44,400,000	**$ 52,029,000**
7	SR 75 - Hugh Cox Road to north of Daniel Boone High School, including Hugh Cox Road approach	0.62	$ 382,000	$ 6,798,000	**$ 7,179,000**
8	SR 81 - I-81 to Jonesborough north city limit	11.20	$ 17,262,000	$110,506,000	**$127,768,000**
9	SR 81 – Jonesboro south city limit to SR 107	4.32	$ 6,658,000	$ 42,624,000	**$ 49,282,000**
10	SR 81 - Nolichucky River to near Unicoi County line	1.49	$ 2,296,000	$ 14,701,000	**$ 16,998,000**
11	SR 107 – East of SR 353 to SR 81	5.98	$ 1,843,000	$ 14,900,000	**$ 16,743,000**
Total State Routes:					**$269,999,000**

1.1 COST-PER-MILE CALCULATIONS

2013-2014 COST DATA SHEET

ROW Cost Per Mile x ROW Factor + Construction Cost Per Mile x Terrain Factor x Construction Factor
+ PE Cost (10% of Construction Cost)+ Contingencies Cost (15% of Construction Cost) x Distance

Base Per Mile ROW Cost (based on reconstructing two to four lanes in a rural area). $1,233,000

Right Of Way (ROW) Factor

Area	Factor
CBD	3.25
CBD Urbanized	12.50
Heavy Commercial (High Rise, Large Building)	3.25
Strip Commercial	3.25
Fringe (Mixed, Residential/Commercial)	1.75
Industries (Factories, Warehouse)	1.75
Light Residential (1/4- Acres)	1.75
Medium Residential (Acres+)	1.75
Heavy Residential (Apartments)	1.75
Public Use (Parks, School)	1.75
Rural	1.00

State Route Base Per Mile Construction Cost $7,973,000

Local Road Base Per Mile Construction Cost $5,980,000

Terrain Factor

Area	Factor
Flat	1.00
Rolling	1.10
Mountainous	2.60
Heavy Mountainous	5.00

Construction Factor

Recommendation	Factor	Recommendation	Factor
New 2 Lane	1.00	New 4 Lane	1.60
Reconstruct 2 Lane	0.90	Reconstruct 4 Lane	1.50
Reconstruct 3 Lane	1.10	Reconstruct 4 to 6 Lane	0.90
Reconstruct 2 to 4 Lane	1.30	Reconstruct 4 to 7 Lane	1.00
Reconstruct 2 to 5 Lane	1.50	New 4 Lane Interstate	1.80
Reconstruct 2 to 6 Lane	1.80	Add 2 Interstate Lanes	0.70
Reconstruct 2 to 7 Lane	1.80	Add 4 Interstate Lanes	1.00

Interstate Urbanized Area Factor = Construction Cost x 1.5
Interstate Widening Within Median Factor = Construction Cost x 0.2

Preliminary Engineering Cost 10% of construction cost
Contingencies 15% of construction cost

Other Types of Construction

Resurface only (Interstate) = $180,000 per lane mile
Resurface only (State Route) = $63,200 per lane mile

Welcome Center = $4,800.000

Rest Area = $2,200,000

Sidewalks = $185,000 per mile (per side).

Signalized Intersection - $118,000 This includes mobilization and maintenance of traffic and should be used on projects that are only proposing a signal.

Signalized Intersection - $86,000 - $91,000 This is for signalization only, where other roadway/ intersection improvements are also proposed.

Rural Roundabout = $750,000 - $1 Million
Urban Roundabout = $1 million - $1.5 million

Major River Crossing = $37 million to $58 million
(e.g., Cumberland River $37million)

New Rural Interchange = $8 to $36 million; ($21 million average)
New Urban Interchange = $18 to $86 million; ($36 million average)

Modified Rural Interchange = $2 to $26 million; ($14 million average)
Modified Urban Interchange = $2 to $65 million; ($27 million average)

General Notes:

Data is derived from Tennessee Department of Transportation state-wide cost estimates used for planning purposes;
Cost specifications for individual projects may vary significantly from state-wide averages.

10% of the construction cost is estimated for PE (environmental and design). As a general rule, 60% of the PE cost is environmental and 40% of the PE cost is design.

Use 3.6% inflation rate per year to estimate cost for year of expenditure

Route: Old Gray Station Road/Center Street/Ruritan Drive
Segment: 1 and 2, from SR 75 to Center Street
Description: Improved 3-lane

Date: 9/26/2013
by: JHS
Project ID: 1

LOCAL ROAD	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	0.88				0.57	$614,959
CON	$5,980,000		1.00	1.10		0.57	$3,749,460
PE					0.10		$374,946
CONTINGENCY					0.15		$562,419
Total Cost							5,301,784

Route: Old Gray Station Road/Center Street/Ruritan Drive
Segment: 3 and 4, from Center Street to Lakeview St.
Description: Improved 2-lane

Date: 9/26/2013
by: JHS
Project ID: 1

LOCAL ROAD	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	0.88				0.81	$873,889
CON	$5,980,000		1.10	0.90		0.81	$4,795,362
PE					0.10		$479,536
CONTINGENCY					0.15		$719,304
Total Cost							6,868,091

Route: Old Gray Station Road - Buckingham Road east to the Johnson City limits **Date:** 9/26/2013
Segment: Entire route **by:** JHS
Description: Improved 2-lane **Project ID:** 2

LOCAL ROAD	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	0.75				2.00	$1,849,500
CON	$5,980,000		1.10	0.90		2.00	$11,840,400
PE					0.10		$1,184,040
CONTINGENCY					0.15		$1,776,060
Total Cost							16,650,000

Route: Shadden Road/Highland Church Road – SR 75 to SR 354 **Date:** 9/26/2013
Segment: Entire route **by:** JHS
Description: Improved 2-lane **Project ID:** 3

LOCAL ROAD	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	0.75				4.99	$4,614,503
CON	$5,980,000		1.10	0.90		4.99	$29,541,798
PE					0.10		$2,954,180
CONTINGENCY					0.15		$4,431,270
Total Cost							41,541,750

Route: Highland Church Road and Knob Creek Road – Realign Intersection **Date:** 12/22/2014
Segment: Entire route Option A **by:** JHS
Description: New 2-lane **Project ID:** 4

LOCAL ROAD	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	0.50				0.40	$246,600
CON	$5,980,000		1.00	1.00		0.40	$2,392,000
PE					0.10		$239,200
CONTINGENCY					0.15		$358,800
Total Cost							3,236,600

Route: Highland Church Road and Knob Creek Road – Realign Intersection **Date:** 9/26/2013
Segment: Entire route Option B **by:** JHS
Description: New 2-lane **Project ID:** 4

LOCAL ROAD	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	0.50				0.43	$265,095
CON	$5,980,000		1.00	1.00		0.43	$2,571,400
PE					0.10		$257,140
CONTINGENCY					0.15		$385,710
Total Cost							3,479,345

Route: New Road – Roy Martin Road to intersection of Cedar Creek Road and Fr **Date:** 9/26/2013
Segment: Entire route **by:** JHS
Description: New 2-lane **Project ID:** 5

LOCAL ROAD	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	0.50				0.74	$456,210
CON	$5,980,000		1.10	1.00		1.00	$6,578,000
PE					0.10		$657,800
CONTINGENCY					0.15		$986,700
Total Cost							8,678,710

Route: SR 75 - SR 81 to Hugh Cox Road through Sulphur Springs **Date:** 9/26/2013
Segment: Entire route **by:** JHS
Description: Improved 2-lane **Project ID:** 6

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	1.25				4.95	$7,629,188
CON	$7,973,000		1.00	0.90		4.95	$35,519,715
PE					0.10		$3,551,972
CONTINGENCY					0.15		$5,327,957
Total Cost							52,028,831

Route: SR 75 - Hugh Cox Road to north of Daniel Boone High School, including I **Date:** 9/26/2013
Segment: Entire route **by:** JHS
Description: New 2-lane **Project ID:** 7

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	0.50				0.62	$382,230
CON	$7,973,000		1.10	1.00		0.62	$5,437,586
PE					0.10		$543,759
CONTINGENCY					0.15		$815,638
Total Cost							7,179,213

Route: SR 81 - I-81 to Jonesborough north city limit
Segment: Entire route
Description: Improved 2-lane

Date: 9/26/2013
by: JHS
Project ID: 8

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	1.25				11.20	$17,262,000
CON	$7,973,000		1.10	0.90		11.20	$88,404,624
PE					0.10		$8,840,462
CONTINGENCY					0.15		$13,260,694
Total Cost							127,767,780

Route: SR 81 – Jonesboro south city limit to SR 107
Segment: Entire route
Description: Improved 2-lane

Date: 9/26/2013
by: JHS
Project ID: 9

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	1.25				4.32	$6,658,200
CON	$7,973,000		1.10	0.90		4.32	$34,098,926
PE					0.10		$3,409,893
CONTINGENCY					0.15		$5,114,839
Total Cost							49,281,858

Route: SR 81 - Nolichucky River to near Unicoi County line
Segment: Entire route
Description: Improved 2-lane

Date: 9/26/2013
by: JHS
Project ID: 10

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	1.25				1.49	$2,296,463
CON	$7,973,000		1.10	0.90		1.49	$11,760,972
PE					0.10		$1,176,097
CONTINGENCY					0.15		$1,764,146
Total Cost							16,997,678

Route: SR 107 – East of SR 353 to SR 81
Segment: Entire route
Description: Improved 2-lane (shoulder widening)

Date: 9/26/2013
by: JHS
Project ID: 11

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Area Factor	Length	Cost
ROW	$1,233,000	0.25				5.98	$1,843,335
CON	$7,973,000		1.00	0.25		5.98	$11,919,635
PE					0.10		$1,191,964
CONTINGENCY					0.15		$1,787,945
Total Cost							16,742,879

2.0 AUP COST ESTIMATE METHODOLOGY

2.0 AUP COST SUMMARY

County Roads

ID	Route	Length (Miles)	COST (AUP Methodology)			
			ROW	Construction cost per Mile	Construction, Utilities, Contingency, & PE	Total
1	Old Gray Station Road/Center Street/Ruritan Drive	1.38	$ 3,893,000	$ 2,565,300	$ 3,540,000	**$ 7,433,000**
2	Old Gray Station Road - Buckingham Road east to the Johnson City limits	2.00	$ 1,602,000	$ 2,547,800	$ 5,096,000	**$ 6,698,000**
3	Shadden Road/Highland Church Road – SR 75 to SR 354	4.99	$ 3,349,000	$ 2,547,800	$ 12,714,000	**$ 16,063,000**
4	Highland Church Road and Knob Creek Road – Realign Intersection	0.43	$ 95,000	$ 2,721,600	$ 1,170,000	**$ 1,265,000**
5	New Road – Roy Martin Road to intersection of Cedar Creek Road and Free Hill Road	0.74	$ 163,000	$ 2,721,600	$ 2,014,000	**$ 2,177,000**
Total County Roads:						**$ 33,636,000**

State Routes

ID	Route	Length (Miles)	COST (AUP Methodology)			
			ROW	Construction	Construction, Utilities, Contingency, & PE	Total
6	SR 75 - SR 81 to Hugh Cox Road through Sulphur Springs	4.95	$ 6,625,000	$ 4,022,000	$ 19,909,000	**$ 26,534,000**
7	SR 75 - Hugh Cox Road to north of Daniel Boone High School, including Hugh Cox Road approach	0.62	$ 473,000	$ 4,341,900	$ 2,692,000	**$ 3,165,000**
8	SR 81 - I-81 to Jonesborough north city limit	11.20	$ 13,015,000	$ 4,022,000	$ 45,046,000	**$ 58,061,000**
9	SR 81 – Jonesboro south city limit to SR 107	4.32	$ 6,421,000	$ 4,022,000	$ 17,375,000	**$ 23,796,000**
10	SR 81 - Nolichucky River to near Unicoi County line	1.49	$ 1,155,000	$ 4,022,000	$ 5,993,000	**$ 7,148,000**
11	SR 107 – East of SR 353 to SR 81	5.98	$ 4,705,000	$ 2,384,000	$ 14,256,000	**$ 18,961,000**
Total State Routes:						**$137,665,000**

2.1 AUP CONSTRUCTION COST CALCULATIONS

Route:	**Construction Cost Per Mile Estimate**
Description:	**Rolling Terrain, Local Route, Reconstruct 2-Lane**
County:	**Washington**
Length:	**1 Mile**
Date:	**September 27, 2013**

DESCRIPTION		TOTAL
Clearing and Grubbing	$	28,000
Earthwork	$	293,000
Railroad Crossing or Separation	$	-
Drainage	$	210,000
Utilities	$	300,000
Structures	$	-
Pavement Removal	$	170,000
Paving	$	586,000
Roadway and Pavement Appurtenances	$	-
Retaining Walls	$	-
Topsoil	$	55,000
Seeding	$	15,000
Sodding	$	-
Rip-Rap or Slope Protection	$	-
Fencing	$	-
Signing	$	3,000
Pavement Markings	$	15,000
Lighting	$	-
Signalization	$	-
Guardrail	$	47,000
Pay Item Quantity Adjustment (15%)[1]	$	258,300
Maintenance of Traffic	$	25,000
Mobilization (5%)	$	100,300
CONSTRUCTION COST (rounded)	$	2,105,600
Engineering and Contingency (10%)	$	210,600
TOTAL CONSTRUCTION COST (rounded)	$	2,316,200
Preliminary Engineering (10%)	$	231,600
PROJECT COST [2](rounded)	**$**	**2,547,800**

[1] ***For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.***

[2] ***For estimating future project costs, a compounded inflation rate of 10% should be applied from the date of this estimate.***

Route: Construction Cost Per Mile Estimate
County: Washington
Section: Rolling Terrain, State Route, Reconstruct 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
Clear and Grubbing							
201-01	11	Acres	$ 2,500.00		$ 27,600	$ 28,000	Area inside prop. R.O.W.
Earthwork							
203-01	78222	CY	$ 3.75	$ 293,333			Excavation (Cut)
203-03	0	CY	$ 2.97	$ -			Borrow (Fill)
		Total			$ 293,333	$ 293,000	
Pavement Removal							
202-03.01	14080	SY	$ 12.07	$ 169,946	$ 169,946	$ 170,000	
Drainage							
607-09.30	1500	FT Pipe	$ 140.00	$ 210,000			48" pipe assummed 300 feet each, 5 crossings per mile
		Total			$ 210,000	$ 210,000	
Utilities							
		Lump Sum	N/A		$ 300,000	$ 300,000	See separate calculations
Paving							
	0	SF	$ 5.02	$ -			arterial street asphalt paving - see separate calcs
	126720	SF	$ 3.82	$ 484,234			local street asphalt paving - see separate calcs
	0	SF	$ 8.24	$ -			concrete ramp - see separate calcs
	0	SF	$ 3.24	$ -			arterial and ramp asphalt shoulder - see separate calcs
	105600	SF	$ 1.95	$ 205,458			local street shoulder - see separate calcs
	0	SF	$ 1.26	$ -			city street overlay - see separate calcs
406-04.02	0	SY	$ 30.80	$ -			High friction surface treatment
415-01.02	0	SY	$ 1.35	$ -			Cold planing (milling) asphalt pavement
		-15% Factor		$ (103,454)			Widening Reduction Factor (if widening, cost = 85% of total paving)
		Total			$ 586,238	$ 586,000	
Maintenance of Traffic							
	1	Each	$ 25,000.00		$ 25,000	$ 25,000	estimate $25,000 per mile
Topsoil							
203-07	5997	CY	$ 9.18		$ 55,053	$ 55,000	
Seeding							

County: Washington
Section: Rolling Terrain, State Route, Reconstruct 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
801-01	485760	SF	$ 25.01		$ 15,186	$ 15,000	sq. ft to be seeded/1000 x 1.25 = units. Unit price in units
Signing							
	1	Mile	$ 3,000.00	$ 3,000.00			$3000/mile
					$ 3,000	$ 3,000	
Pavement Marking							
716-12.01	4	L.M.	$ 2,836.70	$ 11,346.80			Edgelines & Centerlines, Enhanced Flatline Thermo (4")
716-02.05	200	LF	$ 9.74	$ 1,948.00			Stop Lines
716-01.21	66	Each	$ 24.66	$ 1,627.56			Snowplowable Markers (bi-direction 1 color)
					$ 14,922	$ 15,000	
Guardrail							
705-02.02	1000	LF	$ 15.78	$ 15,780			Guardrail (End Terminals Not Included in Price)
705-04.07	10	Each	$ 2,107.76	$ 21,078			Guardrail Terminal (Type 38)
705-04.09	10	Each	$ 1,037.25	$ 10,373			Type 38 Earth Pad
		Total			$ 47,230	$ 47,000	
Total:						**$ 1,747,000**	

Route Utility Cost Estimate Calculations

Option: Local Route, Reconstruct 2-Lane
Route: n/a
County: Washington
Length: 1 Mile

Item	Quantity	Unit	Unit Cost	Total Cost	Description/Quantity Calculation
Gas Line - 4"-100 lb Pressure Line		FT	$ 50	$ -	
Gas Line - 6"-30 lb Pressure Line		FT	$ 35	$ -	
Water Line - 12"		FT	$ 66	$ -	
Water Line - 6"	5280	FT	$ 35	$ 185,000	
Sewer Line		FT	$ 22	$ -	Generally no sewer in rural areas
Telephone Line (Underground)		FT	$ 35	$ -	
Street Light	10	Each	$ 1,765	$ 18,000	
Utility (Power) Pole	26	Each	$ 2,500	$ 66,000	1 pole every 200 feet
Cable TV Pole Attachment	26	Each	$ 1,000	$ 26,000	1 pole every 200 feet

Total: **$ 300,000**

Costs updated in 2007

Paving Cost by Cross Section
JHS

City Street Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	1.25	$ 0.63	Design Guidelines 4-411.00
307-01.08	Binder AC (PG64-22) GR "B-M2"	Ton	$ 77.20	2	$ 0.97	Design Guidelines 4-307.00
307-01.01	Black Base AC (PG64-22) GR "A"	Ton	$ 74.58	3	$ 1.43	Design Guidelines 4-307.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	8	$ 0.79	Design Guidelines 4-303.00
Total:				**14.25**	**$ 3.82**	

Arterial (Asphalt) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-02.10	Bituminous Surface	Tons	$ 87.02	1.25	$ 0.64	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-02.08	Bituminous Binder	Tons	$ 63.81	2.00	$ 0.80	Design Guidelines 4-307.00
307-02.01	Bituminious Base	Tons	$ 60.63	6.50	$ 2.52	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	10.00	$ 0.99	Design Guidleines 4-303.00
Total:				**19.75**	**$ 5.02**	

City Street Overlay (Assume Double Layer of Surface AC):

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	2.5	$ 1.26	Design Guidelines 4-411.00
Total:				**2.5**	**$ 1.26**	

Ramp (Concrete) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
501-01.03	Portland Cement Concrete PVMT (Plain	S.Y.	$ 53.62	10.00	$ 5.96	
313-03	Treated Permeable Base	S.Y.	$ 17.01	4.00	$ 1.89	
303-01	Mineral Aggregate Base	Tons	$ 15.82	4.00	$ 0.40	Design Guidleines 4-303.00
Total:				**18**	**$ 8.24**	

City Street Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Surface AC (PG64-22) GR "E"	Ton	$ 79.44	1.5	$ 0.68	Design Guidelines 4-411.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	12.75	$ 1.26	Design Guidelines 4-303.00
Total:				**14.25**	**$ 1.95**	

Arterial and Ramp (Asphalt) Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Bituminous Surface	Tons	$ 79.44	1.25	$ 0.57	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-01.08	Bituminous Binder	Tons	$ 77.20	2.00	$ 0.97	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	16.50	$ 1.64	Design Guidleines 4-303.00
Total:				**19.75**	**$ 3.24**	

= referenced from previous input price

Route:	**Construction Cost Per Mile Estimate**
Description:	**Rolling Terrain, Local Route, New 2-Lane**
County:	**Washington**
Length:	**1 Mile**
Date:	**September 27, 2013**

DESCRIPTION		TOTAL
Clearing and Grubbing	$	43,000
Earthwork	$	763,000
Railroad Crossing or Separation	$	-
Drainage	$	210,000
Utilities	$	-
Structures	$	-
Pavement Removal	$	-
Paving	$	690,000
Roadway and Pavement Appurtenances	$	-
Retaining Walls	$	-
Topsoil	$	55,000
Seeding	$	15,000
Sodding	$	-
Rip-Rap or Slope Protection	$	-
Fencing	$	-
Signing	$	3,000
Pavement Markings	$	15,000
Lighting	$	-
Signalization	$	-
Guardrail	$	47,000
Pay Item Quantity Adjustment (15%)[1]	$	276,200
Maintenance of Traffic	$	25,000
Mobilization (5%)	$	107,100
CONSTRUCTION COST (rounded)	$	2,249,300
Engineering and Contingency (10%)	$	224,900
TOTAL CONSTRUCTION COST (rounded)	$	2,474,200
Preliminary Engineering (10%)	$	247,400
PROJECT COST [2](rounded)	**$**	**2,721,600**

[1] *For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.*

[2] *For estimating future project costs, a compounded inflation rate of 10% should be applied from the date of this estimate.*

Route: Construction Cost Per Mile Estimate
County: Washington
Section: Rolling Terrain, State Route, New 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
Clear and Grubbing							
201-01	17	Acres	$ 2,500.00		$ 43,200	$ 43,000	Area inside prop. R.O.W.
Earthwork							
203-01	203378	CY	$ 3.75	$ 762,667			Excavation (Cut)
203-03	0	CY	$ 2.97	$ -			Borrow (Fill)
		Total			$ 762,667	$ 763,000	
Pavement Removal							
202-03.01	0	SY	$ 12.07	$ -	$ -	$ -	
Drainage							
607-09.30	1500	FT Pipe	$ 140.00	$ 210,000			48" pipe assummed 300 feet each, 5 crossings per mile
		Total			$ 210,000	$ 210,000	
Utilities							
		Lump Sum	N/A		$ -	$ -	See separate calculations
Paving							
		SF	$ 5.02	$ -			arterial street asphalt paving - see separate calcs
	126720	SF	$ 3.82	$ 484,234			local street asphalt paving - see separate calcs
	0	SF	$ 8.24	$ -			concrete ramp - see separate calcs
		SF	$ 3.24	$ -			arterial and ramp asphalt shoulder - see separate calcs
	105600	SF	$ 1.95	$ 205,458			local street shoulder - see separate calcs
	0	SF	$ 1.26	$ -			city street overlay - see separate calcs
406-04.02	0	SY	$ 30.80	$ -			High friction surface treatment
415-01.02	0	SY	$ 1.35	$ -			Cold planing (milling) asphalt pavement
		-15% Factor		$ -			Widening Reduction Factor (if widening, cost = 85% of total paving)
		Total			$ 689,692	$ 690,000	
Maintenance of Traffic							
	1	Each	$ 25,000.00		$ 25,000	$ 25,000	estimate $25,000 per mile
Topsoil							
203-07	5997	CY	$ 9.18		$ 55,053	$ 55,000	
Seeding							

County: Washington
Section: Rolling Terrain, State Route, New 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
801-01	485760	SF	$ 25.01		$ 15,186	$ 15,000	sq. ft to be seeded/1000 x 1.25 = units. Unit price in units
Signing							
	1	Mile	$ 3,000.00	$ 3,000.00			$3000/mile
					$ 3,000	$ 3,000	
Pavement Marking							
716-12.01	4	L.M.	$ 2,836.70	$ 11,346.80			Edgelines & Centerlines, Enhanced Flatline Thermo (4")
716-02.05	200	LF	$ 9.74	$ 1,948.00			Stop Lines
716-01.21	66	Each	$ 24.66	$ 1,627.56			Snowplowable Markers (bi-direction 1 color)
					$ 14,922	$ 15,000	
Guardrail							
705-02.02	1000	LF	$ 15.78	$ 15,780			Guardrail (End Terminals Not Included in Price)
705-04.07	10	Each	$ 2,107.76	$ 21,078			Guardrail Terminal (Type 38)
705-04.09	10	Each	$ 1,037.25	$ 10,373			Type 38 Earth Pad
		Total			$ 47,230	$ 47,000	
Total:						**$ 1,866,000**	

Route Utility Cost Estimate Calculations

Option: Local Route, New Location (No utilities)
Route: n/a
County: Washington
Length: 1 Mile

Item	Quantity	Unit	Unit Cost	Total Cost	Description/Quantity Calculation
Gas Line - 4"-100 lb Pressure Line		FT	$ 50	$ -	
Gas Line - 6"-30 lb Pressure Line		FT	$ 35	$ -	
Water Line - 12"		FT	$ 66	$ -	
Water Line - 6"	0	FT	$ 35	$ -	
Sewer Line		FT	$ 22	$ -	Generally no sewer in rural areas
Telephone Line (Underground)		FT	$ 35	$ -	
Street Light	0	Each	$ 1,765	$ -	
Utility (Power) Pole	0	Each	$ 2,500	$ -	1 pole every 200 feet
Cable TV Pole Attachment	0	Each	$ 1,000	$ -	1 pole every 200 feet

Total: **$ -**

Costs updated in 2007

Paving Cost by Cross Section
JHS

City Street Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	1.25	$ 0.63	Design Guidelines 4-411.00
307-01.08	Binder AC (PG64-22) GR "B-M2"	Ton	$ 77.20	2	$ 0.97	Design Guidelines 4-307.00
307-01.01	Black Base AC (PG64-22) GR "A"	Ton	$ 74.58	3	$ 1.43	Design Guidelines 4-307.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	8	$ 0.79	Design Guidelines 4-303.00
Total:				**14.25**	**$ 3.82**	

Arterial (Asphalt) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-02.10	Bituminous Surface	Tons	$ 87.02	1.25	$ 0.64	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-02.08	Bituminous Binder	Tons	$ 63.81	2.00	$ 0.80	Design Guidelines 4-307.00
307-02.01	Bituminious Base	Tons	$ 60.63	6.50	$ 2.52	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	10.00	$ 0.99	Design Guidleines 4-303.00
Total:				**19.75**	**$ 5.02**	

City Street Overlay (Assume Double Layer of Surface AC):

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	2.5	$ 1.26	Design Guidelines 4-411.00
Total:				**2.5**	**$ 1.26**	

Ramp (Concrete) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
501-01.03	Portland Cement Concrete PVMT (Plain	S.Y.	$ 53.62	10.00	$ 5.96	
313-03	Treated Permeable Base	S.Y.	$ 17.01	4.00	$ 1.89	
303-01	Mineral Aggregate Base	Tons	$ 15.82	4.00	$ 0.40	Design Guidleines 4-303.00
Total:				**18**	**$ 8.24**	

City Street Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Surface AC (PG64-22) GR "E"	Ton	$ 79.44	1.5	$ 0.68	Design Guidelines 4-411.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	12.75	$ 1.26	Design Guidelines 4-303.00
Total:				**14.25**	**$ 1.95**	

Arterial and Ramp (Asphalt) Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Bituminous Surface	Tons	$ 79.44	1.25	$ 0.57	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-01.08	Bituminous Binder	Tons	$ 77.20	2.00	$ 0.97	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	16.50	$ 1.64	Design Guidleines 4-303.00
Total:				**19.75**	**$ 3.24**	

= referenced from previous input price

Route:	**Construction Cost Per Mile Estimate**
Description:	**Level Terrain, Local Route, 2-Lane to 3-Lane**
County:	**Washington**
Length:	**1 Mile**
Date:	**September 27, 2013**

DESCRIPTION		TOTAL
Clearing and Grubbing	$	31,000
Earthwork	$	763,000
Railroad Crossing or Separation	$	-
Drainage	$	210,000
Utilities	$	-
Structures	$	-
Pavement Removal	$	-
Paving	$	607,000
Roadway and Pavement Appurtenances	$	-
Retaining Walls	$	-
Topsoil	$	55,000
Seeding	$	15,000
Sodding	$	-
Rip-Rap or Slope Protection	$	-
Fencing	$	-
Signing	$	3,000
Pavement Markings	$	15,000
Lighting	$	-
Signalization	$	-
Guardrail	$	47,000
Pay Item Quantity Adjustment (15%)[1]	$	261,900
Maintenance of Traffic	$	25,000
Mobilization (5%)	$	101,600
CONSTRUCTION COST (rounded)	$	2,134,500
Engineering and Contingency (10%)	$	213,500
TOTAL CONSTRUCTION COST (rounded)	$	2,348,000
Preliminary Engineering (10%)	$	234,800
PROJECT COST [2](rounded)	**$**	**2,582,800**

[1] *For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.*

[2] *For estimating future project costs, a compounded inflation rate of 10% should be applied from the date of this estimate.*

Route: Construction Cost Per Mile Estimate
County: Washington
Section: Rolling Terrain, State Route, New 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
Clear and Grubbing							
201-01	12	Acres	$ 2,500.00		$ 31,200	$ 31,000	Area inside prop. R.O.W.
Earthwork							
203-01	203378	CY	$ 3.75	$ 762,667			Excavation (Cut)
203-03	0	CY	$ 2.97	$ -			Borrow (Fill)
		Total			$ 762,667	$ 763,000	
Pavement Removal							
202-03.01	0	SY	$ 12.07	$ -	$ -	$ -	
Drainage							
607-09.30	1500	FT Pipe	$ 140.00	$ 210,000			48" pipe assummed 300 feet each, 5 crossings per mile
		Total			$ 210,000	$ 210,000	
Utilities							
		Lump Sum	N/A		$ -	$ -	See separate calculations
Paving							
		SF	$ 5.02	$ -			arterial street asphalt paving - see separate calcs
	63360	SF	$ 3.82	$ 242,117			local street asphalt paving - see separate calcs
	0	SF	$ 8.24	$ -			concrete ramp - see separate calcs
		SF	$ 3.24	$ -			arterial and ramp asphalt shoulder - see separate calcs
	105600	SF	$ 1.95	$ 205,458			local street shoulder - see separate calcs
	126720	SF	$ 1.26	$ 159,565			city street overlay - see separate calcs
406-04.02	0	SY	$ 30.80	$ -			High friction surface treatment
415-01.02	0	SY	$ 1.35	$ -			Cold planing (milling) asphalt pavement
		-15% Factor		$ -			Widening Reduction Factor (if widening, cost = 85% of total paving)
		Total			$ 607,140	$ 607,000	
Maintenance of Traffic							
	1	Each	$ 25,000.00		$ 25,000	$ 25,000	estimate $25,000 per mile
Topsoil							
203-07	5997	CY	$ 9.18		$ 55,053	$ 55,000	
Seeding							

County: Washington
Section: Rolling Terrain, State Route, New 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
801-01	485760	SF	$ 25.01		$ 15,186	$ 15,000	sq. ft to be seeded/1000 x 1.25 = units. Unit price in units
Signing							
	1	Mile	$ 3,000.00	$ 3,000.00			$3000/mile
					$ 3,000	$ 3,000	
Pavement Marking							
716-12.01	4	L.M.	$ 2,836.70	$ 11,346.80			Edgelines & Centerlines, Enhanced Flatline Thermo (4")
716-02.05	200	LF	$ 9.74	$ 1,948.00			Stop Lines
716-01.21	66	Each	$ 24.66	$ 1,627.56			Snowplowable Markers (bi-direction 1 color)
					$ 14,922	$ 15,000	
Guardrail							
705-02.02	1000	LF	$ 15.78	$ 15,780			Guardrail (End Terminals Not Included in Price)
705-04.07	10	Each	$ 2,107.76	$ 21,078			Guardrail Terminal (Type 38)
705-04.09	10	Each	$ 1,037.25	$ 10,373			Type 38 Earth Pad
		Total			$ 47,230	$ 47,000	
Total:						**$ 1,771,000**	

Route Utility Cost Estimate Calculations

Option: Local Route, New Location (No utilities)
Route: n/a
County: Washington
Length: 1 Mile

Item	Quantity	Unit	Unit Cost	Total Cost	Description/Quantity Calculation
Gas Line - 4"-100 lb Pressure Line		FT	$ 50	$ -	
Gas Line - 6"-30 lb Pressure Line		FT	$ 35	$ -	
Water Line - 12"		FT	$ 66	$ -	
Water Line - 6"	0	FT	$ 35	$ -	
Sewer Line		FT	$ 22	$ -	Generally no sewer in rural areas
Telephone Line (Underground)		FT	$ 35	$ -	
Street Light	0	Each	$ 1,765	$ -	
Utility (Power) Pole	0	Each	$ 2,500	$ -	1 pole every 200 feet
Cable TV Pole Attachment	0	Each	$ 1,000	$ -	1 pole every 200 feet

Total: **$ -**

Costs updated in 2007

Paving Cost by Cross Section
JHS

City Street Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	1.25	$ 0.63	Design Guidelines 4-411.00
307-01.08	Binder AC (PG64-22) GR "B-M2"	Ton	$ 77.20	2	$ 0.97	Design Guidelines 4-307.00
307-01.01	Black Base AC (PG64-22) GR "A"	Ton	$ 74.58	3	$ 1.43	Design Guidelines 4-307.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	8	$ 0.79	Design Guidelines 4-303.00
Total:				**14.25**	**$ 3.82**	

Arterial (Asphalt) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-02.10	Bituminous Surface	Tons	$ 87.02	1.25	$ 0.64	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-02.08	Bituminous Binder	Tons	$ 63.81	2.00	$ 0.80	Design Guidelines 4-307.00
307-02.01	Bituminious Base	Tons	$ 60.63	6.50	$ 2.52	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	10.00	$ 0.99	Design Guidleines 4-303.00
Total:				**19.75**	**$ 5.02**	

City Street Overlay (Assume Double Layer of Surface AC):

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	2.5	$ 1.26	Design Guidelines 4-411.00
Total:				**2.5**	**$ 1.26**	

Ramp (Concrete) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
501-01.03	Portland Cement Concrete PVMT (Plain	S.Y.	$ 53.62	10.00	$ 5.96	
313-03	Treated Permeable Base	S.Y.	$ 17.01	4.00	$ 1.89	
303-01	Mineral Aggregate Base	Tons	$ 15.82	4.00	$ 0.40	Design Guidleines 4-303.00
Total:				**18**	**$ 8.24**	

City Street Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Surface AC (PG64-22) GR "E"	Ton	$ 79.44	1.5	$ 0.68	Design Guidelines 4-411.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	12.75	$ 1.26	Design Guidelines 4-303.00
Total:				**14.25**	**$ 1.95**	

Arterial and Ramp (Asphalt) Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Bituminous Surface	Tons	$ 79.44	1.25	$ 0.57	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-01.08	Bituminous Binder	Tons	$ 77.20	2.00	$ 0.97	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	16.50	$ 1.64	Design Guidleines 4-303.00
Total:				**19.75**	**$ 3.24**	

= referenced from previous input price

Route:	**Construction Cost Per Mile Estimate**
Description:	**Rolling Terrain, State Route, Reconstruct 2-Lane**
County:	**Washington**
Length:	**1 Mile**
Date:	**September 27, 2013**

DESCRIPTION		TOTAL
Clearing and Grubbing	$	28,000
Earthwork	$	1,056,000
Railroad Crossing or Separation	$	-
Drainage	$	210,000
Utilities	$	300,000
Structures	$	-
Pavement Removal	$	170,000
Paving	$	832,000
Roadway and Pavement Appurtenances	$	-
Retaining Walls	$	-
Topsoil	$	55,000
Seeding	$	15,000
Sodding	$	-
Rip-Rap or Slope Protection	$	-
Fencing	$	-
Signing	$	3,000
Pavement Markings	$	15,000
Lighting	$	-
Signalization	$	-
Guardrail	$	47,000
Pay Item Quantity Adjustment (15%)[1]	$	409,700
Maintenance of Traffic	$	25,000
Mobilization (5%)	$	158,300
CONSTRUCTION COST (rounded)	$	3,324,000
Engineering and Contingency (10%)	$	332,400
TOTAL CONSTRUCTION COST (rounded)	$	3,656,400
Preliminary Engineering (10%)	$	365,600
PROJECT COST [2](rounded)	**$**	**4,022,000**

[1] *For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.*

[2] *For estimating future project costs, a compounded inflation rate of 10% should be applied from the date of this estimate.*

Route: Construction Cost Per Mile Estimate
County: Washington
Section: Rolling Terrain, State Route, Reconstruct 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
Clear and Grubbing							
201-01	11	Acres	$ 2,500.00		$ 27,600	$ 28,000	Area inside prop. R.O.W.
Earthwork							
203-01	281600	CY	$ 3.75	$ 1,056,000			Excavation (Cut)
203-03	0	CY	$ 2.97	$ -			Borrow (Fill)
		Total			$ 1,056,000	$ 1,056,000	
Pavement Removal							
202-03.01	14080	SY	$ 12.07	$ 169,946	$ 169,946	$ 170,000	
Drainage							
607-09.30	1500	FT Pipe	$ 140.00	$ 210,000			48" pipe assummed 300 feet each, 5 crossings per mile
		Total			$ 210,000	$ 210,000	
Utilities							
		Lump Sum	N/A		$ 300,000	$ 300,000	See separate calculations
Paving							
	126720	SF	$ 5.02	$ 636,099			arterial street asphalt paving - see separate calcs
	0	SF	$ 3.82	$ -			local street asphalt paving - see separate calcs
	0	SF	$ 8.24	$ -			concrete ramp - see separate calcs
	105600	SF	$ 3.24	$ 342,348			arterial and ramp asphalt shoulder - see separate calcs
	0	SF	$ 1.95	$ -			local street shoulder - see separate calcs
	0	SF	$ 1.26	$ -			city street overlay - see separate calcs
406-04.02	0	SY	$ 30.80	$ -			High friction surface treatment
415-01.02	0	SY	$ 1.35	$ -			Cold planing (milling) asphalt pavement
		-15% Factor		$ (146,767)			Widening Reduction Factor (if widening, cost = 85% of total paving)
		Total			$ 831,680	$ 832,000	
Maintenance of Traffic							
	1	Each	$ 25,000.00		$ 25,000	$ 25,000	estimate $25,000 per mile
Topsoil							
203-07	5997	CY	$ 9.18		$ 55,053	$ 55,000	
Seeding							

County: Washington
Section: Rolling Terrain, State Route, Reconstruct 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
801-01	485760	SF	$ 25.01		$ 15,186	$ 15,000	sq. ft to be seeded/1000 x 1.25 = units. Unit price in units
Signing							
	1	Mile	$ 3,000.00	$ 3,000.00			$3000/mile
					$ 3,000	$ 3,000	
Pavement Marking							
716-12.01	4	L.M.	$ 2,836.70	$ 11,346.80			Edgelines & Centerlines, Enhanced Flatline Thermo (4")
716-02.05	200	LF	$ 9.74	$ 1,948.00			Stop Lines
716-01.21	66	Each	$ 24.66	$ 1,627.56			Snowplowable Markers (bi-direction 1 color)
					$ 14,922	$ 15,000	
Guardrail							
705-02.02	1000	LF	$ 15.78	$ 15,780			Guardrail (End Terminals Not Included in Price)
705-04.07	10	Each	$ 2,107.76	$ 21,078			Guardrail Terminal (Type 38)
705-04.09	10	Each	$ 1,037.25	$ 10,373			Type 38 Earth Pad
		Total			$ 47,230	$ 47,000	
Total:						**$ 2,756,000**	

Route Utility Cost Estimate Calculations

Option: State Route, Reconstruct 2-Lane
Route: n/a
County: Washington
Length: 1 Mile

Item	Quantity	Unit	Unit Cost	Total Cost	Description/Quantity Calculation
Gas Line - 4"-100 lb Pressure Line		FT	$ 50	$ -	
Gas Line - 6"-30 lb Pressure Line		FT	$ 35	$ -	
Water Line - 12"		FT	$ 66	$ -	
Water Line - 6"	5280	FT	$ 35	$ 185,000	
Sewer Line		FT	$ 22	$ -	Generally no sewer in rural areas
Telephone Line (Underground)		FT	$ 35	$ -	
Street Light	10	Each	$ 1,765	$ 18,000	
Utility (Power) Pole	26	Each	$ 2,500	$ 66,000	1 pole every 200 feet
Cable TV Pole Attachment	26	Each	$ 1,000	$ 26,000	1 pole every 200 feet

Total: **$ 300,000**

Costs updated in 2007

Paving Cost by Cross Section
JHS

City Street Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	1.25	$ 0.63	Design Guidelines 4-411.00
307-01.08	Binder AC (PG64-22) GR "B-M2"	Ton	$ 77.20	2	$ 0.97	Design Guidelines 4-307.00
307-01.01	Black Base AC (PG64-22) GR "A"	Ton	$ 74.58	3	$ 1.43	Design Guidelines 4-307.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	8	$ 0.79	Design Guidelines 4-303.00
Total:				**14.25**	**$ 3.82**	

Arterial (Asphalt) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-02.10	Bituminous Surface	Tons	$ 87.02	1.25	$ 0.64	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-02.08	Bituminous Binder	Tons	$ 63.81	2.00	$ 0.80	Design Guidelines 4-307.00
307-02.01	Bituminious Base	Tons	$ 60.63	6.50	$ 2.52	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	10.00	$ 0.99	Design Guidleines 4-303.00
Total:				**19.75**	**$ 5.02**	

City Street Overlay (Assume Double Layer of Surface AC):

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	2.5	$ 1.26	Design Guidelines 4-411.00
Total:				**2.5**	**$ 1.26**	

Ramp (Concrete) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
501-01.03	Portland Cement Concrete PVMT (Plain	S.Y.	$ 53.62	10.00	$ 5.96	
313-03	Treated Permeable Base	S.Y.	$ 17.01	4.00	$ 1.89	
303-01	Mineral Aggregate Base	Tons	$ 15.82	4.00	$ 0.40	Design Guidleines 4-303.00
Total:				**18**	**$ 8.24**	

City Street Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Surface AC (PG64-22) GR "E"	Ton	$ 79.44	1.5	$ 0.68	Design Guidelines 4-411.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	12.75	$ 1.26	Design Guidelines 4-303.00
Total:				**14.25**	**$ 1.95**	

Arterial and Ramp (Asphalt) Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Bituminous Surface	Tons	$ 79.44	1.25	$ 0.57	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-01.08	Bituminous Binder	Tons	$ 77.20	2.00	$ 0.97	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	16.50	$ 1.64	Design Guidleines 4-303.00
Total:				**19.75**	**$ 3.24**	

= referenced from previous input price

Route:	**Construction Cost Per Mile Estimate**
Description:	**Rolling Terrain, State Route, New 2-Lane**
County:	**Washington**
Length:	**1 Mile**
Date:	**September 27, 2013**

DESCRIPTION		TOTAL
Clearing and Grubbing	$	43,000
Earthwork	$	1,584,000
Railroad Crossing or Separation	$	-
Drainage	$	210,000
Utilities	$	-
Structures	$	-
Pavement Removal	$	-
Paving	$	978,000
Roadway and Pavement Appurtenances	$	-
Retaining Walls	$	-
Topsoil	$	55,000
Seeding	$	15,000
Sodding	$	-
Rip-Rap or Slope Protection	$	-
Fencing	$	-
Signing	$	3,000
Pavement Markings	$	15,000
Lighting	$	-
Signalization	$	-
Guardrail	$	47,000
Pay Item Quantity Adjustment (15%)[1]	$	442,500
Maintenance of Traffic	$	25,000
Mobilization (5%)	$	170,900
CONSTRUCTION COST (rounded)	$	3,588,400
Engineering and Contingency (10%)	$	358,800
TOTAL CONSTRUCTION COST (rounded)	$	3,947,200
Preliminary Engineering (10%)	$	394,700
PROJECT COST [2](rounded)	**$**	**4,341,900**

[1] *For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.*

[2] *For estimating future project costs, a compounded inflation rate of 10% should be applied from the date of this estimate.*

Route: Construction Cost Per Mile Estimate
County: Washington
Section: Rolling Terrain, State Route, New 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
Clear and Grubbing							
201-01	17	Acres	$ 2,500.00		$ 43,200	$ 43,000	Area inside prop. R.O.W.
Earthwork							
203-01	422400	CY	$ 3.75	$ 1,584,000			Excavation (Cut)
203-03	0	CY	$ 2.97	$ -			Borrow (Fill)
		Total			$ 1,584,000	$ 1,584,000	
Pavement Removal							
202-03.01	0	SY	$ 12.07	$ -	$ -	$ -	
Drainage							
607-09.30	1500	FT Pipe	$ 140.00	$ 210,000			48" pipe assummed 300 feet each, 5 crossings per mile
		Total			$ 210,000	$ 210,000	
Utilities							
		Lump Sum	N/A		$ -	$ -	See separate calculations
Paving							
	126720	SF	$ 5.02	$ 636,099			arterial street asphalt paving - see separate calcs
	0	SF	$ 3.82	$ -			local street asphalt paving - see separate calcs
	0	SF	$ 8.24	$ -			concrete ramp - see separate calcs
	105600	SF	$ 3.24	$ 342,348			arterial and ramp asphalt shoulder - see separate calcs
	0	SF	$ 1.95	$ -			local street shoulder - see separate calcs
	0	SF	$ 1.26	$ -			city street overlay - see separate calcs
406-04.02	0	SY	$ 30.80	$ -			High friction surface treatment
415-01.02	0	SY	$ 1.35	$ -			Cold planing (milling) asphalt pavement
		-15% Factor		$ -			Widening Reduction Factor (if widening, cost = 85% of total paving)
		Total			$ 978,447	$ 978,000	
Maintenance of Traffic							
	1	Each	$ 25,000.00		$ 25,000	$ 25,000	estimate $25,000 per mile
Topsoil							
203-07	5997	CY	$ 9.18		$ 55,053	$ 55,000	
Seeding							

County: Washington
Section: Rolling Terrain, State Route, New 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
801-01	485760	SF	$ 25.01		$ 15,186	$ 15,000	sq. ft to be seeded/1000 x 1.25 = units. Unit price in units
Signing							
	1	Mile	$ 3,000.00	$ 3,000.00			$3000/mile
					$ 3,000	$ 3,000	
Pavement Marking							
716-12.01	4	L.M.	$ 2,836.70	$ 11,346.80			Edgelines & Centerlines, Enhanced Flatline Thermo (4")
716-02.05	200	LF	$ 9.74	$ 1,948.00			Stop Lines
716-01.21	66	Each	$ 24.66	$ 1,627.56			Snowplowable Markers (bi-direction 1 color)
					$ 14,922	$ 15,000	
Guardrail							
705-02.02	1000	LF	$ 15.78	$ 15,780			Guardrail (End Terminals Not Included in Price)
705-04.07	10	Each	$ 2,107.76	$ 21,078			Guardrail Terminal (Type 38)
705-04.09	10	Each	$ 1,037.25	$ 10,373			Type 38 Earth Pad
		Total			$ 47,230	$ 47,000	
Total:						**$ 2,975,000**	

Route Utility Cost Estimate Calculations

Option: State Route, New Location (No utilities)
Route: n/a
County: Washington
Length: 1 Mile

Item	Quantity	Unit	Unit Cost	Total Cost	Description/Quantity Calculation
Gas Line - 4"-100 lb Pressure Line		FT	$ 50	$ -	
Gas Line - 6"-30 lb Pressure Line		FT	$ 35	$ -	
Water Line - 12"		FT	$ 66	$ -	
Water Line - 6"	0	FT	$ 35	$ -	
Sewer Line		FT	$ 22	$ -	Generally no sewer in rural areas
Telephone Line (Underground)		FT	$ 35	$ -	
Street Light	0	Each	$ 1,765	$ -	
Utility (Power) Pole	0	Each	$ 2,500	$ -	1 pole every 200 feet
Cable TV Pole Attachment	0	Each	$ 1,000	$ -	1 pole every 200 feet

Total: **$ -**

Costs updated in 2007

Paving Cost by Cross Section
JHS

City Street Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	1.25	$ 0.63	Design Guidelines 4-411.00
307-01.08	Binder AC (PG64-22) GR "B-M2"	Ton	$ 77.20	2	$ 0.97	Design Guidelines 4-307.00
307-01.01	Black Base AC (PG64-22) GR "A"	Ton	$ 74.58	3	$ 1.43	Design Guidelines 4-307.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	8	$ 0.79	Design Guidelines 4-303.00
Total:				**14.25**	**$ 3.82**	

Arterial (Asphalt) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-02.10	Bituminous Surface	Tons	$ 87.02	1.25	$ 0.64	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-02.08	Bituminous Binder	Tons	$ 63.81	2.00	$ 0.80	Design Guidelines 4-307.00
307-02.01	Bituminious Base	Tons	$ 60.63	6.50	$ 2.52	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	10.00	$ 0.99	Design Guidleines 4-303.00
Total:				**19.75**	**$ 5.02**	

City Street Overlay (Assume Double Layer of Surface AC):

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	2.5	$ 1.26	Design Guidelines 4-411.00
Total:				**2.5**	**$ 1.26**	

Ramp (Concrete) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
501-01.03	Portland Cement Concrete PVMT (Plain	S.Y.	$ 53.62	10.00	$ 5.96	
313-03	Treated Permeable Base	S.Y.	$ 17.01	4.00	$ 1.89	
303-01	Mineral Aggregate Base	Tons	$ 15.82	4.00	$ 0.40	Design Guidleines 4-303.00
Total:				**18**	**$ 8.24**	

City Street Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Surface AC (PG64-22) GR "E"	Ton	$ 79.44	1.5	$ 0.68	Design Guidelines 4-411.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	12.75	$ 1.26	Design Guidelines 4-303.00
Total:				**14.25**	**$ 1.95**	

Arterial and Ramp (Asphalt) Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Bituminous Surface	Tons	$ 79.44	1.25	$ 0.57	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-01.08	Bituminous Binder	Tons	$ 77.20	2.00	$ 0.97	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	16.50	$ 1.64	Design Guidleines 4-303.00
Total:				**19.75**	**$ 3.24**	

= referenced from previous input price

Route:	**Construction Cost Per Mile Estimate**
Description:	**Level Terrain, State Route, Existing 2-Lane, New Shoulders**
County:	**Washington**
Length:	**1 Mile**
Date:	**September 27, 2013**

DESCRIPTION		TOTAL
Clearing and Grubbing	$	43,000
Earthwork	$	440,000
Railroad Crossing or Separation	$	-
Drainage	$	210,000
Utilities	$	280,000
Structures	$	-
Pavement Removal	$	-
Paving	$	502,000
Roadway and Pavement Appurtenances	$	-
Retaining Walls	$	-
Topsoil	$	55,000
Seeding	$	15,000
Sodding	$	-
Rip-Rap or Slope Protection	$	-
Fencing	$	-
Signing	$	3,000
Pavement Markings	$	15,000
Lighting	$	-
Signalization	$	-
Guardrail	$	47,000
Pay Item Quantity Adjustment (15%)[1]	$	241,500
Maintenance of Traffic	$	25,000
Mobilization (5%)	$	93,800
CONSTRUCTION COST (rounded)	$	1,970,300
Engineering and Contingency (10%)	$	197,000
TOTAL CONSTRUCTION COST (rounded)	$	2,167,300
Preliminary Engineering (10%)	$	216,700
PROJECT COST [2](rounded)	**$**	**2,384,000**

[1] ***For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.***

[2] ***For estimating future project costs, a compounded inflation rate of 10% should be applied from the date of this estimate.***

Route: Construction Cost Per Mile Estimate
County: Washington
Section: Rolling Terrain, State Route, New 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
Clear and Grubbing							
201-01	17	Acres	$ 2,500.00		$ 43,200	$ 43,000	Area inside prop. R.O.W.
Earthwork							
203-01	117333	CY	$ 3.75	$ 440,000			Excavation (Cut)
203-03	0	CY	$ 2.97	$ -			Borrow (Fill)
		Total			$ 440,000	$ 440,000	
Pavement Removal							
202-03.01	0	SY	$ 12.07	$ -	$ -	$ -	
Drainage							
607-09.30	1500	FT Pipe	$ 140.00	$ 210,000			48" pipe assummed 300 feet each, 5 crossings per mile
		Total			$ 210,000	$ 210,000	
Utilities							
		Lump Sum	N/A		$ 280,000	$ 280,000	See separate calculations
Paving							
	0	SF	$ 5.02	$ -			arterial street asphalt paving - see separate calcs
	0	SF	$ 3.82	$ -			local street asphalt paving - see separate calcs
	0	SF	$ 8.24	$ -			concrete ramp - see separate calcs
	105600	SF	$ 3.24	$ 342,348			arterial and ramp asphalt shoulder - see separate calcs
	0	SF	$ 1.95	$ -			local street shoulder - see separate calcs
	126720	SF	$ 1.26	$ 159,565			city street overlay - see separate calcs
406-04.02	0	SY	$ 30.80	$ -			High friction surface treatment
415-01.02	0	SY	$ 1.35	$ -			Cold planing (milling) asphalt pavement
		-15% Factor		$ -			Widening Reduction Factor (if widening, cost = 85% of total paving)
		Total			$ 501,913	$ 502,000	
Maintenance of Traffic							
	1	Each	$ 25,000.00		$ 25,000	$ 25,000	estimate $25,000 per mile
Topsoil							
203-07	5997	CY	$ 9.18		$ 55,053	$ 55,000	
Seeding							

County: Washington
Section: Rolling Terrain, State Route, New 2-Lane
Length: 1 Miles

Item	Quantity	Unit	2013 Unit Cost	Sub-Total	Total Cost	Rounded Cost	Description/Quantity Calculation
801-01	485760	SF	$ 25.01		$ 15,186	$ 15,000	sq. ft to be seeded/1000 x 1.25 = units. Unit price in units
Signing							
	1	Mile	$ 3,000.00	$ 3,000.00			$3000/mile
					$ 3,000	$ 3,000	
Pavement Marking							
716-12.01	4	L.M.	$ 2,836.70	$ 11,346.80			Edgelines & Centerlines, Enhanced Flatline Thermo (4")
716-02.05	200	LF	$ 9.74	$ 1,948.00			Stop Lines
716-01.21	66	Each	$ 24.66	$ 1,627.56			Snowplowable Markers (bi-direction 1 color)
					$ 14,922	$ 15,000	
Guardrail							
705-02.02	1000	LF	$ 15.78	$ 15,780			Guardrail (End Terminals Not Included in Price)
705-04.07	10	Each	$ 2,107.76	$ 21,078			Guardrail Terminal (Type 38)
705-04.09	10	Each	$ 1,037.25	$ 10,373			Type 38 Earth Pad
		Total			$ 47,230	$ 47,000	
Total:						**$ 1,635,000**	

Route Utility Cost Estimate Calculations

Option: State Route, New Shoulders
Route: n/a
County: Washington
Length: 1 Mile

Item	Quantity	Unit	Unit Cost	Total Cost	Description/Quantity Calculation
Gas Line - 4"-100 lb Pressure Line		FT	$ 50	$ -	
Gas Line - 6"-30 lb Pressure Line		FT	$ 35	$ -	
Water Line - 12"		FT	$ 66	$ -	
Water Line - 6"	5280	FT	$ 35	$ 185,000	
Sewer Line		FT	$ 22	$ -	Generally no sewer in rural areas
Telephone Line (Underground)		FT	$ 35	$ -	
Street Light	0	Each	$ 1,765	$ -	
Utility (Power) Pole	26	Each	$ 2,500	$ 66,000	1 pole every 200 feet
Cable TV Pole Attachment	26	Each	$ 1,000	$ 26,000	1 pole every 200 feet

Total: **$ 280,000**

Costs updated in 2007

Paving Cost by Cross Section
JHS

City Street Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	1.25	$ 0.63	Design Guidelines 4-411.00
307-01.08	Binder AC (PG64-22) GR "B-M2"	Ton	$ 77.20	2	$ 0.97	Design Guidelines 4-307.00
307-01.01	Black Base AC (PG64-22) GR "A"	Ton	$ 74.58	3	$ 1.43	Design Guidelines 4-307.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	8	$ 0.79	Design Guidelines 4-303.00
Total:				**14.25**	**$ 3.82**	

Arterial (Asphalt) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-02.10	Bituminous Surface	Tons	$ 87.02	1.25	$ 0.64	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-02.08	Bituminous Binder	Tons	$ 63.81	2.00	$ 0.80	Design Guidelines 4-307.00
307-02.01	Bituminious Base	Tons	$ 60.63	6.50	$ 2.52	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	10.00	$ 0.99	Design Guidleines 4-303.00
Total:				**19.75**	**$ 5.02**	

City Street Overlay (Assume Double Layer of Surface AC):

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.10	Surface AC (PG64-22) GR "D"	Ton	$ 85.53	2.5	$ 1.26	Design Guidelines 4-411.00
Total:				**2.5**	**$ 1.26**	

Ramp (Concrete) Mainline:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
501-01.03	Portland Cement Concrete PVMT (Plain	S.Y.	$ 53.62	10.00	$ 5.96	
313-03	Treated Permeable Base	S.Y.	$ 17.01	4.00	$ 1.89	
303-01	Mineral Aggregate Base	Tons	$ 15.82	4.00	$ 0.40	Design Guidleines 4-303.00
Total:				**18**	**$ 8.24**	

City Street Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Surface AC (PG64-22) GR "E"	Ton	$ 79.44	1.5	$ 0.68	Design Guidelines 4-411.00
303-01	Mineral Agg Base GRA "D"	Ton	$ 15.82	12.75	$ 1.26	Design Guidelines 4-303.00
Total:				**14.25**	**$ 1.95**	

Arterial and Ramp (Asphalt) Shoulder:

Item No.	Description	Units	2013 Unit Cost	Thickness (Inches)	Cost per S.F.	Based On
411-01.07	Bituminous Surface	Tons	$ 79.44	1.25	$ 0.57	Design Guidelines 4-411.00
403-01	Tack Coat	Tons	$ 535.08	0.00	$ 0.01	Design Guidelines 4-403.00
307-01.08	Bituminous Binder	Tons	$ 77.20	2.00	$ 0.97	Design Guidelines 4-307.00
402-01	Prime Coat	Tons	$ 365.52	0.00	$ 0.05	Design Guidelines 4-402.00
402-02		Tons	$ 24.91		$ 0.01	Design Guidelines 4-402.00
303-01	Mineral Aggregate Base	Tons	$ 15.82	16.50	$ 1.64	Design Guidleines 4-303.00
Total:				**19.75**	**$ 3.24**	

= referenced from previous input price

2.2 AUP RIGHT-OF-WAY COST CALCULATIONS

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	Old Gray Station/Center/Ruritan
Length:	1.38 Miles
Project ID:	1

Average Cost per Acre		**$ 30,000**
Land Cost		
Estimated Right-of-Way Acquistion (Acres)	6.8	
Estimated R.O.W. Cost	$ 205,000	
Estimated Family Displacement Property Cost	$ 2,275,000	
Unfactored Right-of-Way Land Costs	$ 2,480,000	
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)		$ 3,546,000
Incidentals		
Estimated Right-of-Way Tracts Affected	19	
Incidental Expenses per Tract	$ 2,835	
Incidental Expenses		$ 54,000
Relocation Payments		
Residence Relocations	13	
Estimated Cost per Relocation	$ 22,500	
Relocation Payments		$ 292,500
Total R.O.W. Costs		**$ 3,893,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	Old Gray Station Road
Length:	2 Miles
Project ID:	2

Average Cost per Acre			**$**	**30,000**
Land Cost				
Estimated Right-of-Way Acquistion (Acres)		9.9		
Estimated R.O.W. Cost	$	298,000		
Estimated Family Displacement Property Cost	$	700,000		
Unfactored Right-of-Way Land Costs	$	998,000		
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)			$	1,427,000
Incidentals				
Estimated Right-of-Way Tracts Affected		30		
Incidental Expenses per Tract	$	2,835		
Incidental Expenses			$	85,000
Relocation Payments				
Residence Relocations		4		
Estimated Cost per Relocation	$	22,500		
Relocation Payments			$	90,000
Total R.O.W. Costs			**$**	**1,602,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	Shadden Road/Highland Church Road
Length:	4.99 Miles
Project ID:	3

Average Cost per Acre		**$ 30,000**
Land Cost		
Estimated Right-of-Way Acquistion (Acres)	24.8	
Estimated R.O.W. Cost	$ 743,000	
Estimated Family Displacement Property Cost	$ 1,400,000	
Unfactored Right-of-Way Land Costs	$ 2,143,000	
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)		$ 3,064,000
Incidentals		
Estimated Right-of-Way Tracts Affected	37	
Incidental Expenses per Tract	$ 2,835	
Incidental Expenses		$ 105,000
Relocation Payments		
Residence Relocations	8	
Estimated Cost per Relocation	$ 22,500	
Relocation Payments		$ 180,000
Total R.O.W. Costs		**$ 3,349,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	Highland Church Road and Knob Creek Road
Length:	0.43 Miles
Project ID:	4

Average Cost per Acre			**$**	**30,000**
Land Cost				
Estimated Right-of-Way Acquistion (Acres)		2.1		
Estimated R.O.W. Cost	$	64,000		
Estimated Family Displacement Property Cost	$	-		
Unfactored Right-of-Way Land Costs	$	64,000		
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)			$	92,000
Incidentals				
Estimated Right-of-Way Tracts Affected		1		
Incidental Expenses per Tract	$	2,835		
Incidental Expenses			$	3,000
Relocation Payments				
Residence Relocations		0		
Estimated Cost per Relocation	$	22,500		
Relocation Payments			$	-
Total R.O.W. Costs			**$**	**95,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	New Road from Roy Martin to Cedar Creek
Length:	0.74 Miles
Project ID:	5

Average Cost per Acre			**$**	**30,000**
Land Cost				
Estimated Right-of-Way Acquistion (Acres)		3.7		
Estimated R.O.W. Cost	$	110,000		
Estimated Family Displacement Property Cost	$	-		
Unfactored Right-of-Way Land Costs	$	110,000		
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)			$	157,000
Incidentals				
Estimated Right-of-Way Tracts Affected		2		
Incidental Expenses per Tract	$	2,835		
Incidental Expenses			$	6,000
Relocation Payments				
Residence Relocations		0		
Estimated Cost per Relocation	$	22,500		
Relocation Payments			$	-
Total R.O.W. Costs			**$**	**163,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	SR 75
Length:	4.95 Miles
Project ID:	6

Average Cost per Acre		**$ 30,000**
Land Cost		
Estimated Right-of-Way Acquistion (Acres)	86.0	
Estimated R.O.W. Cost	$ 2,579,000	
Estimated Family Displacement Property Cost	$ 1,750,000	
Unfactored Right-of-Way Land Costs	$ 4,329,000	
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)		$ 6,190,000
Incidentals		
Estimated Right-of-Way Tracts Affected	74	
Incidental Expenses per Tract	$ 2,835	
Incidental Expenses		$ 210,000
Relocation Payments		
Residence Relocations	10	
Estimated Cost per Relocation	$ 22,500	
Relocation Payments		$ 225,000
Total R.O.W. Costs		**$ 6,625,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	SR 75
Length:	0.62 Miles
Project ID:	7

Average Cost per Acre			**$**	**30,000**
Land Cost				
Estimated Right-of-Way Acquistion (Acres)		10.8		
Estimated R.O.W. Cost	$	323,000		
Estimated Family Displacement Property Cost	$	-		
Unfactored Right-of-Way Land Costs	$	323,000		
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)			$	462,000
Incidentals				
Estimated Right-of-Way Tracts Affected		4		
Incidental Expenses per Tract	$	2,835		
Incidental Expenses			$	11,000
Relocation Payments				
Residence Relocations		0		
Estimated Cost per Relocation	$	22,500		
Relocation Payments			$	-
Total R.O.W. Costs			**$**	**473,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	SR 81
Length:	11.2 Miles
Project ID:	8

Average Cost per Acre		**$ 30,000**
Land Cost		
Estimated Right-of-Way Acquistion (Acres)	194.5	
Estimated R.O.W. Cost	$ 5,836,000	
Estimated Family Displacement Property Cost	$ 2,800,000	
Unfactored Right-of-Way Land Costs	$ 8,636,000	
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)		$ 12,349,000
Incidentals		
Estimated Right-of-Way Tracts Affected	108	
Incidental Expenses per Tract	$ 2,835	
Incidental Expenses		$ 306,000
Relocation Payments		
Residence Relocations	16	
Estimated Cost per Relocation	$ 22,500	
Relocation Payments		$ 360,000
Total R.O.W. Costs		**$ 13,015,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	SR 81
Length:	4.32 Miles
Project ID:	9

Average Cost per Acre		**$ 30,000**
Land Cost		
Estimated Right-of-Way Acquistion (Acres)	75.0	
Estimated R.O.W. Cost	$ 2,251,000	
Estimated Family Displacement Property Cost	$ 1,925,000	
Unfactored Right-of-Way Land Costs	$ 4,176,000	
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)		$ 5,972,000
Incidentals		
Estimated Right-of-Way Tracts Affected	71	
Incidental Expenses per Tract	$ 2,835	
Incidental Expenses		$ 201,000
Relocation Payments		
Residence Relocations	11	
Estimated Cost per Relocation	$ 22,500	
Relocation Payments		$ 247,500
Total R.O.W. Costs		**$ 6,421,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	SR 81
Length:	1.49 Miles
Project ID:	10

Average Cost per Acre			**$**	**30,000**
Land Cost				
Estimated Right-of-Way Acquistion (Acres)		25.9		
Estimated R.O.W. Cost	$	776,000		
Estimated Family Displacement Property Cost	$	-		
Unfactored Right-of-Way Land Costs	$	776,000		
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)			$	1,110,000
Incidentals				
Estimated Right-of-Way Tracts Affected		16		
Incidental Expenses per Tract	$	2,835		
Incidental Expenses			$	45,000
Relocation Payments				
Residence Relocations		0		
Estimated Cost per Relocation	$	22,500		
Relocation Payments			$	-
Total R.O.W. Costs			**$**	**1,155,000**

Route R.O.W. Cost Estimate Calculations

Estimated Right-of-Way Costs

Route:	SR 107
Length:	5.98 Miles
Project ID:	11

Average Cost per Acre		**$ 30,000**
Land Cost		
Estimated Right-of-Way Acquistion (Acres)	103.9	
Estimated R.O.W. Cost	$ 3,116,000	
Estimated Family Displacement Property Cost	$ -	
Unfactored Right-of-Way Land Costs	$ 3,116,000	
Right-of-Way Cost (including contingencies =1.43 x unfactored cost)		$ 4,456,000
Incidentals		
Estimated Right-of-Way Tracts Affected	88	
Incidental Expenses per Tract	$ 2,835	
Incidental Expenses		$ 249,000
Relocation Payments		
Residence Relocations	0	
Estimated Cost per Relocation	$ 22,500	
Relocation Payments		$ -
Total R.O.W. Costs		**$ 4,705,000**