

2015

Town of Elkton 2040 Area Study



DRAFT SUBMISSION – December 2015
Virginia Department of Transportation
Staunton District Planning

Disclaimer

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Virginia Department of Transportation
Staunton District Planning
811 Commerce Road
Staunton, VA 24401
(540)332-9067

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1.0 INTRODUCTION

The *Town of Elkton 2040 Area Study* provides a plan for the development and maintenance of a multimodal transportation system within the downtown area of Elkton, Virginia that supports existing and projected travel demands to the year 2040. This report provides details on the identification of existing transportation needs, forecasting and identification of future travel demands, and transportation improvement recommendations for the study area. Recommendations were developed to address current needs and future year 2040 needs.

1.1 Study Purpose and Need

The Town of Elkton is located in Rockingham County and had a population of 2,762 in the 2010 US Census. Located at the crossroads of US Primaries 33 and 340, the Town assumes an important role in both the local and regional transportation network. Given the Town's proximity to regional job centers with Merck & Co. and Miller Coors facilities located just south of Town and the growing development areas to the east of Harrisonburg, the Town of Elkton has the potential to experience moderate future population growth. The Town's location along the Shenandoah River and between Shenandoah National Park and Massanutten Resort, as well as the historical significance of the Town may also add to future growth from a tourism and recreational standpoint. The primary goal of this study is to evaluate the existing transportation network of the Town from a multimodal perspective in an existing and future year 2040 scenario, determine the future needs of the network and then develop recommendations to address those needs.

In particular, this study serves the following purposes:

- Evaluate the transportation system within the defined study limits;
- Determine major issues, challenges, and needs associated with the transportation infrastructure within the study area;
- Develop strategies and recommend improvements addressing current and future transportation demands;
- Identify needs for all modes of transportation based upon capacity, safety and functional requirements including the effectiveness and efficiency of the overall transportation system;

- Recommend transportation improvement projects that will be prioritized and phased over time, relative to available funding.

The study will provide the Town of Elkton and the Virginia Department of Transportation (VDOT) with a tool to help identify needs and transportation recommendations as the Town continues to develop and grow in the future.

1.2 Study Limits

Through discussions with Town and CSPDC representatives, it was determined that the *Town of Elkton 2040 Area Study* would focus on the downtown area of town generally bordered by the triangle created from Stuart Avenue (US 340), Old Spotswood Trail (US 33 Business), and Spotswood Avenue. Rockingham Street runs parallel to Spotswood Avenue and is also included in the study area.

The area study includes the following five intersections, which were evaluated as part of the study analysis:

1. Stuart Avenue & Old Spotswood Trail & Blue and Gold Drive (signalized)
2. Stuart Avenue & Rockingham Street (two-way stop controlled)
3. Stuart Avenue & Spotswood Avenue (signalized)
4. Spotswood Avenue & Old Spotswood Trail (one-way stop controlled)
5. Spotswood Avenue & Rockingham Street (one-way stop controlled)

Figure 1 provides a detailed map of the study area and analyzed intersections.

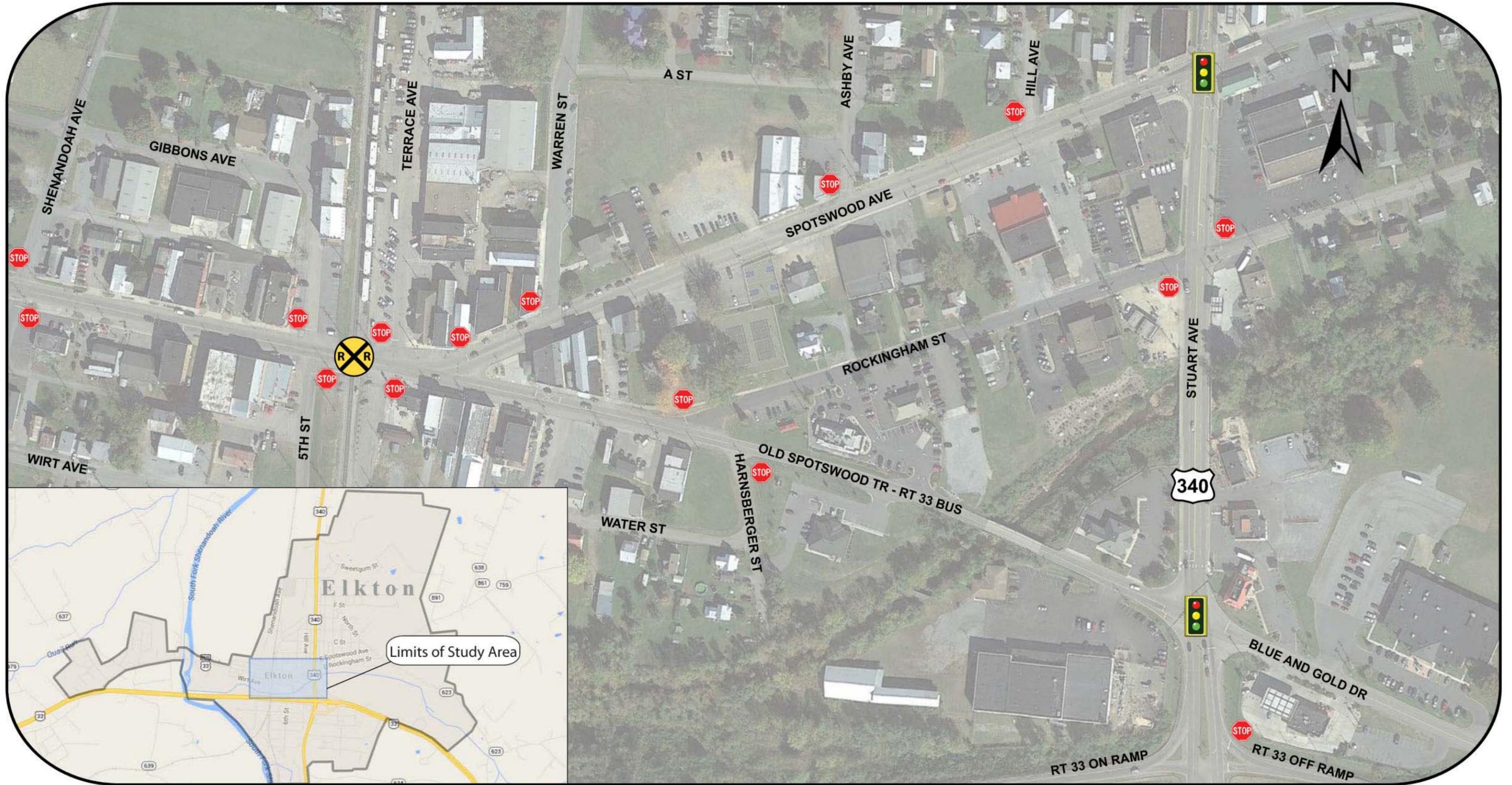


FIGURE 1
STUDY AREA

**TOWN OF ELKTON
2040 AREA STUDY**

1.3 Study Approach

This area study was developed as part of a structured approach with four basic components:

- Data collection
- Coordination with Town and CSPDC representatives and public involvement
- Analysis of existing study year conditions, forecasting of future traffic demands and development of a series of transportation scenario models
- Development of recommendations to address existing and future transportation needs

Data Collection

Necessary data to conduct a complete evaluation and analysis of the study scope was determined and collected at the onset of this study. The data collected included updates to traffic counts, determination of factored growth rates, review and updates to the roadway inventory and conditions, a review of accident data, the review of existing land uses and anticipated changes within the study area, assessment of environment issues, and previous transportation planning documents.

Coordination with Local Representatives and Public Involvement

Through a series of meetings with Town and CSPDC representatives, existing and future transportation needs were identified and reviewed, and recommendations for transportation improvements were developed. A Public Participation Meeting has been scheduled in January 2016 to present the draft recommendations of the study and provide an opportunity for public comments.

Forecasting of Future Traffic Demands

Based on historic trends and land use plans, traffic volumes were forecasted for the study horizon year of 2040. Any expected changes in demand for other modes of transportation were developed as appropriate.

Development of Transportation Recommendations

Based on an assessment of current and projected travel needs and safety, recommendations for improvements to the Town of Elkton study area were developed. Improvements to address system connectivity, other modes of travel, and accommodation of movement were developed based on observed deficiencies and needs identified as part of the data collection and analysis process.

2.0 EXISTING CONDITIONS

2.1 Existing Roadway Geometry

The study limits for the *Town of Elkton 2040 Area Study* consist of Stuart Avenue (US 340), Old Spotswood Trail (US 33 Bus.), Spotswood Avenue, and Rockingham Street. A description of roadway characteristics follows:

Stuart Avenue (US 340) is classified as a Minor Arterial and serves as an important north / south corridor through the Shenandoah Valley, ultimately connecting I-66 to I-81. Within the study limits, Stuart Avenue is a 4-lane, undivided, curb and gutter facility with sidewalks on both sides. Right-of-way averages approximately 60 feet in width.



Stuart Ave. looking north

Old Spotswood Trail (US 33 Business) is classified as a Major Collector and provides local east / west access in the Town's transportation network. Within the study limits, Old Spotswood Trail is a 2-lane facility with sections containing curb and gutter and sidewalk. East of Rockingham Street, the roadway is ditch section without sidewalk. Right-of-way averages approximately 40-60 feet in width.



Old Spotswood Tr. looking east

Spotswood Avenue is classified as a Major Collector and provides local east / west access, connecting Stuart Avenue and Old Spotswood Trail. Within the study limits, Spotswood Avenue is a 2-lane facility with curb and gutter and sidewalks. Right-of-way averages approximately 60 feet in width.



Spotswood Ave. looking northeast

Rockingham Street is a 2-lane local road. It serves as a parallel facility to Spotswood Avenue, connecting Stuart Avenue to Old Spotswood Trail. The road contains curb and gutter and sidewalks. Right-of-way averages approximately 40 feet in width.



Rockingham St. looking west

As part of this study, five existing intersections were analyzed for capacity and safety deficiencies. The location of the existing intersections and their lane configuration are shown with the analysis presented later in this chapter.

2.2 Existing Traffic Volumes and Operating Conditions

Vehicular turning movement counts were completed in March and April 2014 for the intersections of Old Spotswood Trail / Blue and Gold Drive and Stuart Avenue and Old Spotswood Trail and Spotswood Avenue. Utilizing previous turning movement counts from 2002 and 2005 for the Stuart Avenue and Spotswood Avenue, comparative 2014 counts were also developed for that intersection. Figure 2 identifies morning and afternoon peak hour volumes for each movement at the five study intersections and average daily traffic counts for each road segment between the intersections (per VDOT 2013 counts). The peak hour volumes were loaded into traffic modeling software (Synchro v.8) and analyzed to determine the Level of Service for each intersection movement. For interrupted flow (signal or stop sign controlled intersections), Level of Service is a direct measurement of vehicular delay. The following tables provides Level of Service criteria for signalized intersections and unsignalized intersections:

Table 1 – Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (sec/veh)	General Description of Traffic Conditions
A	≤ 10	Free Flow
B	> 10 – 20	Stable Flow (slight delays)
C	> 20 – 35	Stable Flow (acceptable delays)
D	> 35 – 55	Approaching Unstable Flow (tolerable delay, occasionally waiting through more than one signal cycle before proceeding)
E	> 55 – 80	Unstable Flow (intolerable delay)
F	> 80	Forced Flow (jammed)

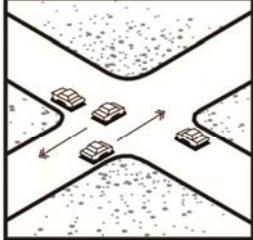
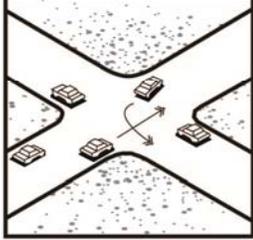
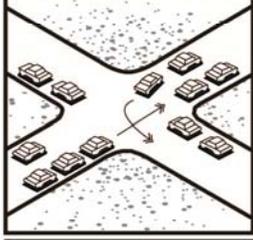
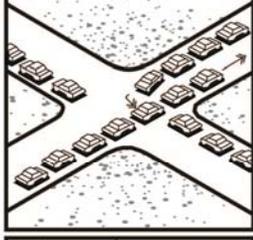
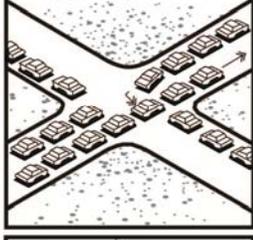
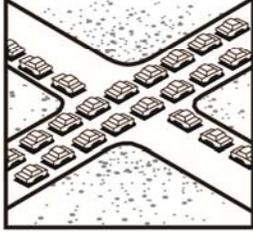
Table 2 – Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

The resulting Level of Service for each approach within the study intersections is also identified on Figure 2. All intersection approaches operate at an acceptable Level of Service C or better during the existing year peak hours. For rural settings, average intersection Level of Service C or better is viewed as operationally acceptable.

Analysis results for each intersection in the study area can be found in Appendix A.

Table 3 - Level of Service Descriptions

LEVEL OF SERVICE	Level of Service(LOS)	What it looks like	What it means	
			Along Roadway Segments	At Intersections
	A		Free flow, low traffic density.	No vehicle waits thru more than one signal indication.
	B		Delay isn't unreasonable, stable traffic flow.	On rare occasions motorists wait thru more than one signal indication.
	C		Stable condition, movements somewhat restricted due to higher volumes, but not objectionable for motorists.	Intermittently drivers wait thru more than one signal indication, and occasionally backups may develop behind left turning vehicles, traffic flow still stable and acceptable.
	D		Movements more restricted, queues and delays may occur during short peaks, but lower demands occur often enough to permit clearing, thus preventing excessive backups.	Delays at intersections may become extensive with some, especially left-turning vehicles waiting two or more signal indications, but enough cycles with lower demand occur to permit periodic clearance, thus preventing excessive backups.
	E		Actual capacity of the roadway involves delay to all motorists due to congestion.	Very long queues may create lengthy delays, especially for left turning vehicles.
	F		Forced flow with demand volumes greater than capacity resulting in complete congestion. Volumes drop to zero in extreme cases.	Backups from locations downstream restrict or prevent movement of vehicles out of approach creating a storage area during part or all of an hour.



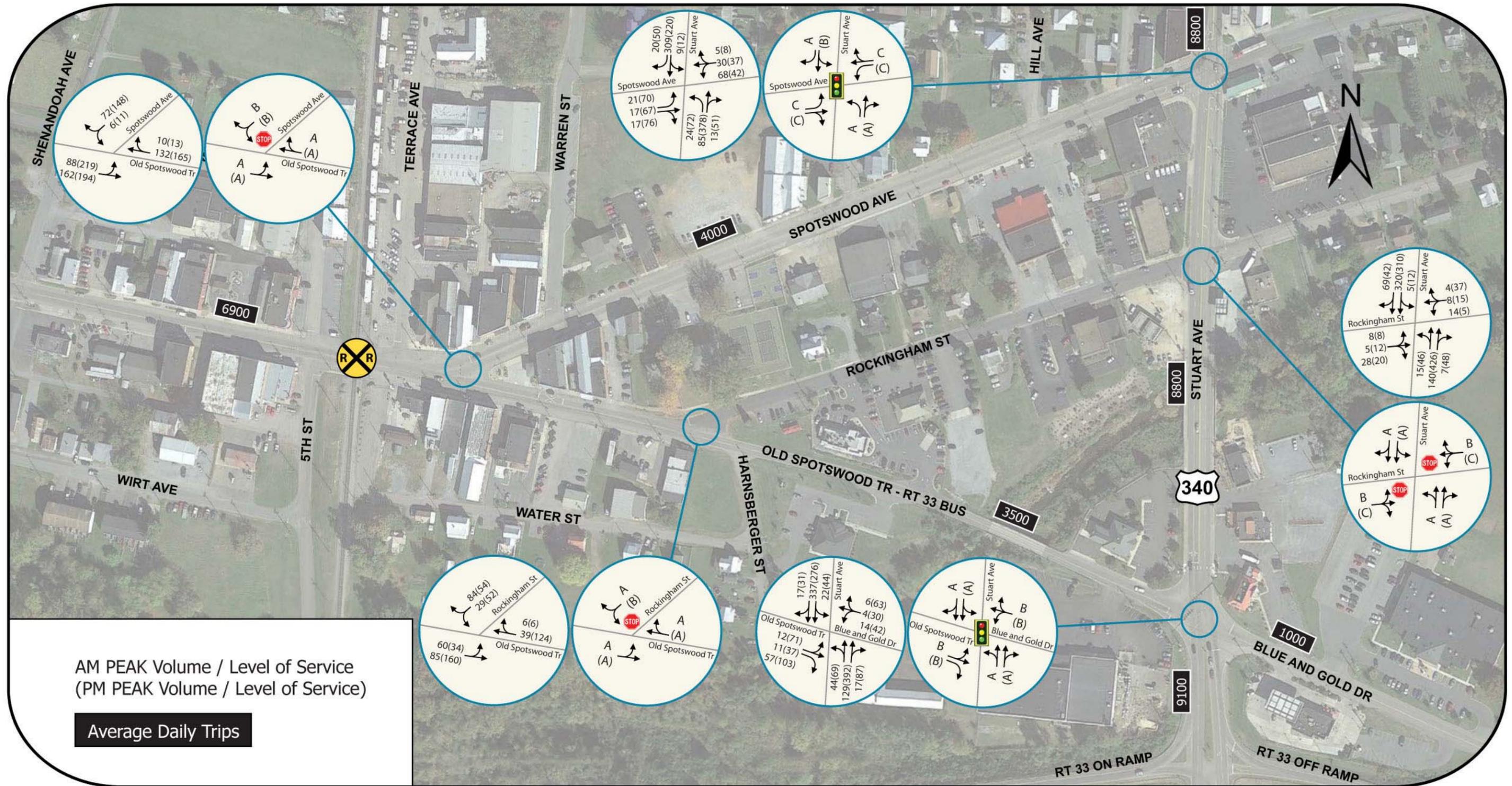


FIGURE 2
EXISTING (2014) TRAFFIC
VOLUMES & LEVEL OF SERVICE



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2040 AREA STUDY

2.3 Roadway Safety

In addition to congestion and convenience of travel, safety is another critical element used to determine the quality of a transportation system. Motor vehicle crash information provides a measure of the safety of the street and highway system. Recent motor vehicle crash data (2011 - 2013) for the study area was obtained from VDOT Staunton District Traffic Engineering Division. Roadway safety was assessed based on a review of records for all traffic crashes. The frequency of crashes at various locations along the transportation network within the study limits was assessed, as well as potential causes for these crashes.

The analysis for this study included the identification of locations with potential safety concerns. This effort was performed at a planning-level with the purpose of determining possible transportation improvements to mitigate the safety concerns. The planning-level analysis does not replace detailed traffic engineering safety studies that may be required in the future at particular locations.

As illustrated in Figure 3, over a three year period, there were 34 crashes within the study limits. Fixed object, off-road collisions and collisions with deer were not included in the totals shown on the figure. Of the 34 crashes identified, 9 were injury crashes and 1 was a pedestrian injury crash (located at the intersection of Stuart Avenue and Spotswood Avenue). The intersection experiencing the highest number of crashes at 9 was Stuart Avenue and Spotswood Avenue. As the number of crashes at an intersection can be linked to the traffic volumes entering the intersection, crash rates were determined to assess the relative safety of each intersection. The Institute of Transportation Engineers (ITE) recommends that improvements be evaluated for intersections with a crash rate of over 2 crashes per million entering vehicles (MEV). In reviewing the crash totals, all of the intersections within the study limits have crash rates of less than 1.00 per MEV. As related to the traffic volumes within the study area, the lower crash volumes and severity identify a relatively safe transportation network from a vehicular operations standpoint. The identification of the pedestrian injury crash warrants the review and possible recommendations for upgrades to the pedestrian facilities within the study limits.

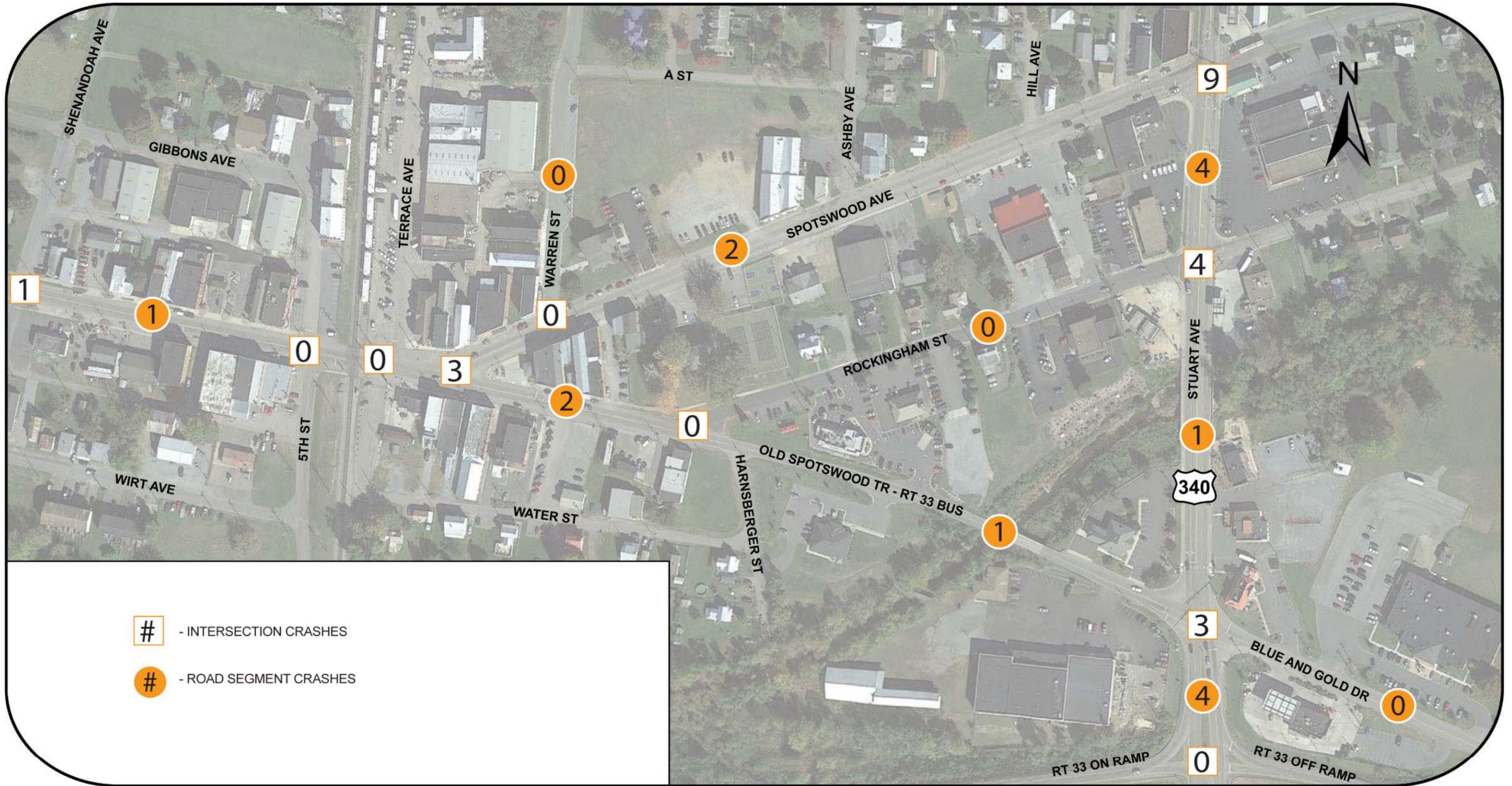


FIGURE 3
CRASH LOCATIONS
(2011 - 2013)

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2040 AREA STUDY

2.4 Existing Multimodal and Parking Facilities

This section discusses existing multimodal facilities within the Town of Elkton study limits. Currently, the dominant mode of transportation within the study area is by personal vehicle. Other modes include sidewalks, pedestrian street crossings and an existing bicycle lane located just outside of the study limits. The Town is not served by fixed route transit. The following sections discuss the existing location and condition of the study area's multimodal facilities and downtown parking facilities.

Pedestrian

At present, the study area contains an extensive sidewalk network. There are existing sidewalks on both sides of Stuart Avenue and Spotswood Avenue within the study limits. However, there are segments where the sidewalk network could be improved by reducing the width and / or number of commercial entrances to extend sidewalks and repair section of existing sidewalk in inadequate condition. Rockingham Street general contains sidewalks on both side of the street as well, except for a missing segment on the south side of the street from the entrance of the existing McDonalds restaurant to the intersection with Old Spotswood Trail. Old Spotswood Trail contains sidewalks on both sides of the street along the western end of the study area. However, as the road leave the main downtown area, the sidewalks end at the intersection with Rockingham Street. The absence of sidewalks between Rockingham Street and Stuart Avenue was identified as a primary need in the study to improve pedestrian connectivity and safety from the Stuart Avenue corridor to the downtown area of Town. Improved pedestrian road crossing were also identified as a primary needs. Figure 4 identifies the location of existing sidewalks and crosswalks in the study area. Future pedestrian recommendations are discussed in Chapter 4.0.

Bicycle

While there are no bicycle facilities in the immediate study limits, a wide shoulder, marked bicycle lane was recently installed along the north side of Blue and Gold Drive between the eastern most parking lot entrance of the Elkton Community Center and Elkton Middle School (a distance of approximately 0.5 mile). As a result of the lack of formal bicycle accommodations, only more experienced users who are comfortable riding with motor vehicle traffic would likely cycle within the study area.

The study area will require retrofit to accommodate bicycle uses. However, bicycling has the potential to be very beneficial in this established area where a substantial development mix of offices, stores, public facilities and residences exist. The Central

Shenandoah Valley Bicycle Plan (2005) includes future recommended bikeway / wide shoulders on US 33 to the south of the study area, but does not contain recommendations within the study limits. Figure 4 also identifies potential pedestrian and /or cyclist destinations within and in proximity to the study area. Future bicycle recommendations are discussed in Chapter 4.0.

Existing Parking Facilities

Figure 5 identifies all existing on-street and off-street public parking spaces available within the study area.

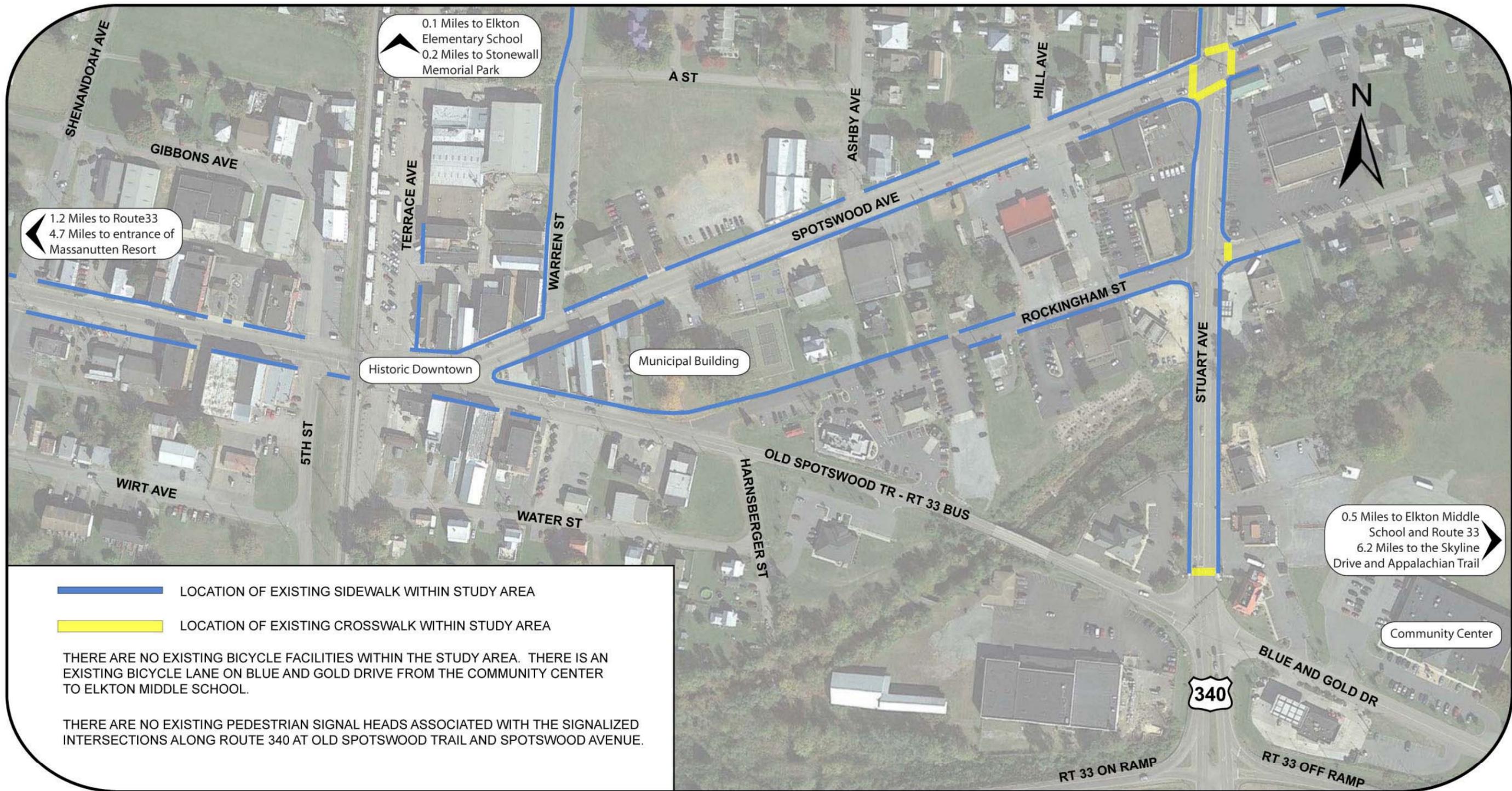


FIGURE 4
EXISTING MULTIMODAL FACILITIES
AND PEDESTRIAN /
BICYCLE DESTINATIONS



TOWN OF ELKTON
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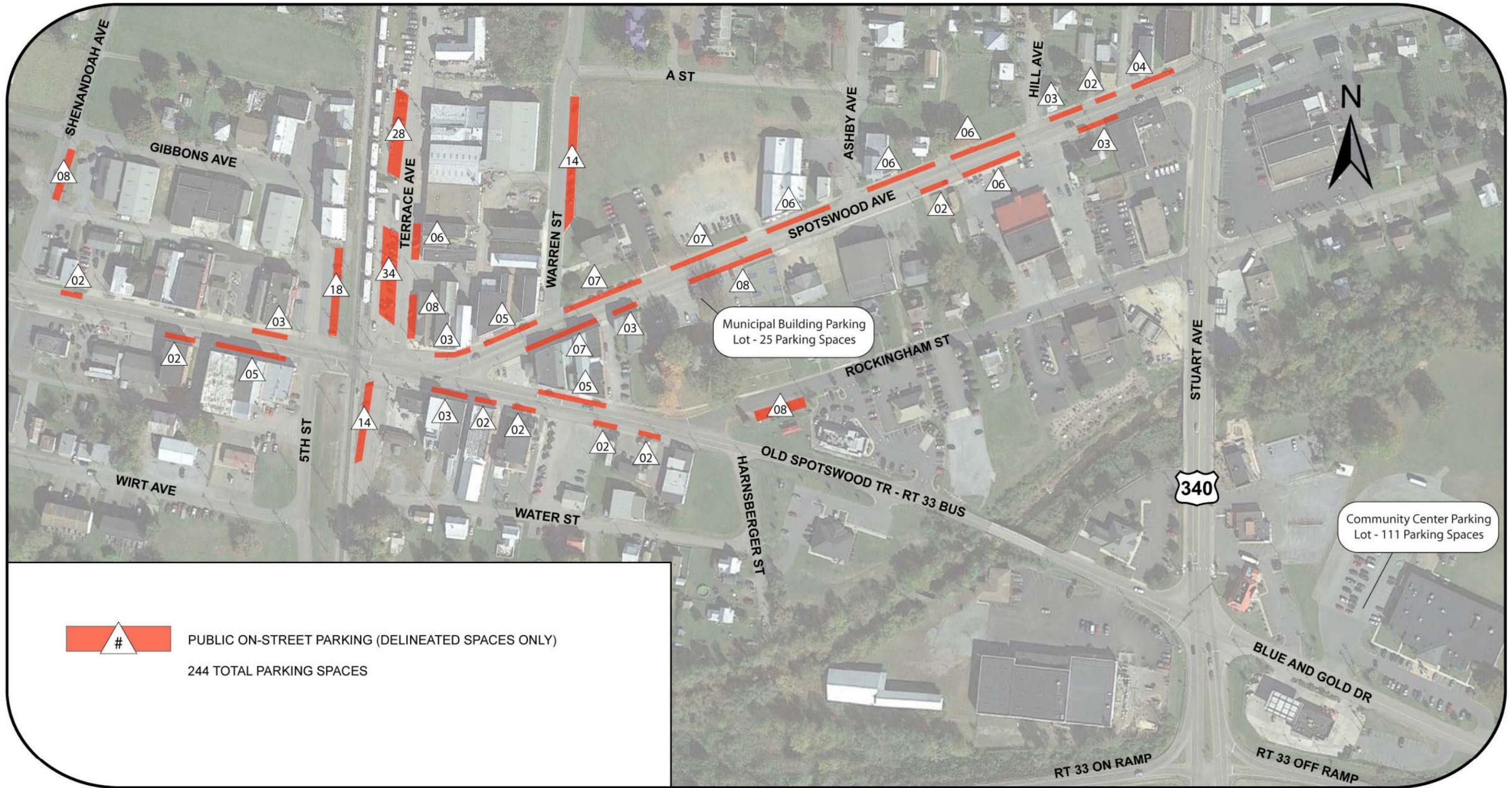


FIGURE 5
EXISTING ON-STREET
PARKING FACILITIES

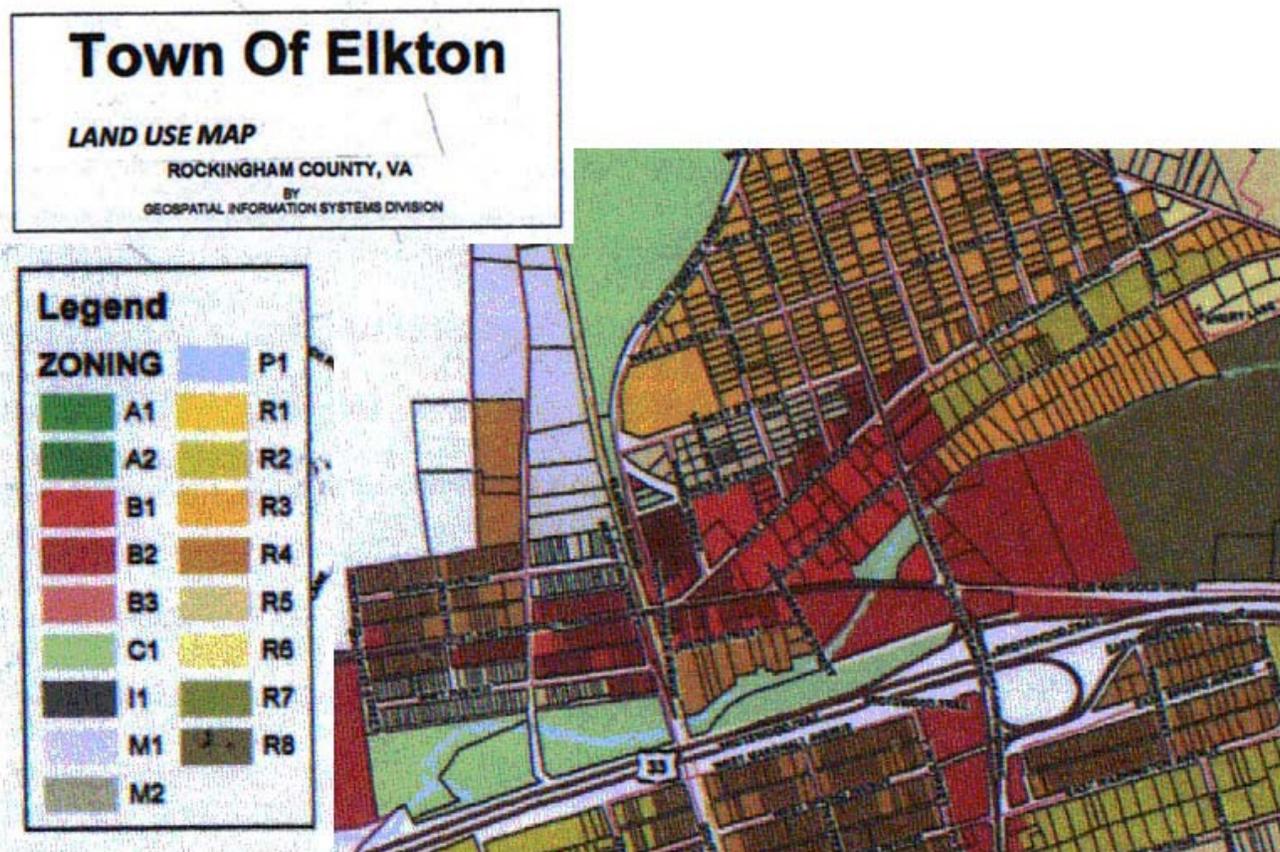
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2.5 Existing Land Use

Land use patterns are important to transportation systems as they largely affect a community's economy and environment, and in turn affect travel tendencies. Land use and transportation systems should be designed to be compatible and mutually supportive in order to support economic growth and enhance quality of life.

A site inspection was performed on January 28, 2015 to determine the existing commercial uses within the study area. Figure 6 identifies all commercial building uses within the study area. Currently vacant spaces are identified and the established use of the vacant space is also noted if it could be determined upon site inspection.

A portion of the Town Zoning Map covering the study area is provided below. The study area is primarily zoned / planned for commercial / general business per the Town of Elkton 2013 Comprehensive Plan.



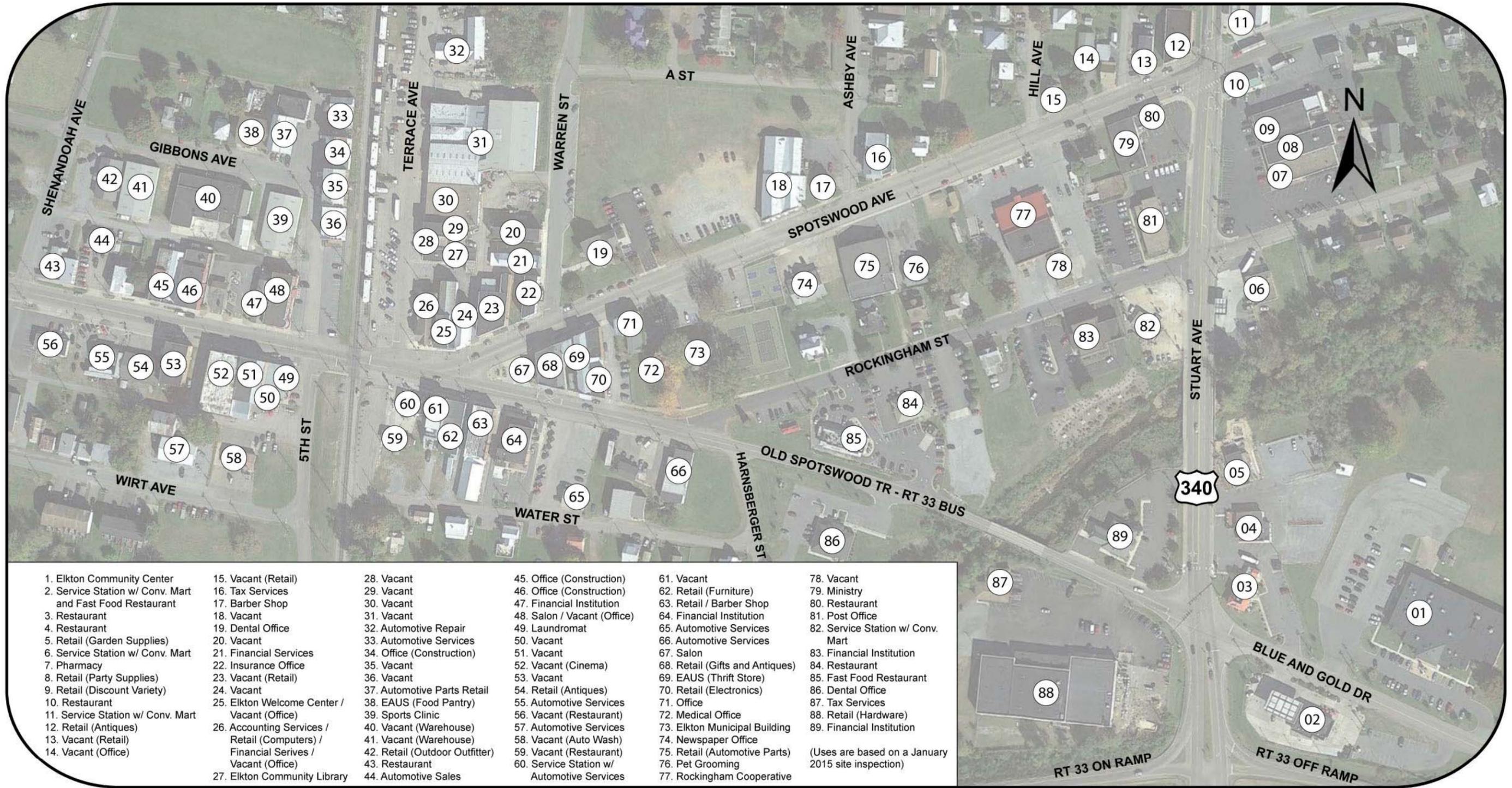


FIGURE 6
EXISTING COMMERCIAL USES

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2040 AREA STUDY

2.6 Existing Environmental Conditions

This section discusses existing environmental conditions within the limits of the *Town of Elkton 2040 Area Study*. As the majority of the study area is developed, environmental constraints should be minimal in the implementation of transportation improvements. Geographic Information Systems (GIS) mapping at local, state and federal levels was reviewed to determine potential environmental constraints within the study limits. Elk Run, a tributary of the South Fork of the Shenandoah River flows southwest through the study area with a town park located along the stream. Elk Run contains a mapped floodplain. As a result, any future improvements within the floodplain would have to follow Federal regulations to identify that there are no impacts to the floodplain that may result in downstream flooding. Hydrological and National Wetland Inventory mapping did not identify any existing wetlands within the study area. Many of the previously developed properties along the corridor consist of or at one time operated as vehicle fueling stations. Department of Environmental Quality and Environmental Protection Agency mapping indicates numerous petroleum release sites along the corridor. If future transportation improvements along the corridor require additional right-of-way, there may be a need to conduct a Phase I Environmental Site Assessment to determine potential soil contamination or pollution sources such as underground tanks. Any findings may lead to Phase II efforts, including mitigation. Furthermore, given the developed nature of the study area, historical or archeological constraints should not be present. Additional environmental work will be required as needed with the project development of any recommendations included in this study.

3.0 PUBLIC INVOLVEMENT

The development of the *Town of Elkton 2040 Area Study* included multiple coordination meetings with representatives from the Town, CSPDC, and VDOT District Planning. With the draft completion of the study and future year transportation recommendations, a Public Involvement Meeting has been scheduled in January 2016 to present the findings and recommendation of the report for public review and comment.

It is important to gather public input in order to properly plan for the future of the study corridor and better serve the needs of the locality. Public input will be assessed to identify potential additional deficiencies not captured in the scope of the study, as well as determine if adjustments to the recommendations are necessary from the user's perspective. This information will assist in the development of the future improvement recommendation options and will be an integral part in the study process.

3.1 Coordination Meetings

On October 14, 2014, VDOT staff met with Town and CSPDC representatives to conduct a study kickoff meeting. The study scope, objectives and goals were discussed. The study methodology and process to be utilized, including the selection of the study area limits and focus on multimodal / accessibility improvements, was explained to the Town. During the meeting, a consensus was reached on the study area limits, scope and a tentative schedule.

On March 13, 2015, a second coordination meeting was held to discuss the findings of the existing conditions inventory, existing year analysis, and the identification of transportation needs within the study limits. VDOT presented a recommended growth rate for future year analysis based on a potential future land use / development scenario, which was agreed to by Town representatives.

A third coordination meeting was held on July 16, 2015, at which the future year recommendation options and analysis was presented and discussed with the Town and CSPDC. Comments from the meeting were incorporated into the study and the recommendations were revised as necessary.

3.2 Public Involvement Meeting

With a draft of the study now complete, a Public Involvement Meeting is scheduled for January 11, 2016.

4.0 PROJECTED FUTURE CONDITIONS and RECOMMENDATIONS

4.1 Traffic Forecast Methodology

In order to conduct future year analysis and obtain reliable results to assist in the development of transportation recommendations, an appropriate annual growth rate and 2040 traffic forecasts will be required that accurately reflect to the best of our abilities, the anticipated economic growth and development of the town over the next 25 years.

In reviewing the Town of Elkton 2013 Comprehensive Plan, the Land Use chapter states that the town has a desired growth rate / projection of 3% annually through 2026. Based on the 2010 population of the town of 2,726, this growth rate would more than double the town's population for a 2040 population of 6,617. While this may seem to be an aggressive growth rate, the Comprehensive Plan indicates that this desired rate also takes into account future annexation plans from the surrounding county. For the purposes of transportation planning, population growth due to annexation does not represent physical growth or development and should not be considered in traffic forecasts.

In comparing historical VDOT traffic counts for the previous 10-year period and VDOT traffic forecasts in the Statewide Planning Software, the three roadways that define the study area generally possess a 0.5% annual linear growth rate.

In order to validate a more conservative or aggressive growth rate, a future 2040 development scenario was developed for the Town of Elkton based on vacant residential lot and non-residential use information from the 2013 Comprehensive Plan, as well as findings of commercial vacancy in the downtown area from site visits / visual survey. Based on the 2013 Comprehensive Plan, the Town of Elkton currently has 1,156 lots containing a residential dwelling and 1,635 vacant, residential zoned lots ready for construction. Of these 1,635 vacant lots, 1,314 exist in several zoned master plan communities located throughout town that have not yet been constructed. The R8 zoning or Planned Unit Development makes up the largest percentage of residential zoning within the town limits. For the purpose of the future development scenario, 20% of the overall vacant residential lots (25% of the Planned Unit Development lots) will be considered constructed and occupied by 2040. The scenario will assume a 50 / 50 split of single family detached (164 dwelling units) and attached (164 dwelling units) homes.

Future Conditions and Recommendations

The future development scenario will also consider the following commercial development to be concentrated in the study area by 2040:

- 20,000 square feet of specialty retail
- 50,000 square feet of general light industrial / warehousing
- 10,000 square feet of general office
- 10,000 square feet of medical office
- 5,000 square feet of fast-food restaurant with drive-thru
- 5,000 square feet of sit-down restaurant

These land uses and development intensities were assigned vehicle trip generation rates based on the ITE (Institute of Transportation Engineers) Trip Generation Manual to produce proposed average daily trips, as well as peak hour trips. Total vehicle trip generation from the future 2040 scenario development consists of the following totals:

Average Daily Trips:	7,337	(2,514 residential trips / 4,823 commercial trips)
AM Peak Hour Trips:	458	(202 residential trips / 256 commercial trips)
PM Peak Hour Trips:	517	(254 residential trips / 263 commercial trips)

The future scenario trips were then assigned trip destination splits within the study area. For the residential trips, it was assumed that 70% would utilize Stuart Avenue, accessing Route 33 and a combined 30% would utilize Old Spotswood Trail and Spotswood Avenue to access the downtown area during the peak hours. For the commercial trips, it was assumed that 100% would access the downtown area during the peak hours, with 55% originating from Stuart Avenue to the south (Route 33), 20% originating from Stuart Avenue to the north, and 25% originating from Old Spotswood Trail from the west of downtown. With these assigned splits, the 2040 future development scenario possesses an average vehicular growth rate of 1.4% in the AM peak hour and 1.0% in the PM peak hour. While also considering the historic VDOT traffic counts average growth rate of 0.5% for roadways within the study area, VDOT District Planning proposes an average 1.0% growth rate for the study area in the development of the future year analysis scenarios. In discussions with Town and CSPDC representatives, it was believed that the proposed 1.0% growth rate was adequate, but conservative. It was agreed that the study would utilize the 1.0% annual growth rate, but recommendations developed through the study would also be verified in the accommodation of a more aggressive 2.0% annual growth rate.

4.2 Future Baseline Scenario

Prior to the development of the transportation improvement recommendations, the existing transportation network was analyzed with the projected 2040 traffic volumes by applying the 1.0% annual growth rate. This “No Build” scenario is analyzed in order to identify potential future transportation issues as a result of anticipated traffic growth under the assumption of no improvements to the transportation network. Figure 7 identifies future year 2040 morning and afternoon peak hour volumes for each movement at the intersections and average daily traffic counts for each road segment between the intersections within the study area. The peak hour volumes were loaded into traffic modeling software (Synchro v.8) and analyzed to determine the Level of Service for each intersection movement.

The resulting Level of Service for each approach for the intersections within the study area is also identified on Figure 7. All study intersection approaches and movements operate at an acceptable Level of Service C or better during the 2040 No Build year peak hours. For rural settings, average intersection Level of Service C or better is viewed as operationally acceptable.

As a result of the acceptable Levels of Service in the future 2040 no build condition within the existing transportation network and the identification of multimodal needs during the analysis of existing conditions, it was discussed and agreed between VDOT, the Town, and the CSPDC that the *Town of Elkton 2040 Area Study* would focus on potential pedestrian and bicycle facility improvement recommendations, particularly an improved connection between the downtown area and the Elkton Community Center along Old Spotswood Trail (Route 33 Business) and the development of “complete” streets. At the request of Town representatives, the area study would also include a parking study to look at existing public parking and identify potential improvements to increase parking capacity and efficiency.

Analysis results for each intersection in the study area can be found in Appendix A.

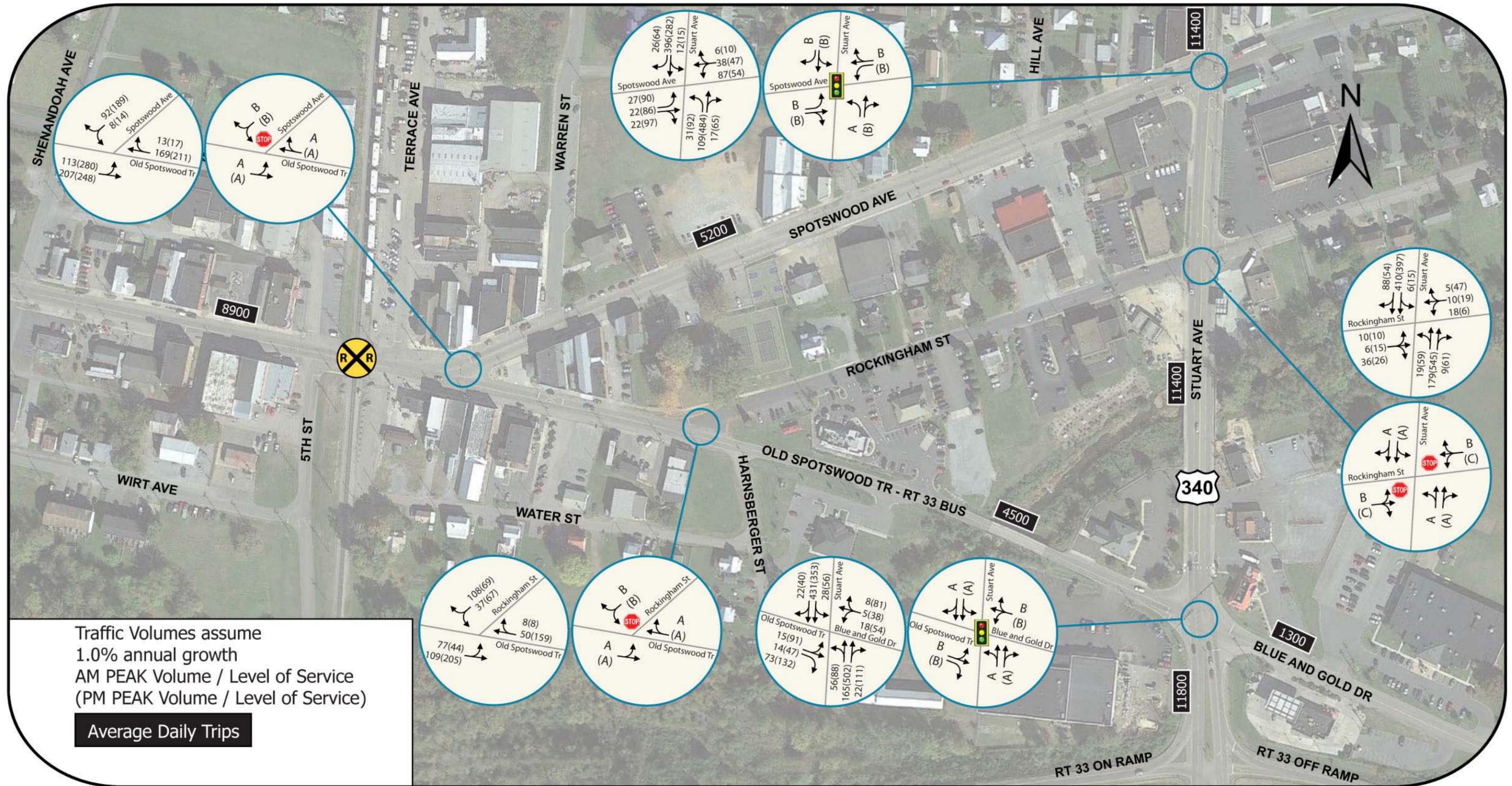


FIGURE 7
FUTURE (2040) TRAFFIC
VOLUMES & LEVEL OF SERVICE
(NO IMPROVEMENTS)

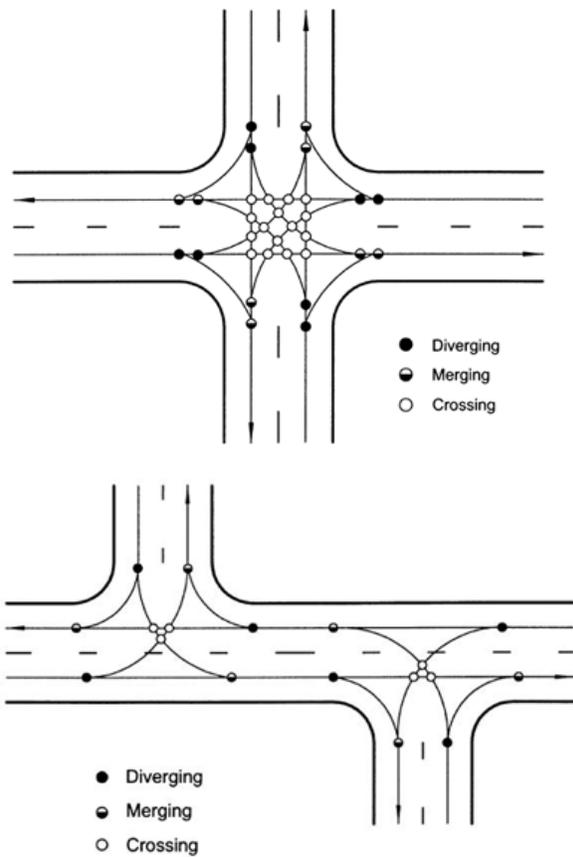
TOWN OF ELKTON
2040 AREA STUDY



4.3 Future Alternative Scenarios

Based on the results of the Future 2040 baseline scenario and the needs identified in analysis of the existing conditions of the study area and in discussions with Town and CSPDC representatives, two future year recommendation scenario options were developed and analyzed. The recommendations in both options focus on multimodal enhancements, access management improvements, signal coordination and modifications, and locations for the potential expansion of public parking facilities to improve accessibility and safety for all users of the transportation network within the study limits.

Both future year recommendation options propose access management improvements in the study area. Access management is a proactive process of identifying and implementing modifications to full access intersections and commercial entrances in order to better define land use access points to enhance safety and operations of the transportation network.



Each full access 4-leg intersection, contains 32 possible conflict points and each 3-leg intersection contains 9 possible conflict points. By restricting the left turn movements to and from a side street and consolidating them to another designated intersection, the conflicting turning movements can be reduced by 75% at a 4-leg intersection and 55% at a 3-leg intersection. The proposed intersection modifications at the Rockingham Street / Stuart Avenue intersection will reduce conflict points along the Stuart Avenue corridor, enhancing safety for all users of the transportation network.

Source: Federal Highway Administration

4.4 2040 Improvement Recommendations – Option I

Utilizing the study area analysis and existing conditions inventory and input from Town representatives, future transportation needs were identified and evaluated in the development of improvement recommendations. As the existing transportation system was determined to adequately support future vehicular growth in the baseline analysis, it was determined that the future transportation needs of the Town would focus on improving multimodal accessibility and safety within the study area. The primary need would be addressing the lack of facilities to provide for a pedestrian connection between the community center and the downtown central business district. The Option I improvement recommendations as identified on Figure 8, are as follows:

Operational, Access Management, and Safety Improvements Corridor:

- Coordination and phasing / timing optimization of the existing traffic signals at the intersections with Spotswood Avenue and Old Spotswood Trail.
- Designating an exclusive Stuart Avenue northbound left turn lane at the intersections with Old Spotswood Trail and Rockingham Street and the installation of a raised median along portions of Stuart Avenue within the study area to limit left turn movements into and out of adjacent businesses in order to reduce vehicular conflict points and improve traffic operations.
- Installation of intersection medians at Rockingham Street to restrict through and left turn movements from and onto Stuart Avenue to reduce vehicular conflict points and improve traffic operations (both Rockingham Street approaches at Stuart Avenue become right-in / right-out only).

Multimodal Improvements within the study area:

- Improve existing pedestrian crossings at the Stuart Avenue / Old Spotswood Trail and Stuart Avenue / Spotswood Avenue intersections (re-delineate of crosswalks and installation of pedestrian signal heads). With the introduction of the raised median improvement along Stuart Avenue, the Old Spotswood Trail intersection pedestrian crossing will benefit from the median by incorporating it into the crossing as a pedestrian refuge island.
- Installation of new pedestrian crossings at the Old Spotswood Trail / Spotswood Avenue and Warren Street / Spotswood Avenue intersections, the Old Spotswood Trail / 5th Street intersection, as well as the rail road crossing on Old Spotswood Trail. Flashing, pedestrian crossing signage can replace

- the existing vehicular overhead flashing yellow signals at the Old Spotswood Trail / Spotswood Avenue intersection.
- Propose sidewalk along the north side of Old Spotswood Trail beginning at Rockingham Street. After crossing the entrance into McDonalds, the sidewalk turns northeast and travels through the existing town park along the stream bank, before connecting to the existing sidewalk on the west side of Stuart Avenue (this connection will require the design of a ramp / retaining system and cooperation / easements from the adjacent property owner).
 - Repair existing sidewalks and install new sidewalk segments to fill in “gaps” as necessary in the existing network within the study area limits.
 - Extend the existing bicycle lane along Blue and Gold Drive to the intersection with Stuart Avenue.
 - Install sharrow lane markings along Stuart Avenue, Old Spotswood Trail, and Spotswood Avenue within the study area limits.

Parking Improvements within the study area:

- Expansion of the existing parking lot accessed from Rockingham Street to increase available parking spaces and improve access to the town park. The expansion could include an interparcel connection to the existing McDonalds parking lot to improve vehicular accessibility within the study area.
- Re-delineation of parking spaces in the Terrace Avenue and 5th Street parking lots to increase available parking spaces and improve traffic flow / parking efficiency.
- Development of a permanent, hard surfaced or temporary / overflow, light surfaced parking area in the vacant parcel on the north side of Spotswood Avenue.

Wayfinding Improvements

- Due to the bridge constraints on Old Spotswood Trail in accommodating direct pedestrian access from the community center / Stuart Avenue corridor to downtown, new signage will be necessary to direct pedestrian users to the proposed trail / sidewalk through the Town Park to safely access the downtown area.
- Improve existing wayfinding signage along the Stuart Avenue corridor within the Town. Signage should be expanded to improve access to not only downtown, but specific locations including the Town Welcome Center, Town Municipal Building, the Community Center, Town parks, and the Miller-Kite House. New signage to direct visitors to existing and proposed parking areas is also recommended.

4.5 2040 Option I Traffic Volumes and Level of Service

The Option I recommendations and their impacts on the existing transportation network, including vehicular re-routing and volume adjustments (as identified on Figure 9), were analyzed in the traffic modeling software to determine potential impacts to transportation operations and delay. The resulting Level of Service for each approach for the intersections within the study area is identified on Figure 9. All study intersection approaches and movements operate at an acceptable Level of Service C or better during the 2040 Option I recommendations year peak hours.

Analysis results for each intersection in the study area can be found in Appendix A.

The proposed bicycle improvements along Stuart Avenue and Old Spotswood Trail are compatible with both the 2005 CSPDC bicycle plan and the current draft of the Rockingham County bicycle plan. These documents recommend wide shoulder improvements along US 33 and along Stuart Avenue to the north and south of the Town limits. The combination of designated bicycle lanes and sharrows along Old Spotswood Trail will complement the future facilities along US 33, by allowing users to stop or travel through Town. Also, while independent bicycle lanes are not possible on Stuart Avenue through town due to pavement width constraints, the recommended sharrows will link bicycle use designation to the future improvements along the County portions of Route 340.

Example of “Sharrow” lane markings



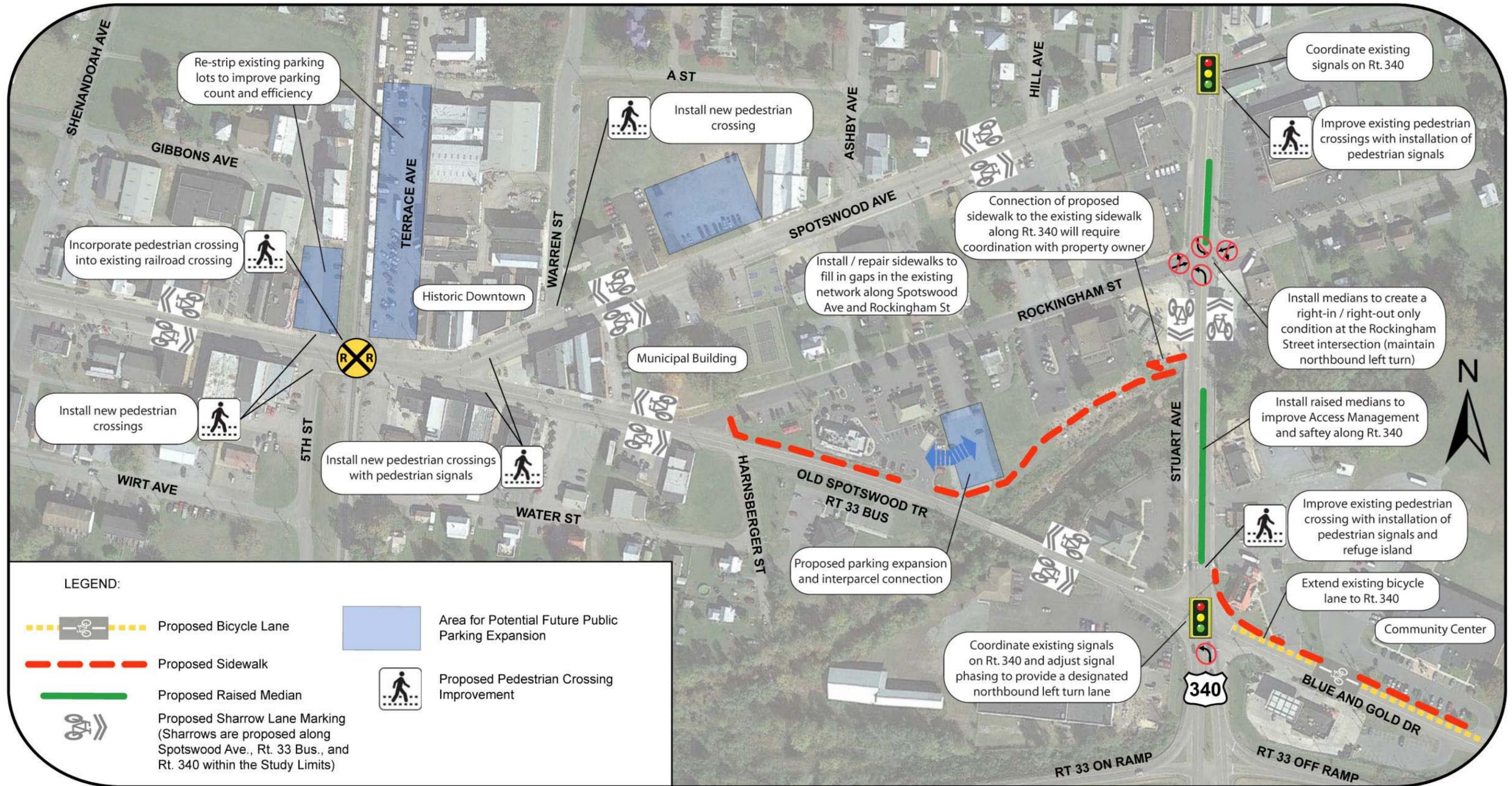


FIGURE 8
FUTURE (2040) RECOMMENDATIONS
OPTION I - ACCESS MANAGEMENT
AND MULTIMODAL IMPROVEMENTS



4.6 2040 Improvement Recommendations - Option II

Expanding upon the recommendations of Option I, a change in the transportation network in the form of a one way couplet is introduced in Option II, in order to accommodate additional multimodal enhancements within the study area. Option II recommends Spotswood Avenue for westbound traffic only (west of Stuart Avenue), designating this road as the primary access to the downtown core from the east. Old Spotswood Trail would be designated for eastbound traffic only, between Spotswood Avenue and Stuart Avenue. Establishing one directional travel lane on these facilities frees up existing pavement surface to incorporate bicycle lanes, walkways, and potential on-street parking adjustments. The Option II improvement recommendations as identified on Figure 10, are as follows:

Operational, Access Management, and Safety Improvements:

- Coordination and phasing / timing optimization of the existing traffic signals at the intersections with Spotswood Avenue and Old Spotswood Trail. The phasing adjustments accommodate the proposed one way traffic design.
- Designating an exclusive Stuart Avenue northbound left turn lane at the intersection with Rockingham Street and the installation of a raised median along a portion of Stuart Avenue between Rockingham Street and Spotswood Avenue to limit left turn movements into and out of adjacent businesses in order to reduce vehicular conflict points and improve traffic operations.
- Installation of intersection medians at Rockingham Street to restrict through and left turn movements from and onto Stuart Avenue to reduce vehicular conflict points and improve traffic operations (both Rockingham Street approaches at Stuart Avenue become right-in / right-out only).

Multimodal Improvements within the study area:

- Improve existing pedestrian crossings at the Stuart Avenue / Old Spotswood Trail and Stuart Avenue / Spotswood Avenue intersections (re-delineate crosswalks and installation of pedestrian signal heads).
- Installation of new pedestrian crossings at the Old Spotswood Trail / Spotswood Avenue and Warren Street / Spotswood Avenue intersections, the Old Spotswood Trail / 5th Street intersection, as well as the rail road crossing on Old Spotswood Trail. Flashing, pedestrian crossing signage can replace the existing vehicular overhead flashing yellow signals at the Old Spotswood Trail / Spotswood Avenue intersection. The one way designation on Spotswood Avenue would allow for the installation of an intersection median

- to delineate the westbound right and left turn movements. This median could enhance the design of the pedestrian crossing by providing a refuge island.
- Installation of a sidewalk along the north side of Old Spotswood Trail between Rockingham Street and Stuart Avenue. The one way eastbound designation on Old Spotswood Trail will permit the utilization of the existing westbound lane to accommodating a pedestrian crossing / walkway over the existing bridge (connecting the proposed sidewalk on either side).
 - Repair existing sidewalks and install new sidewalk segments to fill in “gaps” as necessary in the existing network within the study area limits.
 - Extend the existing bicycle lane along Blue and Gold Drive to the intersection with Stuart Avenue.
 - Propose a bicycle lane on Spotswood Avenue between Stuart Avenue and Old Spotswood Trail and on Old Spotswood Trail between Spotswood Avenue and Stuart Avenue.
 - Install sharrow lane markings along Stuart Avenue and Old Spotswood Trail (west of the rail road crossing) within the study area limits.

Parking Improvements within the study area:

- The one way designation on Spotswood Avenue will allow for the parallel street parking on the north side of Spotswood (immediately adjacent to both sides of the intersection with Warren Street) to be replaced with angled parking spaces. This will increase available on-street parking in the downtown core and have a potential for aesthetic improvements (note that the existing pavement width on Old Spotswood Trail could not accommodate similar on-street parking adjustments).
- Expansion of the existing parking lot accessed from Rockingham Street to increase available parking spaces and improve access to the town park. The expansion could include an interparcel connection to the existing McDonalds parking lot to improve vehicular accessibility within the study area.
- Re-delineation of parking spaces in the Terrace Avenue and 5th Street parking lots to increase available parking spaces and improve traffic flow / parking efficiency.
- Development of a permanent, hard surfaced or temporary/overflow, light surfaced parking area in the vacant parcel on the north side of Spotswood Avenue.

Wayfinding Improvements

- New signage to efficiently and clearly communicate the one-way traffic configuration recommended with Option II will be critical in the successful implementation of the design.
- Improve existing wayfinding signage along the Stuart Avenue corridor within the Town. Signage should be expanded to improve access to not only downtown, but specific locations including the Town Welcome Center, Town Municipal Building, the Community Center, Town parks, and the Miller-Kite House. New signage to direct visitors to existing and proposed parking areas is also recommended.

4.7 2040 Option II Traffic Volumes and Level of Service

The Option II recommendations and their impacts on the existing transportation network, including vehicular re-routing and volume adjustments (as identified on Figure 11), were analyzed in the traffic modeling software to determine potential impacts to transportation operations and delay. The resulting Level of Service for each approach for the intersections within the study area is identified on Figure 11. All study intersection approaches and movements operate at an acceptable Level of Service C or better during the 2040 Option II recommendations year peak hours.

Analysis results for each intersection in the study area can be found in Appendix A.

A scenario that reversed the proposed one way couplet, by designating Spotswood Avenue for eastbound traffic and Old Spotswood Trail as westbound traffic was also analyzed in the traffic modeling software. However, this scenario was abandoned when analysis results indicated the creation of a significant eastbound queue on Old Spotswood Trail at the Spotswood Avenue intersection for portions of both morning and afternoon peak hours. The queue blocked the railroad crossing, in addition to the intersections with Terrance Avenue and 5th Street, creating undesirable conditions.

It should be noted that the one-way configuration as recommended in Option II will impact the Town's reimbursement from the State for the maintenance of Town streets. State maintenance reimbursements to localities are based on lane miles. The removal of the two-way configuration on Spotswood Avenue and Old Spotswood Trail reduces the number of lane miles within the Town. However, as a primary, Old Spotswood Trail is maintained by VDOT, so only the 0.25 mile reduction on Spotswood Avenue will impact State maintenance reimbursements. Based on the most recent reimbursement figures, the one-way configuration of Spotswood Avenue would reduce the Town's road

maintenance reimbursement by approximately \$3,000 or 0.7% of the total reimbursement annually. Regarding the maintenance of the actual lane markings, the proposed markings on Spotswood Avenue, Old Spotswood Trail, and Stuart Avenue would simply be replaced during the standard paving cycle for these roadways. In order to maintain parking efficiency, any paving and / or striping improvements to existing or proposed off-street parking lots would need to be maintained by the Town on a more regular cycle to avoid deterioration to the levels of the current state of existing parking areas.

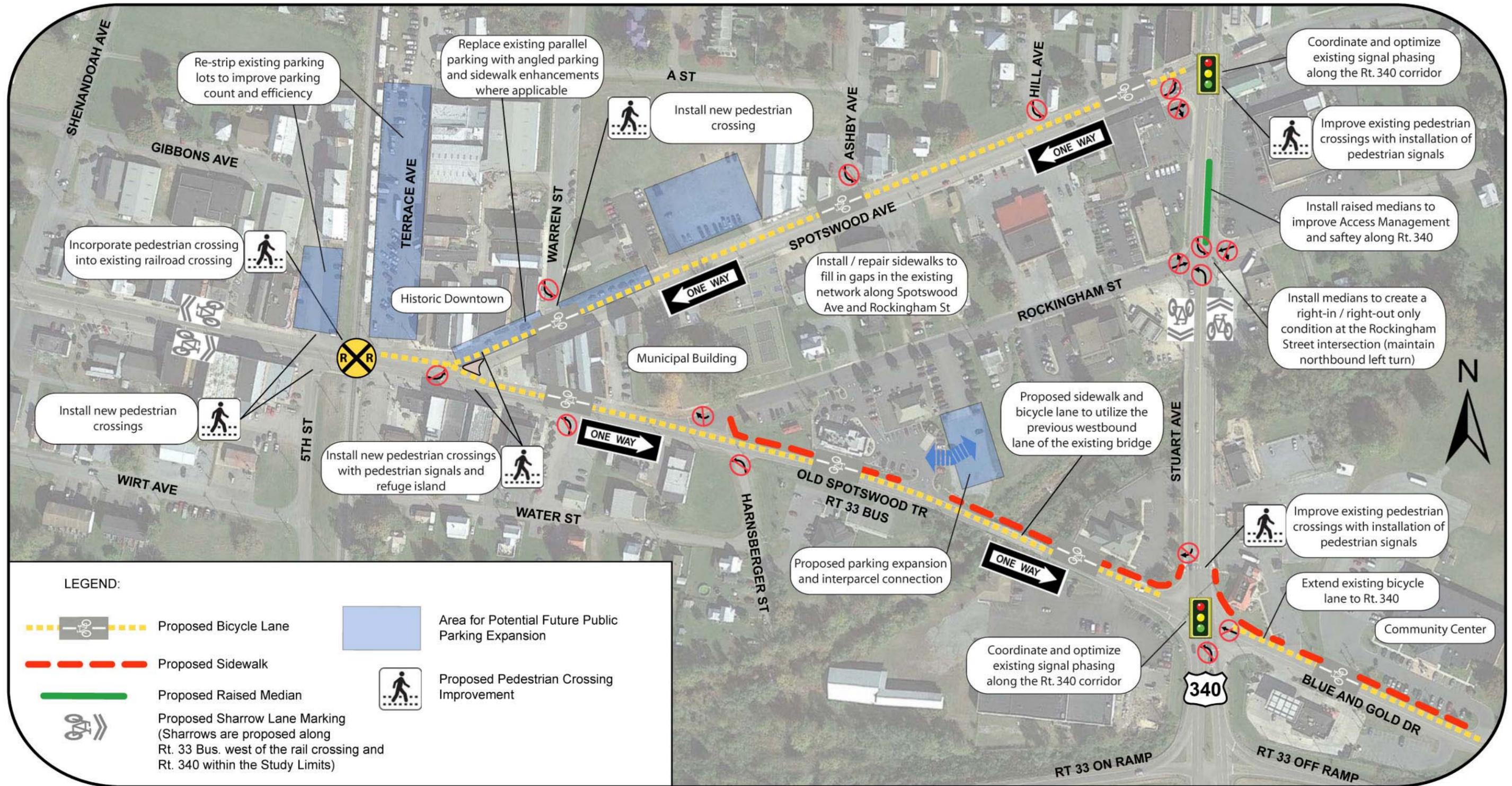


FIGURE 10
 FUTURE (2040) RECOMMENDATIONS
 OPTION II - ONE WAY COUPLET



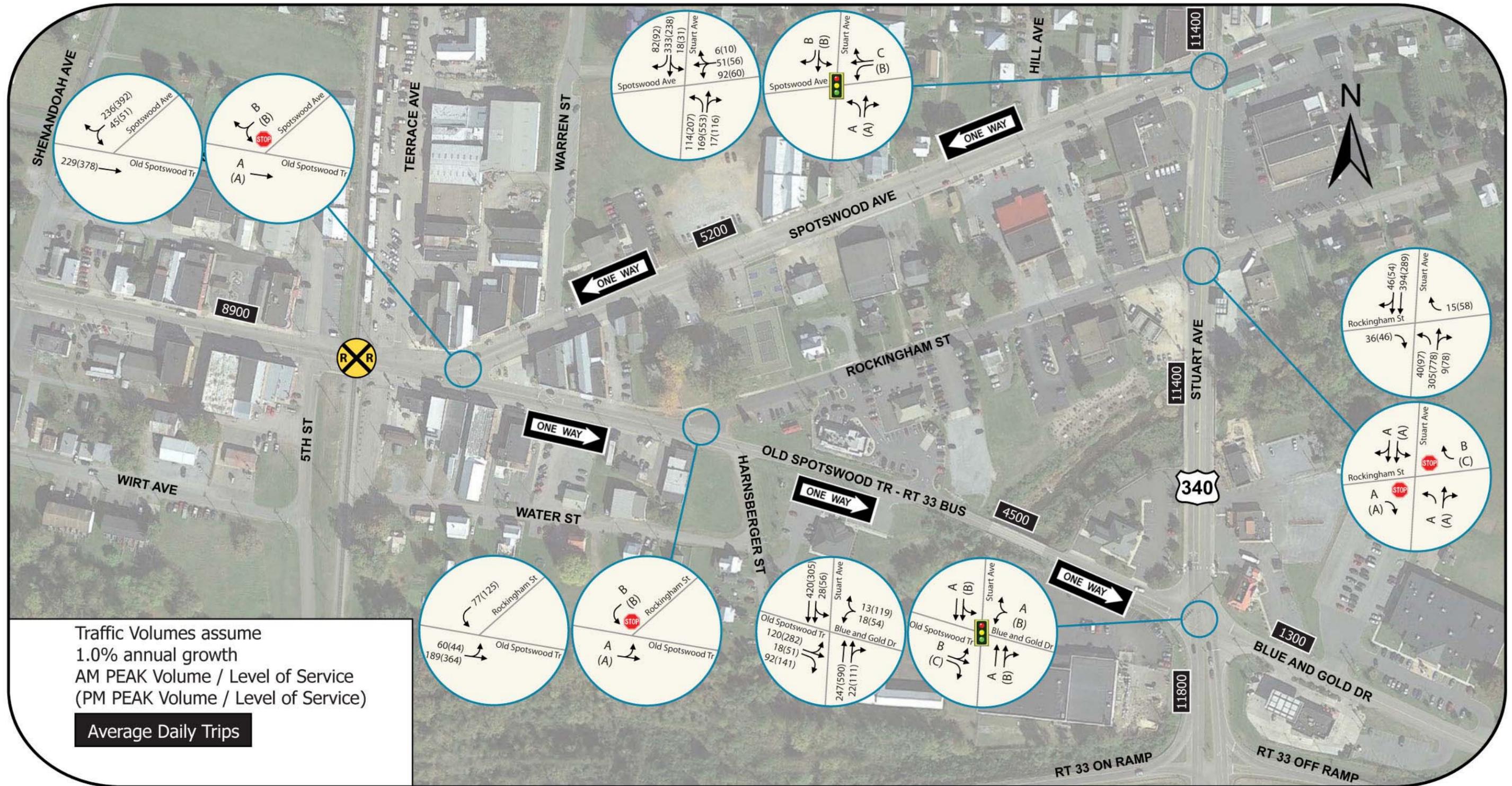


FIGURE 11
FUTURE (2040) TRAFFIC
VOLUMES & LEVEL OF SERVICE
OPTION II - ONE WAY COUPLET

TOWN OF ELKTON
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5.0 CONCEPTUAL RENDERINGS

The following figures consist of conceptual renderings that illustrate the proposed improvement recommendations as presented in the future year options.

Figure 12 illustrates recommended Option I improvements along the Stuart Avenue corridor and the proposed sidewalk through the town park along Elk Run, with the proposed ramp connection to the existing sidewalk along the west side of Stuart Avenue.

Figure 13 is a perspective illustration of the Option I recommendations along Stuart Avenue looking north from the intersection with Old Spotswood Trail / Blue and Gold Drive.

Figure 14 illustrates recommended Option II improvements along the Stuart Avenue corridor with the one-way couplet concept along Old Spotswood Trail and Spotswood Avenue.

Figure 15 illustrates recommended Option II improvements in the downtown area at the intersection of Old Spotswood Trail and Spotswood Avenue.

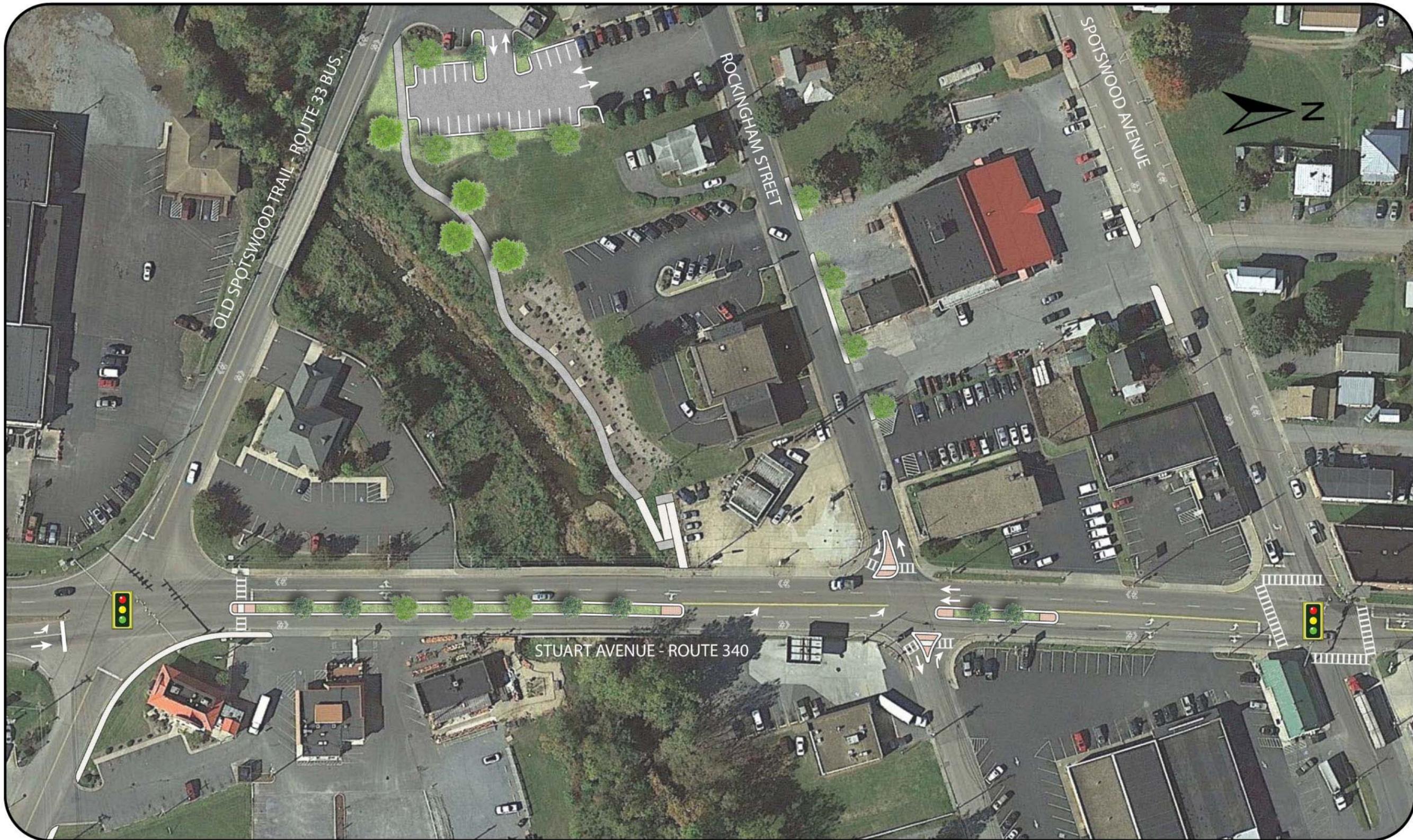


FIGURE 12
FUTURE (2040)
CONCEPTUAL RENDERING - OPTION I

TOWN OF ELKTON
2040 AREA STUDY



FIGURE 13
FUTURE (2040)
CONCEPTUAL RENDERING
OPTION I - US 340 MEDIAN



TOWN OF ELKTON
2040 AREA STUDY

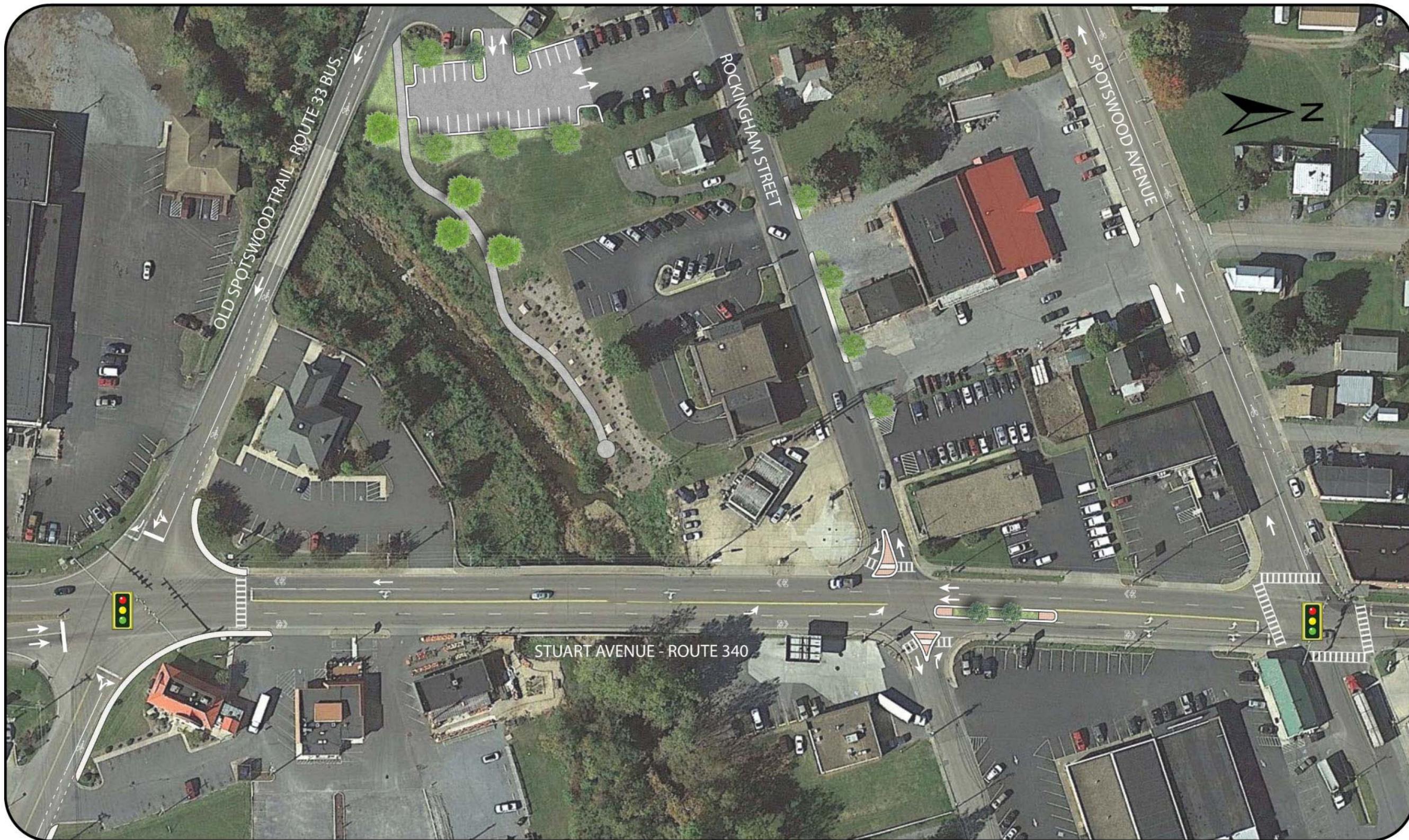


FIGURE 14
FUTURE (2040)
CONCEPTUAL RENDERING - OPTION II

TOWN OF ELKTON
2040 AREA STUDY

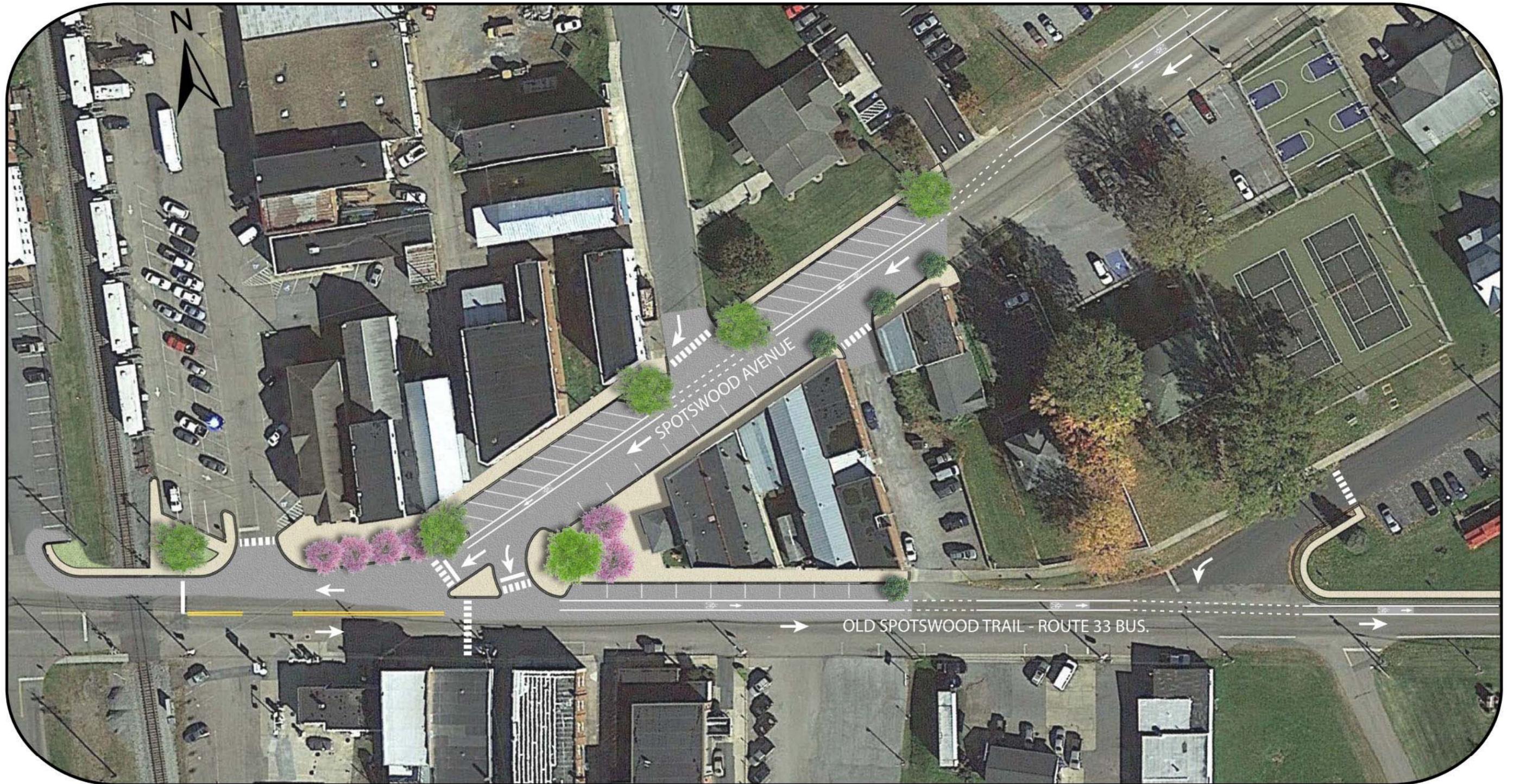


FIGURE 15
FUTURE (2040)
CONCEPTUAL RENDERING
OPTION II - ONE WAY COUPLET



TOWN OF ELKTON
2040 AREA STUDY

6.0 COST ESTIMATES

Cost Estimates to be provided with Final Submission of Area Study

APPENDIX A – TRAFFIC ANALYSIS RESULTS – LEVEL OF SERVICE SUMMARY

Scenario	Overall LOS	Route 340 and Route 33 Business Level of Service per Movement by Approach (Delay in sec/veh)												
		Eastbound			Westbound			Northbound			Southbound			
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
AM Peak Hour														
2014 Existing	A (5.2)	C (21.1)		A (8.0)		B (17.5)			A (3.0)			A (3.2)		
		B (12.7)			B (17.5)			A (3.0)			A (3.2)			
2040 No Build	A (4.8)	C (20.9)		A (8.6)		B (17.0)			A (3.0)			A (3.4)		
		B (12.1)			B (17.0)			A (3.0)			A (3.4)			
2040 Option I	A (4.6)	C (27.6)		A (9.3)		C (22.3)			A (2.8)	A (2.7)		A (2.3)		
		B (14.5)			C (22.3)			A (2.7)			A (2.3)			
2040 Option II	A (6.4)	B (19.0)		A (3.0)		A (0.3)			A (6.5)			A (3.6)		
		B (12.6)			A (0.3)			A (6.5)			A (3.6)			
PM Peak Hour														
2014 Existing	A (9.1)	C (26.6)		A (7.5)		B (16.0)			A (5.9)			A (5.5)		
		B (18.2)			B (16.0)			A (5.9)			A (5.5)			
2040 No Build	B (10.0)	C (27.5)		A (7.7)		B (16.5)			A (7.7)			A (6.5)		
		B (17.8)			B (16.5)			A (7.7)			A (6.5)			
2040 Option I	B (11.8)	C (28.2)		A (5.3)		B (16.8)			A (7.1)	B (11.3)		A (7.5)		
		B (17.0)			B (16.8)			B (11.3)			A (7.5)			
2040 Option II	B (18.9)	C (34.1)		A (8.7)		B (15.1)			B (18.0)			B (12.6)		
		C (26.5)			B (15.1)			B (18.0)			B (12.6)			

Scenario	Overall LOS	Route 340 and Rockingham Street Level of Service per Movement by Approach (Delay in sec/veh)											
		Eastbound			Westbound			Northbound			Southbound		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
AM Peak Hour													
2014 Existing	A (1.5)	B (10.8)			B (12.3)			A (0.8)			A (0.1)		
		B (10.8)			B (12.3)			A (0.8)			A (0.1)		
2040 No Build	A (1.6)	B (11.4)			B (13.5)			A (0.8)			A (0.1)		
		B (11.4)			B (13.5)			A (0.8)			A (0.1)		
2040 Option I	A (0.8)			A (9.2)			A (9.6)	A (8.5)	A (0.0)		A (0.0)		
		A (9.2)			A (9.6)			A (0.8)			A (0.0)		
2040 Option II	A (1.0)			A (9.4)			B (10.7)	A (8.4)	A (0.0)		A (0.0)		
		A (9.4)			B (10.7)			A (0.9)			A (0.0)		
PM Peak Hour													
2014 Existing	A (2.2)	C (16.3)			C (15.4)			A (0.9)			A (0.4)		
		C (16.3)			C (15.4)			A (0.9)			A (0.4)		
2040 No Build	A (2.8)	C (22.7)			C (21.4)			A (1.0)			A (0.4)		
		C (22.7)			C (21.4)			A (1.0)			A (0.4)		
2040 Option I	A (1.3)			A (9.5)			B (14.5)	A (8.6)	A (0.0)		A (0.0)		
		A (9.5)			B (14.5)			A (0.8)			A (0.0)		
2040 Option II	A (1.8)			A (9.7)			C (22.5)	A (8.5)	A (0.0)		A (0.0)		
		A (9.7)			C (22.5)			A (0.9)			A (0.0)		

Scenario	Overall LOS	Route 340 and Spotswood Avenue Level of Service per Movement by Approach (Delay in sec/veh)											
		Eastbound			Westbound			Northbound			Southbound		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
AM Peak Hour													
2014 Existing	B (11.5)	B (14.9)	A (8.7)		B (15.5)	B (12.5)		A (6.4)	A (6.5)		B (12.8)		
		B (10.7)			B (14.2)			A (6.5)			B (12.8)		
2040 No Build	B (12.1)	B (16.4)	B (11.2)		B (17.4)	B (14.5)		A (6.2)	A (6.6)		B (12.7)		
		B (13.2)			B (16.4)			A (6.5)			B (12.7)		

2040 Option I	B (14.2)	C (20.8)	B (13.6)	C (24.9)	B (18.1)	A (5.4)	A (4.5)	B (14.4)
		B (16.6)		C (22.9)		A (4.8)		B (14.4)
2040 Option II	B (11.7)			C (30.6)	C (26.0)	A (5.5)	A (4.7)	B (10.4)
		N/A		C (28.8)		A (5.0)		B (10.4)
PM Peak Hour								
2014 Existing	B (13.1)	B (17.2)	B (13.4)	B (17.1)	B (12.6)	A (7.1)	B (10.2)	B (17.3)
		B (14.6)		B (14.8)		A (9.7)		B (17.3)
2040 No Build	B (15.1)	C (20.0)	B (17.7)	B (19.2)	B (16.1)	A (7.3)	B (13.3)	B (16.8)
		B (17.7)		B (17.6)		B (12.5)		B (16.8)
2040 Option I	B (13.9)	C (24.9)	B (19.0)	C (24.3)	B (18.4)	A (6.8)	A (9.0)	B (14.8)
		C (21.0)		C (21.2)		A (8.7)		B (14.8)
2040 Option II	A (9.6)			B (18.7)	B (16.5)	A (4.5)	A (8.2)	B(12.5)
		N/A		B (17.6)		A (7.3)		B(12.5)

Scenario	Overall LOS	Route 33 Business and Spotswood Avenue Level of Service per Movement by Approach (Delay in sec/veh)							
		Eastbound		Westbound				Southbound	
		LT	TH	TH	RT			LT	RT
AM Peak Hour									
2014 Existing	A (3.7)	A (3.6)		A (0.1)				B (10.3)	
		A (3.6)		A (0.1)				B (10.3)	
2040 No Build	A (3.5)	A (3.3)		A (0.0)				B (10.5)	
2040 Option I	A (3.8)	A (3.8)		A (0.0)				B (10.5)	
		A (3.8)		A (0.0)				B (10.5)	
2040 Option II	A (5.6)	N/A	A (0.0)					B (10.2)	
		A (0.0)		N/A				B (10.2)	
PM Peak Hour									
2014 Existing	A (5.7)	A (5.3)		A (0.0)				B (12.5)	
		A (5.3)		A (0.0)				B (12.5)	
2040 No Build	A (6.2)	A (5.8)		A (0.0)				B (14.2)	
		A (5.8)		A (0.0)				B (14.2)	
2040 Option I	A (6.3)	A (6.0)		A (0.0)				B (14.3)	
		A (6.0)		A (0.0)				B (14.3)	
2040 Option II	A (6.7)	N/A	A (0.0)					B (12.4)	
		A (0.0)		N/A				B (12.4)	

Scenario	Overall LOS	Route 33 Business and Rockingham Street Level of Service per Movement by Approach (Delay in sec/veh)							
		Eastbound		Westbound				Southbound	
		LT	TH	TH	RT			LT	RT
AM Peak Hour									
2014 Existing	A (5.2)	A (3.3)		A (0.0)				A (9.6)	
		A (3.3)		A (0.0)				A (9.6)	
2040 No Build	A (5.4)	A (3.4)		A (0.0)				B (10.2)	
		A (3.4)		A (0.0)				B (10.2)	
2040 Option I	A (5.2)	A (2.9)		A (0.0)				B (10.0)	
		A (2.9)		A (0.0)				B (10.0)	
2040 Option II	A (4.3)	A (2.0)						B (11.8)	N/A
		A (2.0)		N/A				B (11.8)	
PM Peak Hour									
2014 Existing	A (3.4)	A (1.5)		A (0.0)				B (11.1)	
		A (1.5)		A (0.0)				B (11.1)	
		A (1.6)		A (0.0)				B (12.5)	

2040 No Build	A (3.8)	A (1.6)	A (0.0)				B (12.5)	
2040 Option I	A (3.6)	A (1.2)	A (0.0)				B (12.2)	
		A (1.2)	A (0.0)				B (12.2)	
2040 Option II	A (4.3)	A (1.0)					B (14.9)	N/A
		A (1.0)	N/A				B (14.9)	