# State Route 60 Access Management Planning Study, Bradley County, Tennessee

THE UNIVERSITY OF TENNESSEE KNOXVILLE

CENTER FOR TRANSPORTATION RESEARCH

Prepared by:

Mareike Ortmann

Research Associate


For:

Tennessee Department of Transportation (TDOT) – Long Range Planning Division

December 2015


*This document is covered by 23 USC § 409 and its production pursuant to fulfilling public planning requirements does not waive the provisions of § 409.*

# Table of Contents

**1. INTRODUCTION ..... 5**

**2. INVENTORY OF THE STUDY AREA ..... 9**

2.1 GROWTH FACTORS ..... 9

2.2 POLICIES AFFECTING ACCESS MANAGEMENT ..... 9

2.3 THE STUDY AREA ..... 16

2.4 FUNCTIONAL CLASSIFICATION ..... 19

2.5 EXISTING AND FUTURE LAND USES ALONG CORRIDOR 60 ..... 22

2.6 ROADWAY FEATURES ..... 23

2.7 TRAFFIC AND CAPACITY ..... 27

*2.7.1 Traffic Volumes ..... 27*

*2.7.2 Traffic Capacity ..... 29*

*2.7.3 Truck Traffic ..... 33*

2.8 MULTI-MODAL TRANSPORTATION SYSTEM ..... 35

2.9 PROJECTS ..... 41

**3. CRASH ANALYSIS ..... 44**

**4. ANALYSIS OF ACCESS CONTROL ON SR 60 ..... 51**

4.1 ACCESS MANAGEMENT MEASURES: EXISTING AND DESIRED ..... 51

4.2 ACCESS SPACING ..... 54

*4.2.1 Spacing of Access Points ..... 54*

*4.2.2 Access Points on State Route 60 ..... 55*

4.3 CONFLICT POINTS ..... 65

4.4 SPEED LIMIT ..... 69

**5. RECOMMENDATIONS FOR ACCESS MANAGEMENT STANDARDS AND GUIDELINES ..... 71**

5.1 RECOMMENDED STATE ACCESS MANAGEMENT STANDARDS ..... 71

*5.1.1 TDOT's Driveway Entrance Standards ..... 71*

*5.1.2 Access Management Standards from other Sources ..... 76*

5.2 ACCESS MANAGEMENT "TRANSECT" GUIDELINES ..... 79

5.3 ACCESS MANAGEMENT TOOLS ..... 84

5.4 RECOMMENDATIONS FOR ACCESS MANAGEMENT MEASURES ON SR 60 ..... 93

*5.4.1 Recommendations for Section I ..... 93*

*5.4.2 Recommendations for Section II ..... 95*

*5.4.3 Recommendations for Section III ..... 97*

*5.4.4 Recommendations for Section IV* ..... *98*
*5.4.5 Recommendations for Section V* ..... *107*
*5.4.6 Recommendations for Section VI* ..... *109*
5.5. FINAL CONCLUSION ..... 111
**APPENDIX ..... 112**
A. GLOSSARY ..... 112
B. LITERATURE ..... 113

# 1. Introduction

This access management planning study is an outcome of the Corridor Management Agreement (CMA) that is in place between the Tennessee Department of Transportation (TDOT), City of Cleveland and Bradley County for State Route 60 from the Tennessee-Georgia state line to the Hamilton County line.

In March 2010, TDOT participated in the National Governors Association (NGA) Center for Best Practice Policy Academy on Shaping a New Approach to Transportation and Land Use Planning. As a result of this program, Tennessee's project management team, which consisted of TDOT, the Tennessee Department of Environment and Conversation (TDEC), and the Tennessee Department of Economic and Community Development (ECD), developed objectives that would be best accomplished by exploring and advancing the concept of CMA's.

SR 60 in Bradley County was selected as one of two pilot projects, the other project being SR 109 in Sumner and Wilson Counties. A series of workshops were done in which stakeholders developed and prioritized goals, strategies and actions that were considered the most critical to future development along the corridors.

A Corridor Management Committee was created and consists of a partnership between Bradley County, the City of Cleveland, the Cleveland Urban Area Metropolitan Organization (MPO), TDOT and TDEC. The committee is working collaboratively in the management of SR 60 and strives to implement the course of the actions.

The CMA Corridor strategies for SR 60 include:

1. Land Use Planning
2. Access Management
3. Roadway Design & Capacity
4. Traffic Management & Operations

In 2013, the City of Cleveland initiated the access management study under the University of Tennessee, Knoxville, Smart Communities Initiative in response to the needs expressed by the Corridor Management Committee.

*Components of Access Management*

The National Cooperative Highway Research Program (NCHRP) defines Access Management as follows: It is the location, spacing, design, and operation of driveways, median openings, interchanges and street connections to a roadway.

It encompasses a range of methods that promote the efficient and safe movement of people and goods by reducing conflicts on the roadway system.

Examples of access management techniques *[Transportation Research Board: Access Management Manual. 2014]* are

- Locating traffic signals to support signal coordination and efficient traffic progression over a wide range of traffic conditions,
- Using median treatments to limit the exposure of through traffic and pedestrians or bicyclists to left-turning vehicles and to provide a refuge for pedestrians crossing at midblock locations,
- Designing access points to minimize conflicts at the entrance of a site and support smooth entry and exit at speeds appropriate to the connecting roadway,
- Providing right- and left-turn deceleration and storage lanes so drivers can wait safely to complete a turn and turning vehicles do not delay through-traffic movement,
- Limiting and separating driveways and other access points to major roadways to reduce the number of potential conflicts and provide drivers with the time necessary to handle conflicts that do occur,
- Restricting driveways in the vicinity of signalized intersections to reduce intersection conflicts and crashes,
- Providing an adequate network of local and collector roadways and promoting internal connections between land uses to reduce the need for driveway access on major roads and allow vehicles to circulate within neighborhoods and centers rather than on the arterial system, and
- Providing bicycle and pedestrian connections to maintain the continuity of non-vehicular pathways and providing more direct connections to transit or midblock crossing locations.

As more land gets developed along a corridor and traffic increases, the needs for accessibility increase. As major roadways serve both mobility and access functions they have the greatest need for access control.

Transportation projects, particularly those that increase capacity or provide access to new areas, can affect the growth rate and development patterns of those areas. Land values increase as greater regional accessibility stimulates real estate interest. Land use changes occur as commercial or industrial users seek locations on arterials and near highway interchanges and developers of low-density subdivisions build on nearby land made more accessible to job centers. *[TRB. Access Management Manual. 2014].*

The following diagram illustrates the dynamic interaction between transportation and land use.

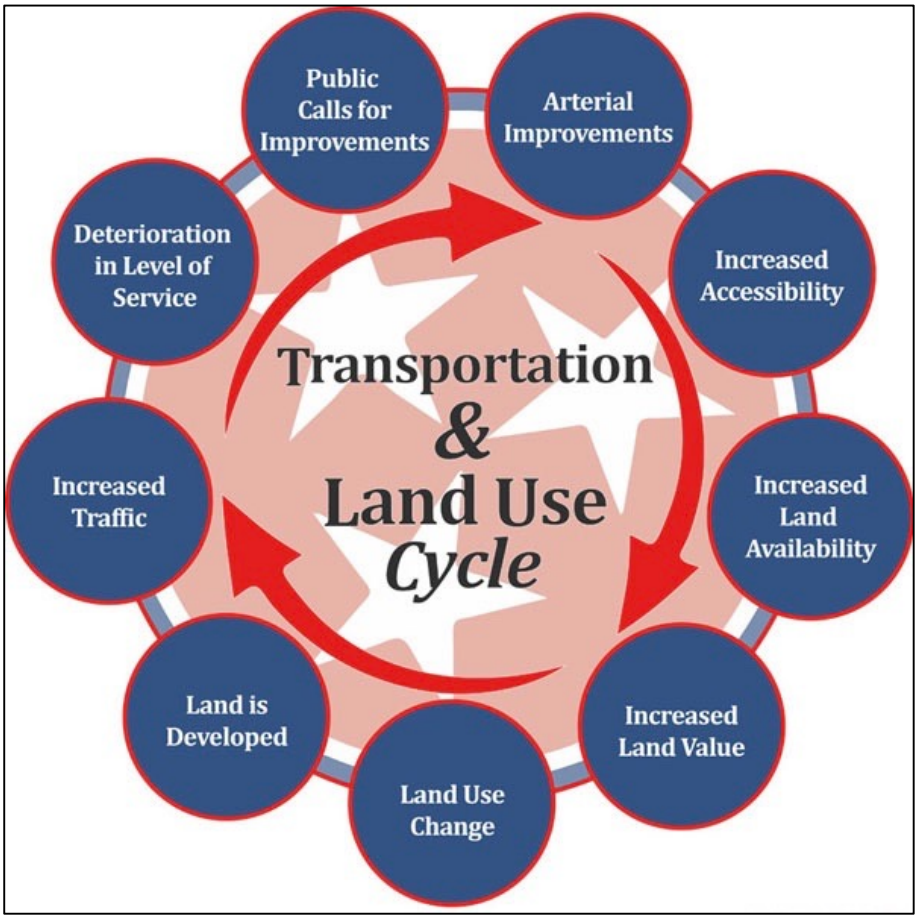



**Figure 1: Transportation and Land Use Cycle** ***[Source: TDOT]***

Access management strives to (a) limit the number of traffic conflicts that occur at any given location and separate the locations at which conflicts can occur and (b) minimize speed changes and limit the speed differential between turning vehicles and through traffic to an acceptable level. *[TRB. Access Management Manual. 2014].*

*Benefits of Access Management*

Access management can increase safety and make roads operate more efficiently. Access control reduces the number and variety of events, while increasing the spacing of events to which drivers must respond. Studies have shown that access management can provide significant benefits for traffic operations:

- Roadways with full access control generally had between 25 and 50 percent of the accidents per million vehicle miles traveled (VMT) of roads without access control. *[TRB Circular E-C019: Urban Street Symposium. 1999]*.

- Increasing the spacing between access points and providing greater separations of conflicts will reduce the number and variety of events to which drivers must respond thus reducing the number of accidents.
- Access management treatments increase capacity and can decrease travel time and delays by 40-60%.

*Plan Objectives*

Access management provides (or manages) access to land development while simultaneously preserving the flow of traffic on the surrounding road network in terms of safety, capacity, and speed *[TRB. NCHRP Report 420. Impacts of Access Management Techniques. 1999]*.

According to the SR 60 CMA, the proposed actions to implement "Access Management" are:

- To establish a process for coordinated access permit review and approval
- To develop corridor Access Management Standards
- To develop a Corridor Access Management Plan as part of the comprehensive plan for Bradley County and the City of Cleveland
- To approve and adopt Corridor Access Management Standards and Corridor Access Management Plan

*Tennessee Law regarding Access Management*

Currently, the State of Tennessee does not have access management guidance in place. TDOT plans to develop an Access Management Guide.

TDOT is currently updating its Manual for Constructing Driveway Entrances on State Highways. It includes regulations on the construction and design of driveways on state highway right-of-way.

TDOT encourages local authorities to develop their own access management regulations governing the construction and design of driveways and intersections. Local authorities are allowed to develop their own regulations on driveways, but when connecting to the state highways, they must abide by the TDOT Driveway Manual. Local standards can be used if they are more stringent than the State's.

# 2. Inventory of the Study Area

## 2.1 Growth Factors

The City of Cleveland and surrounding Bradley County have grown over the past decades and are expected to continue to grow. Cleveland's population was 41,285 at the 2010 Census [*Census Bureau. Quick Facts: Cleveland*]. It is estimated that the city will gain 14,400 new residents by 2035 with the highest rate of growth occurring from 2010 to 2015. The number of housing units, 17,841 in 2010 could potentially increase by 6,300. The City of Cleveland will gain an estimated 45% of the projected growth in Bradley County. The population in Bradley County, which was 98,963 at the 2010 Census, is estimated to increase to 131,212 by 2035. This should increase the demand for new homes by 14,000. About 19,000 new jobs are estimated to be added countywide. [*City of Cleveland, Tennessee. Comprehensive Plan. Chapter: Land Use, P.11*].

The 2035 Bradley County Comprehensive Joint Strategic Plan has analyzed the development capacity of the county and city. The results indicate that Bradley County has enough capacity for the forecasted growth. However, the City of Cleveland does not have enough vacant land to accommodate the forecasted growth without redevelopment or infill development, or without annexing additional land area. [*City of Cleveland, Tennessee. Comprehensive Plan. Chapter: Land Use, P.11*].

According to the Cleveland Comprehensive Plan, recent growth has occurred to the north of downtown Cleveland and throughout Bradley County. Growth has resulted from the expansion of existing employers as well as from new development. It is expected that the Volkswagen plant and Amazon distribution center, located in nearby Chattanooga and Wacker Chemical plant that is currently being built in northern Bradley County will impact growth in Cleveland and Bradley County.

## 2.2 Policies affecting Access Management

**TDOT's Highway Entrance Permit Regulations:**

TDOT's "Manual for Constructing Driveway Entrances on State Highways" was updated in 2015.

This manual states that "access management regulations are necessary in order to preserve the functional integrity of the State Highway System and to promote the safe and efficient movement of people and goods while providing reasonable access to adjoining property owners".

Tennessee Code Annotated (TCA) [54-16-103] provides that highway authorities are authorized to design any controlled-access facility and to regulate, restrict, or prohibit access to best serve the traffic for which the facility is intended.

In general, "no person may construct a driveway or related encroachment on state highway right-of-way, including the modification, revision, or change in use of any existing driveway facilities, without first obtaining a state highway entrance permit" [TCA 54-5-302]. The property owner, whose property will be accessed by the driveway or street being built or modified, is responsible for obtaining a highway entrance permit and fulfilling all associated requirements.

## Cleveland Comprehensive Plan "Major Thoroughfare Plan":

One of the goals of the Major Thoroughfare Plan is to "promote access management and roadway design which accommodates all users". It states further that major thoroughfares need to have limited interruptions in traffic flow. "Access management standards can be used to maintain adequate levels-of-service on roadways by managing the frequency and design of access points." The goal also states that access management is particularly important along SR 60 among others, because of its current condition as a commercial corridor with frequent access to individual properties and since it has the potential for redevelopment.

In the Major Thoroughfare Plan, minimum right-of-way requirements were established for functional classified roads as shown in Table 1. Right-of-way requirements are to be achieved when private development occurs and/or as part of a planned roadway improvement.

**Table 1: Required Minimum Road Right-of-Way**

| Road Type | Right-of-Way (feet) |
|---|---|
| Principal Arterial | 120 |
| Minor Arterial | 80 |
| Urban & Major Collector | 70 |
| Minor Collector | 50 |
| Local Roads | 40-50 |
| Interstate & TDOT Access Controlled Roadways | Per TDOT standards |

The Major Thoroughfare Plan of the City of Cleveland includes some guidance on Access Management. It states that those guidelines are provided as general aids in planning new access points and have been made to provide optimal intersection spacing in accordance with the access policies of TDOT. *[City of Cleveland, Major Thoroughfare Plan and Recommendations, in: Comprehensive Plan, Ch.3: Transportation].*

## *Principal Arterial*

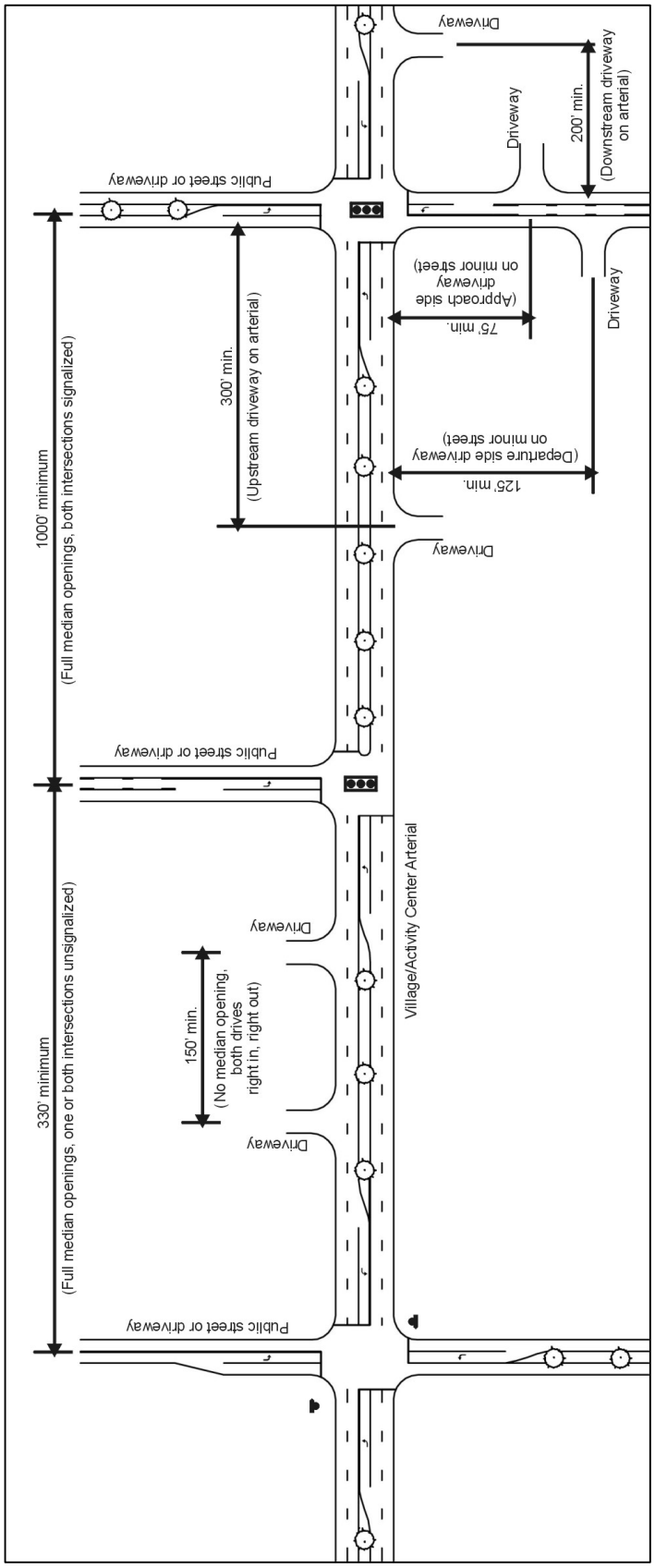



**Figure 2: MTP Access Spacing Guidelines - Principal Arterial**

## *Minor Arterial*

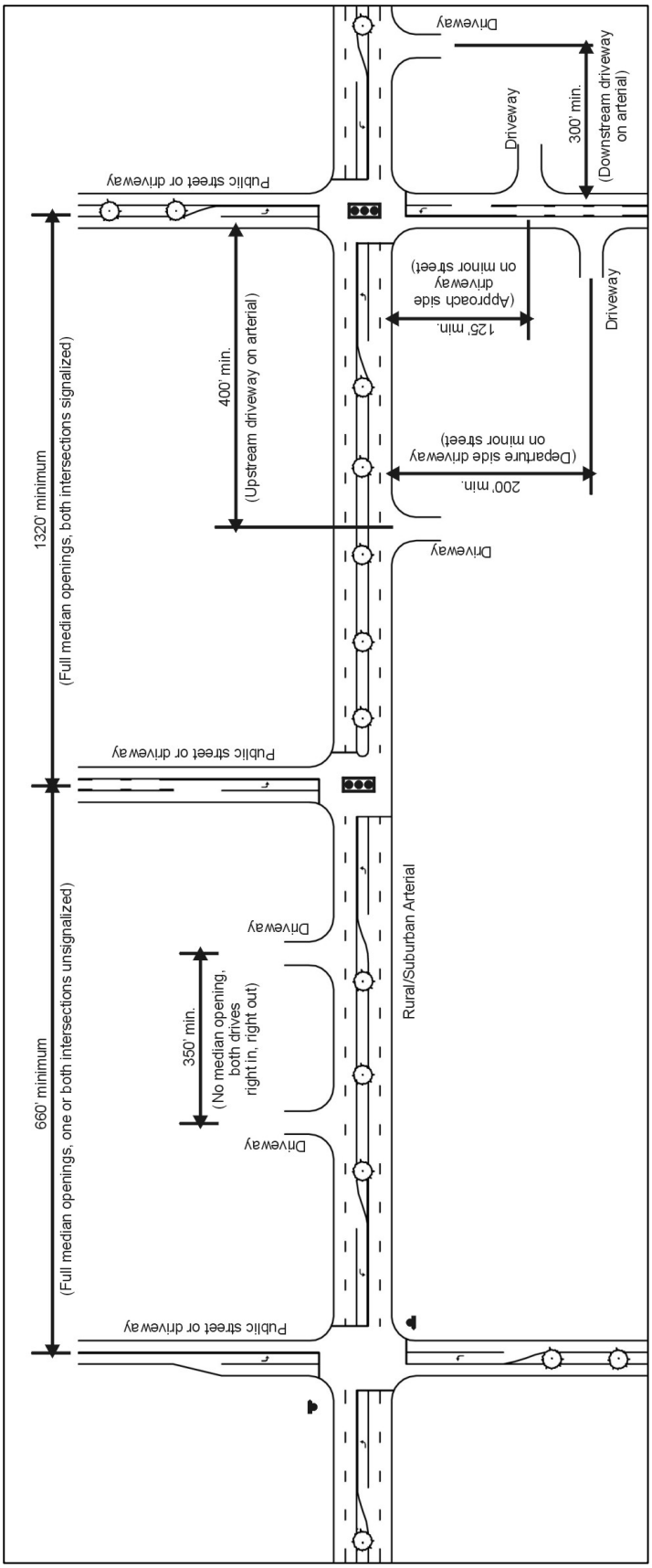



**Figure 3: MTP Access Spacing Guidelines - Minor Arterial**

## *Major / Urban Collector*

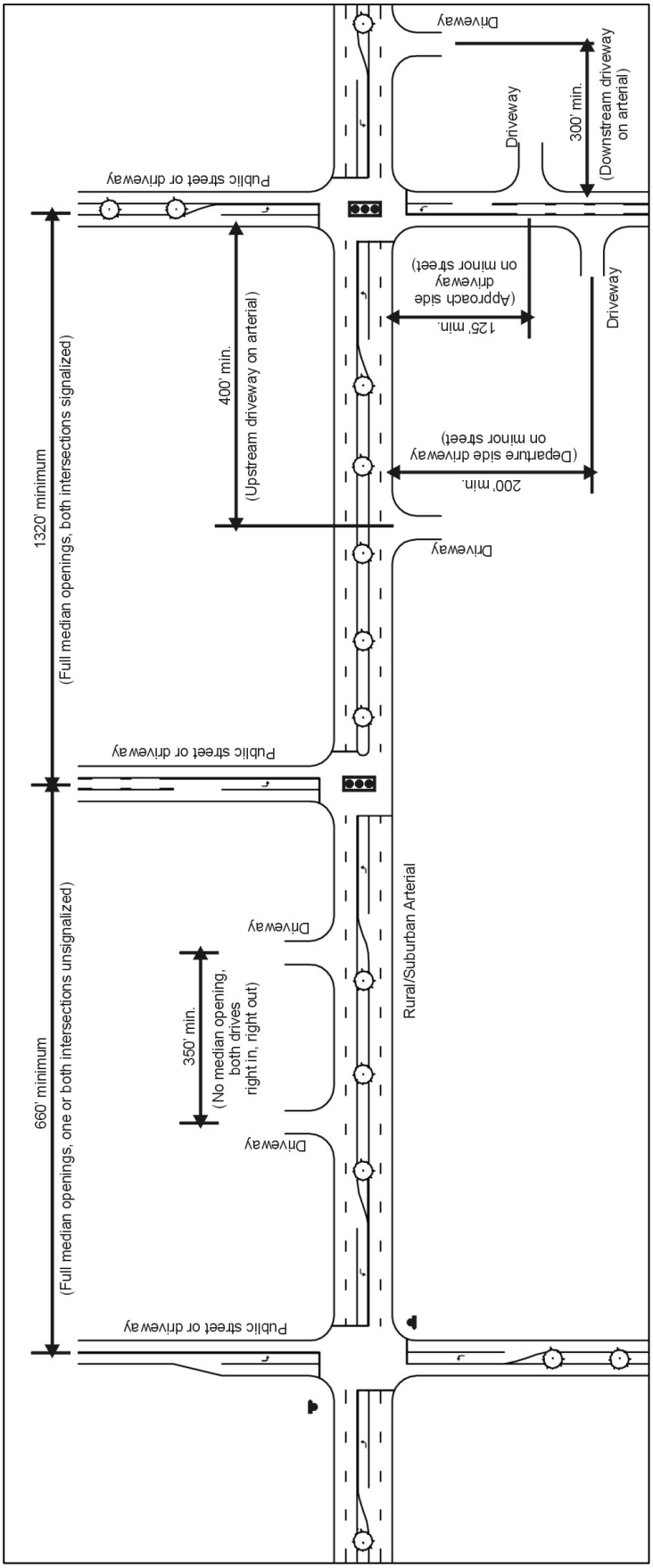



**Figure 4: MTP Access Spacing Guidelines - Major / Urban Collector**

## *Minor / Rural Collector*

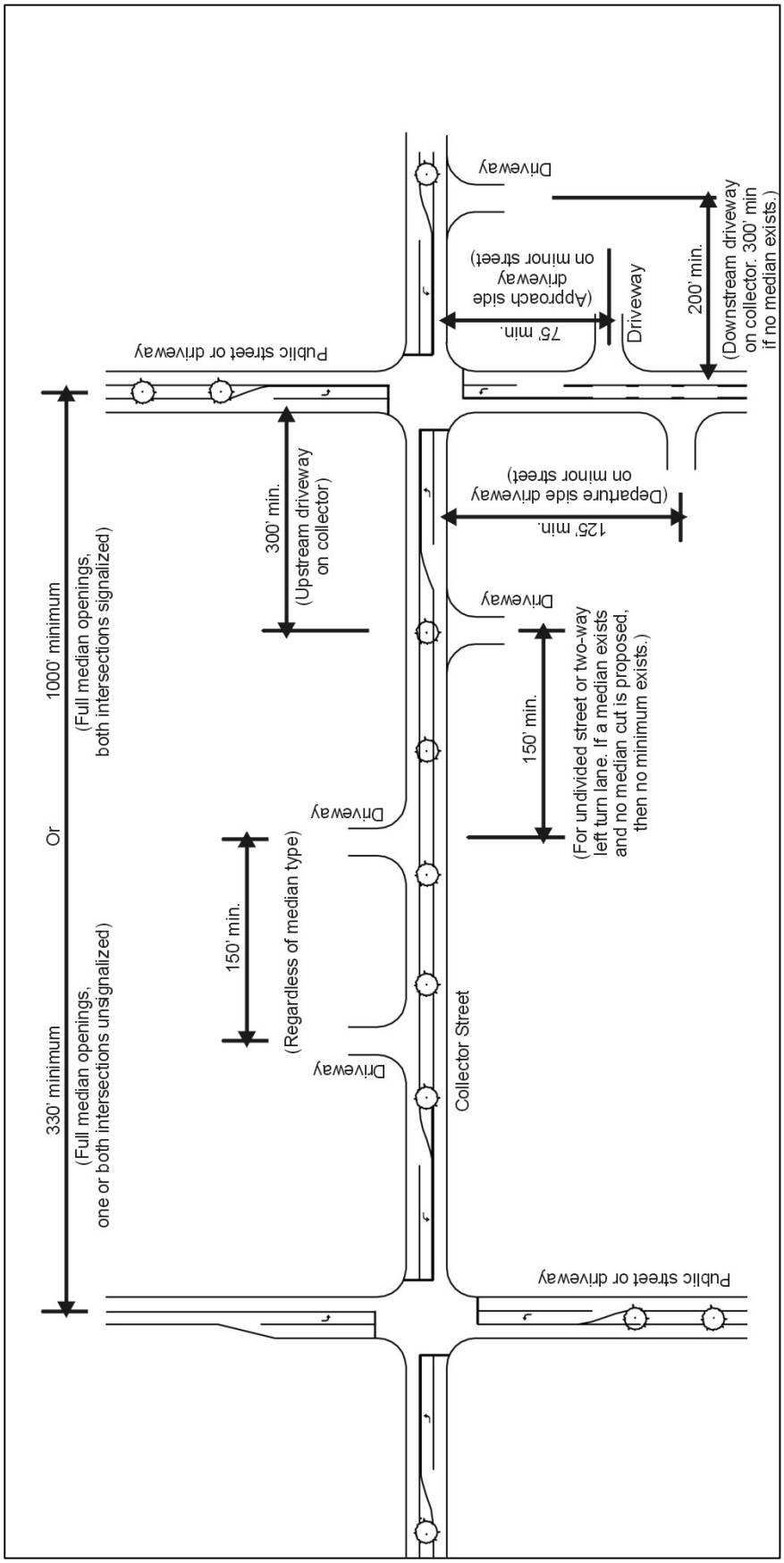



**Figure 5: MTP Access Spacing - Minor Collector**

Cleveland's Major Thoroughfare Plan promotes the Complete Streets Approach. A complete streets approach addresses the needs of bicyclists, pedestrians, transit users, freight, and motor vehicles for people of all capabilities, including those with disabilities, children, and older people. The street is divided into the following zones: frontage zone; pedestrian travel way; buffer zone; on-street parking; bike facility; and travel lane. The width of each zone depends on the density and type of land use in the area. *[City of Cleveland, Major Thoroughfare Plan and Recommendations, in: Comprehensive Plan, Ch.3: Transportation]*

## Cleveland Subdivision Regulations (1997)

Cleveland's Subdivision regulations state in Ch. 4.05, Restriction of Access: When a tract fronts an arterial highway, the planning commission may require such lots to be provided with frontage on a parallel, marginal access road or may require reverse frontage lots. Leaving a wide buffer of existing vegetation is recommended and may be required to lessen the effects of nearby heavy traffic.

## Cleveland – Zoning Ordinance (1996, changes: 2008)

The zoning ordinance of the City of Cleveland contains sections that provide guidance on access control.

The following excerpts are from Chapter 6 of the zoning ordinance, "Fencing Regulations on Limited Access Highways."

According to the zoning ordinance, the city council can designate some locally-owned streets as limited access highways, and negotiate with affected property owners for the right to limit said access.

The driveway regulations contain the following general access requirements:

- A point of access shall not exceed 25 feet in width on lots for residential uses, and 40 feet in width for nonresidential uses, provided that the point of access does not exceed 50 percent of the lot frontage.
- Lots less than 150 feet in width shall have only one point of access to any public street; lots less than 250 feet in width shall have no more than two points of access on through streets.
- The distance between any two points of access shall be at least 25 feet measured from edge of pavement to edge of pavement at the right-of-way line.
- An access point shall be located at least 25 feet from any street intersection measured from the curb radius tangent point or property line radius point.
- Where access to a state or federal highway is controlled by regulations other than those stated herein, the most restrictive regulations shall prevail.

The regulations also contain provisions that driveway entrances should be constructed so vehicles can safely enter and exit, and that the location of the driveway does not interfere with traffic.

In the chapter of design standards for streets it is stated that reserve strips controlling access to streets shall be prohibited except where their control is definitely placed in the city under conditions approved by the planning commission.

Regarding driveway curb cuts, no one shall cut, build, or maintain a driveway across a curb or sidewalk without first obtaining a permit from the public works director. Driveways shall not exceed 35 feet in width at its outer or street edge and when two or more adjoining driveways are provided for the same property a safety island of not less than 10 feet in width at its outer or street edge shall be provided.

According to Ch. 3.4.1, joint use driveways and cross access easements shall be established wherever feasible along arterial streets and major collector streets. The city may reduce required separation distances of access points provided that joint access driveways and cross access easements are provided.

The process of approving driveway permits is integrated in the site plan review, which is done by the City of Cleveland. The Public Works Director is contacted for new driveway cuts and the City's Development and Engineering Department reviews the proposed driveway cuts. The City of Cleveland currently does not require the property owner to complete a formal driveway permit form and/or pay a permitted fee for access. The SR 60 Corridor Management Committee recommended that both the City of Cleveland and Bradley County develop a driveway permit form similar in format. It was also recommended that all driveway permit requests be addressed on a coordinated effort between the jurisdiction and TDOT.

## 2.3 The Study Area

The study area is a 25-mile segment of State Route 60 in Bradley County. The section of SR 60 that is part of this study begins at the Tennessee-Georgia state line and ends at the Hamilton County boundary.

To the south, State Route 60 leads into the state of Georgia and becomes SR 71. State Route 71 runs to the city of Dalton and becomes US Highway 41, which parallels I-75 into Atlanta. Into the northern direction, SR 60 continues into Hamilton County, then into Meigs County, and terminates in the city of Dayton in Rhea County at SR 29 (U.S. 27). It is a 17-mile segment from the Bradley County line to Dayton.

For the purpose of the Access Management planning study, SR 60 has been divided into six sections as shown in the following table and map. (see Table 2)

| **Table 2: Study Sections** | | | |
|---|---|---|---|
| **Section** | **Road Section** | **Log Mile** | **Length (mi)** |
| I. | Georgia State Line to intersection with Golf Drive | LM 0 – 8.69 | 8.69 miles |
| II. | Golf Drive to US 64 bypass. | LM 8.69 – 10.96 | 2.27 miles |
| III. | From US 64 bypass at McGrady Drive to intersection with Parker Street. | LM 10.96 – 15.01 | 4.05 miles |
| IV. | Intersection with Parker Street to intersection with West Lake Drive | LM 15.01 – 16.97 | 1.96 miles |
| V. | From West Lake Drive to intersection with SR 306. | LM 16.97 – 19.89 | 2.92 miles |
| VI. | From SR 306 to Hamilton County line. | LM 19.89 – 25.06 | 5.17 miles |
| *Source: TDOT. TRIMS. 2014* | | | |

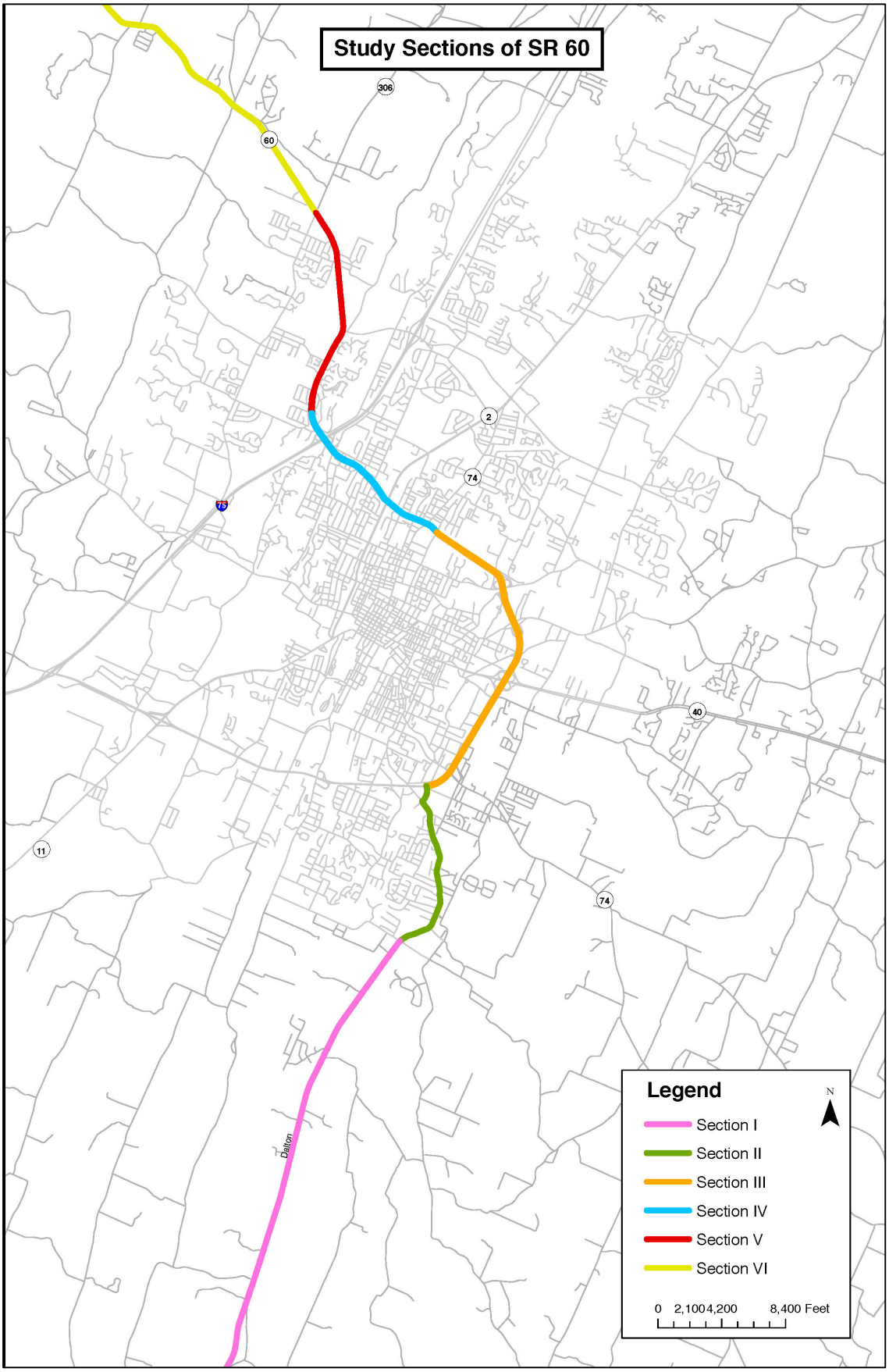



**Figure 6: Study Sections of SR 60**

## 2.4 Functional Classification

Federal functional classification has three basic classification categories to describe roadways: arterials, collectors, and locals. Arterials are primarily designed for through movement, while local roads are focused on access to abutting land uses. Collectors provide intermediate functionality between arterial and local.

There is a basic relationship between functionally classified highway systems in serving traffic mobility and land access. Arterials provide a high level of mobility and a greater degree of access control, while local facilities provide a high level of access to adjacent properties but a low level of mobility. Collector roadways provide a balance between mobility and land access. Figure 7 shows the relationship of functionally classified highway systems in serving traffic mobility and land access. [*FHWA. 2012. Flexibility in Highway Design, Chapter 3: Functional Classification*].

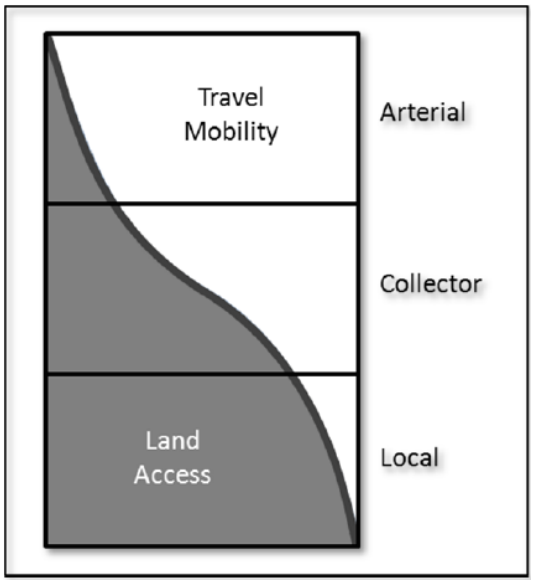



**Figure 7: Functional Class and Accessibility**

The SR 60 segment varies in its functional classifications. There are three different functional classifications: Minor Arterial; Freeway/Expressway; Principal Arterial. The following Table 3 shows the functional classification and adjacent land use.

| Table 3: Functional Classification of SR 60 Sections | | | |
|---|---|---|---|
| **Section** | **Log Mile** | **Functional Class** | **Land Use** |
| I. | 0 – 3.704 | Rural Minor Arterial | Rural |
| | 3.704 – 8.62 | Urban Minor Arterial | Fringe (Mixed Residential Commercial) |
| II. | 8.62 – 10.96 | Urban Minor Arterial | Fringe (Mixed Residential Commercial) |
| III. | 10.96 – 11.29 | Urban Minor Arterial | Rural |
| | 11.29 – 13.82 | Urban Freeway/ Expressway | Commercial |
| | 13.82 – 14.67 | | Rural |
| | 14.67 – 15.18 | | Commercial |
| IV. | 15.18 – 16.69 | Urban Principal Arterial | Commercial |
| V. | 16.69 – 17.02 | Urban Principal Arterial | Commercial |
| | 17.02 – 17.322 | | Fringe (Mixed Residential Commercial) |
| | 17.322 – 17.46 | | Residential |
| | 17.46 – 19.62 | | Fringe (Mixed Residential Commercial) |
| VI. | 19.62 – 25.06 | Urban Principal Arterial | Rural |
| *Source: TDOT. TRIMS. 2015.* | | | |

From the Georgia state line, SR 60 is classified as a rural minor arterial until it passes the urban boundary and becomes an urban minor arterial. Continuing on the U.S. 64 bypass, there is a short section classified as urban minor arterial that changes into an urban freeway/expressway classification. After the intersection with Spring Creek Drive it transitions into an urban principal arterial to the Hamilton County line.

The following map illustrates the functional classification of SR 60.

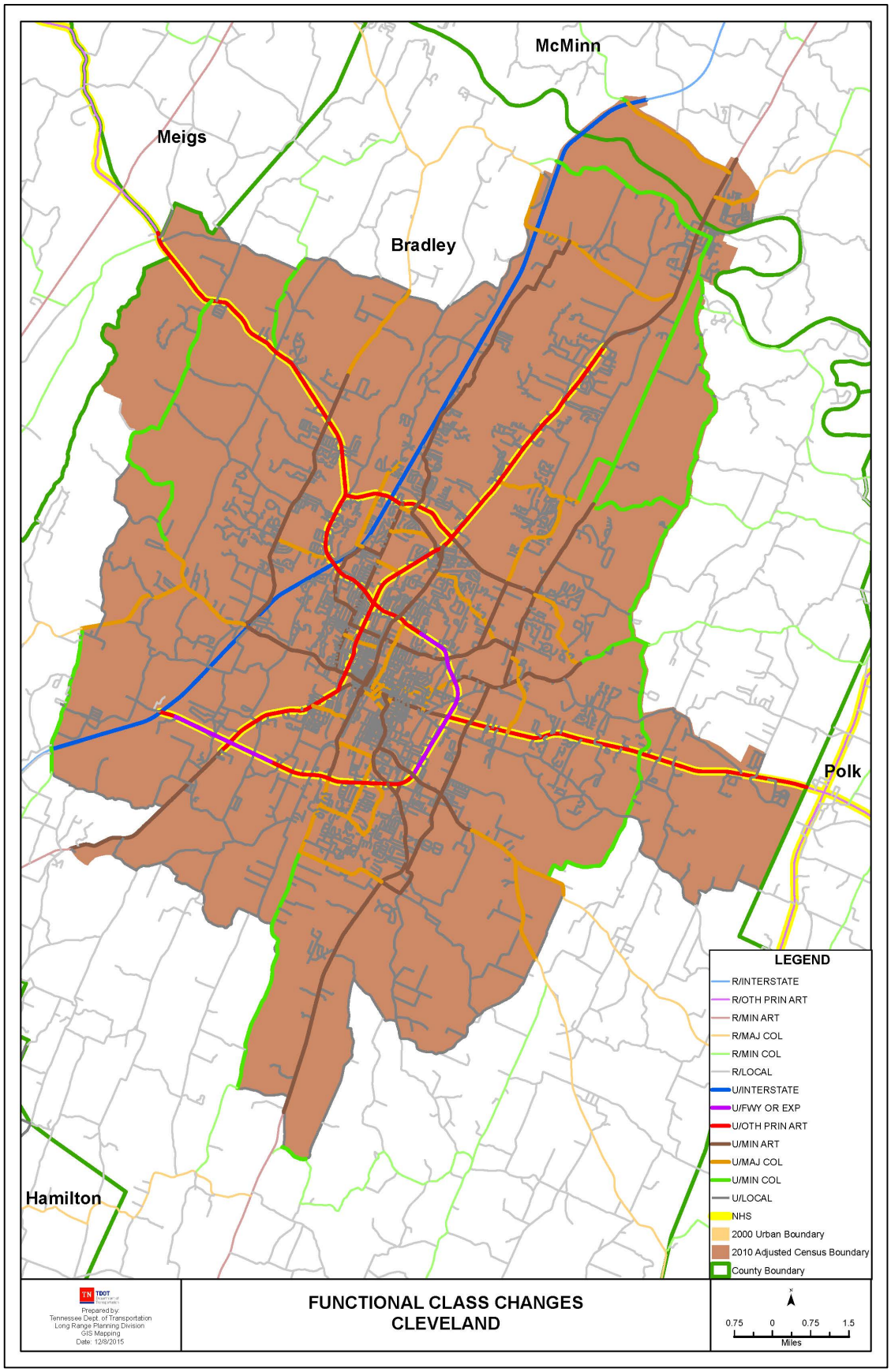



**Figure 8: Functional Classification of SR 60** ***[Source: TDOT. Long Range Planning Division, GIS Mapping, 2015]***

## 2.5 Existing and Future Land Uses along Corridor 60

Land uses vary along SR 60 as the highway transitions from rural to suburban, urban, and back to rural again. The southern and northern sections of SR 60 are in a rural setting, whereas the middle section is in the urban area of Cleveland. Therefore, there is a wide array of land uses that influence the traffic.

The following table lists existing and future planned land uses by sections.

| **Table 4: Existing and Future Land Uses** | |
|---|---|
| **Existing Land Uses** | **Future Land Uses** |
| ***Section I.*** | |
| The land uses along this section are mainly agricultural, forest, and undeveloped land.<br>There is some sparse, low-dense residential development.<br>There are a few churches, and an elementary school (Waterville Elementary School) along this section. | This area is planned to remain rural with land uses such as forest, agriculture, and residential.<br>Near the state border to Georgia along SR 60 a future employment area is planned. |
| ***Section II.*** | |
| Land uses consist of mostly low-dense residential development.<br>Along SR 60 is a golf course (Waterville Golf Course).<br>Closer to Treasury Drive and McGrady Drive are commercial and retail development (e.g. Walmart Supercenter, Walgreens, restaurants, shops, etc.). | The west side of SR 60 is planned to have low to medium-density single-family housing.<br>The east side of SR 60 could be reserved for agriculture, forest and low-dense residential land uses.<br>The area around the interchange with U.S. 64 bypass should be medium density community mixed use. |
| ***Section III.*** | |
| Most land along SR 60 consists of agricultural development, forest, and undeveloped acreage.<br>Some low-dense residential and scattered commercial development as well as industrial development.<br>Industrial development at the interchanges with SR 40 and 20th Street. There are four interchanges on U.S. 64 bypass at SR 74 (Spring Place Road); a major interchange at SR 40; Benton Pike and at 20th Street.<br>Closer to the urban center of Cleveland is new higher density residential and mixed-use development ("Spring Creek development"). | The west side of SR 60 should be low-density residential and high/medium density community mixed-use development.<br>The east side of SR 60 could remain for agricultural, forest and residential uses and industrial uses as it is currently.<br>Industrial land uses could be between SR 40 and 20th St, around the interchange with 20th Street, and the Benton Pike interchange (proximity to Whirlpool).<br>In the city center area, medium density single-family housing is desired along the corridor. |

| ***Section IV.*** | |
|---|---|
| This section is characterized by urban development with a mix of land uses.<br><br>There is residential development consisting of single-family homes and multi-family homes.<br><br>Aside from some institutional and office development (e.g. Church of God office complex, Tennova Healthcare – Cleveland hospital), there are a variety of commercial development such as retail stores, restaurants, hardware stores, hotels, etc.<br><br>Around the I-75 interchange is the typical interchange commercial development consisting of gas stations, restaurants, motels and some offices. | This section is planned to have a mix of land uses as it is currently since most of the land is developed and has a designated use.<br><br>Land bordering SR 60 is designated for low and medium density residential uses, medium density community mixed use and public land uses.<br><br>Commercial development will remain in and around the I-75 interchange. |
| ***Section V.*** | |
| This section is mostly characterized by low-density residential development. There is access from SR 60 to several residential neighborhoods.<br><br>There are churches (Westwood Baptist Church), schools (Cleveland Middle School; Hopewell Elementary School) and some sparse retail stores along this section.<br><br>To the east side of SR 60 (north of Ann Ln) is some commercial development (gas station, etc.). | The desired land uses along this section are medium density single family residential, and some land tracts are set aside for commercial development.<br><br>It is planned to extend Paul Huff Parkway across SR 60 to serve an area set aside for commercial development.<br><br>A new elementary school is planned west of SR 60 north of the bridge over Candies Creek (upper Section V.) |
| ***Section VI.*** | |
| Along this section are mainly agricultural, forests, and undeveloped land uses.<br><br>Some low-density residential development is along the corridor. | Along SR 60, some acreage is designated as a future employment area. An area for future employment is also set-aside near the Hamilton County line. |

## 2.6 Roadway Features

State Route 60 has two lanes from the Georgia state line to the Waterville Elementary School (Section I). Then the highway becomes four lanes until the intersection with West Lake Drive (Section V). TDOT is currently developing a highway project to widen SR 60 from two to four lanes from West Lake Drive to SR 306.

| Table 5: Roadway Features | | | | | | |
|---|---|---|---|---|---|---|
| **Section** | **Log Mile** | **Lanes** | **Lane width** | **Shoulder width** | **ROW** | **Sidewalks** |
| **I** | 0 - 1.92 | 2 | 12 | 8 ft. | 120 ft. | no sidewalks |
| | 1.92 - 8.36 | 2 | 12 | 8 (14ft @ LM 8.2-8.38) | 120 ft. | no sidewalks |
| | 8.36 - 8.49 | 2 | 12 | 23 ft. to LM 8.42, then 16ft | 120 ft. | sidewalks |
| | 8.49 - 8.69 | 4 | 12 | 2 ft. | 120 ft. | sidewalks |
| II | 8.69 - 10.74 | 4 | 12 | 2 ft. | 120 ft. | sidewalks |
| | 10.74 - 10.96 | | | | 120 ft. | sidewalks |
| III | 10.96 - 11.31 | 4 | 12 | 10 ft. | 150 ft. | no sidewalks |
| | 11.31 - 13.39 | 4 | 12 | 10 ft. | 150 ft. | no sidewalks |
| | 13.39 - 13.89 | 4 | 12 | 2-14 ft. | 150 ft. | no sidewalks |
| | 13.89 – 15.01 | 4 | 12 | 2-20 ft. | 150 ft.; 86 ft. (LM 14.67) | begin sidewalks @LM 14.67 (Spring Creek Blvd.) |
| IV | 15.01 – 15.18 | 4 | 12 | 2-20 ft. | 86 ft. | sidewalks |
| | 15.18 - 15.75 | 4 | 12 | 2 ft. | 80 ft. | sidewalks |
| | 15.75 - 16.97 | 4 | 12 | 2-10 ft. | 150 ft. | no sidewalks |
| V | 16.97 - 17.46 | 4 | 12 | 8 ft. | 300 ft. | no sidewalks |
| | 17.46 - 18.35 | 2 | 12 | 2-11 ft. | 150 ft. | no sidewalks |
| | 18.35 - 19.89 | 2 | 12 | 11-16 ft. | 60 ft. | no sidewalks |
| VI | 19.89 - 21.63 | 2 | 12 | 2-4 ft. | 60 ft. | no sidewalks |
| | 21.63 - 25.06 | 2 | 12 | ~ 4 ft. | 60 ft. | no sidewalks |
| *Source: TDOT. TRIMS. 2014.* | | | | | | |

The right-of-way (ROW) width varies on SR 60. Regarding Cleveland's guidelines in the Major Thoroughfare Plan (see Ch. 2.2), most of the current ROW is within the recommended guidance. However, there are some sections on which the ROW in insufficient.

- Section IV: LM 15.18 – 15.83: The current ROW is 80 ft. and should be 120 ft.
- Section V: LM 17.46 – 19.62: The current ROW is 60 ft. and should be 120 ft.
- Section VI: LM 19.62 – 25.06: The current ROW is 60 ft. and should be 120 ft.

All those sections are functionally classified as a "principal arterial" and it is recommended in the Major Thoroughfare Plan to provide for a 120 ft. ROW. This is subject to change in the future along Section V, which will be widened to four lanes. The new ROW for the SR 60 project will be about 104 ft.

The width of lanes along SR 60 is the standard 12 feet.

The width of shoulders along SR 60 varies. According to AASHTO's highway design guidelines, arterials with sufficient traffic volume to justify the construction of four lanes also justify the provision of full-width shoulders, which should be at least 8 ft. On divided arterials with two lanes in each direction, the shoulder should be at least 4 ft. [*AASHTO. A Policy on Geometric Design of Highways and Streets. Ch. 7: Rural and Urban Arterials. 2004]*.

There are some sections along SR 60 that have insufficient shoulder width. For example, Section II has two to five ft. shoulders up to the intersection with U.S. 64 bypass. Also the road segment beginning shortly before Spring Creek development up to Keith Street has two to five ft. shoulders, which is insufficient for a four-lane principal arterial highway. Insufficient shoulder width is also on the road segment on Section V; however, this will be improved in TDOT's widening project.

The shoulder width is shown on the following map.

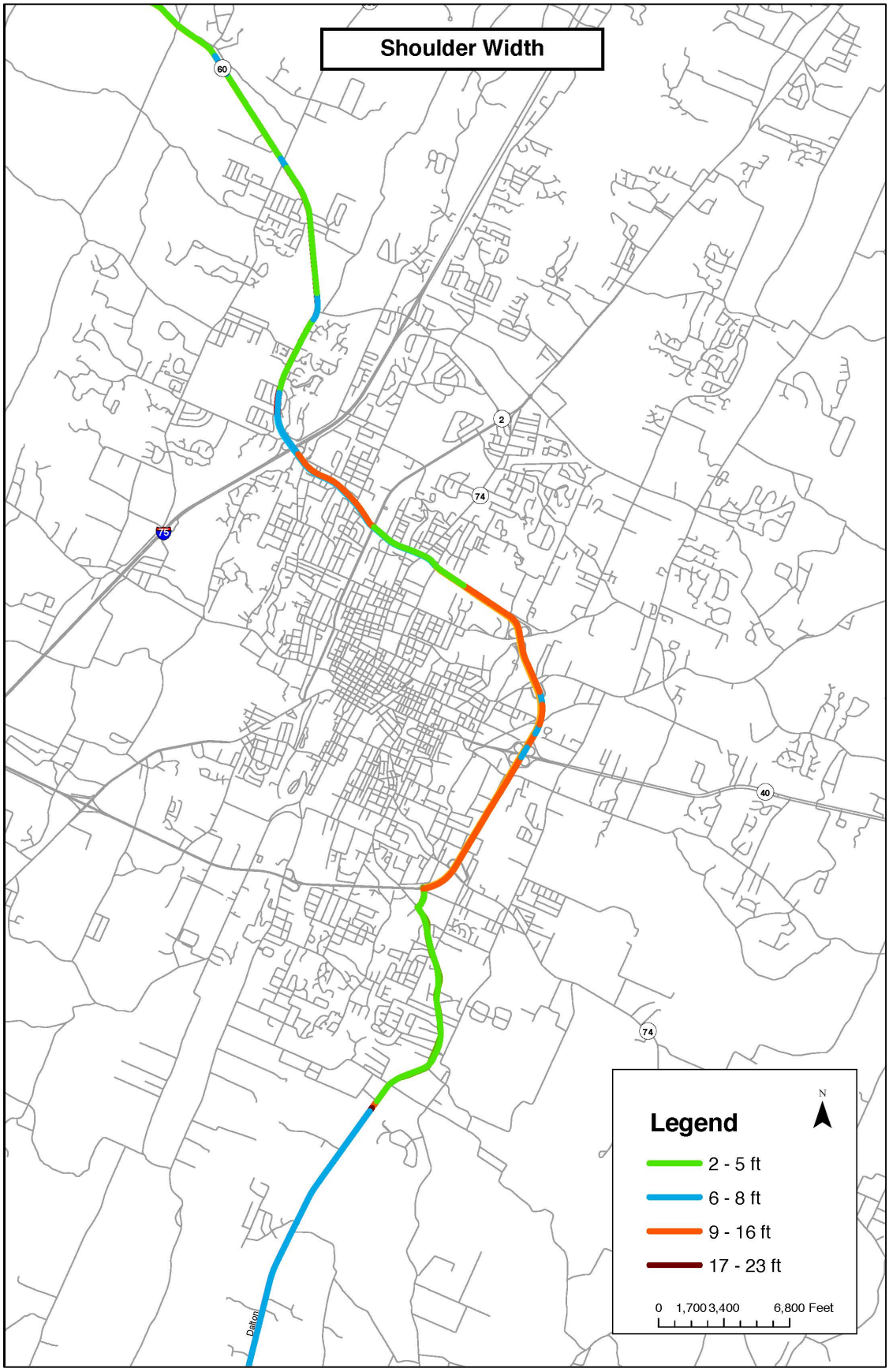



**Figure 9: Shoulder Width**

## 2.7 Traffic and Capacity

### 2.7.1 Traffic Volumes

The traffic volumes are highest on Section III and IV. Those road segments, which consist of four lanes, are classified "urban freeway" and "urban principal arterial." Beginning on U.S. 64 bypass up to the I-75 ramp, traffic volumes range from 15,631 to 32,420 vehicles per day (VPD).

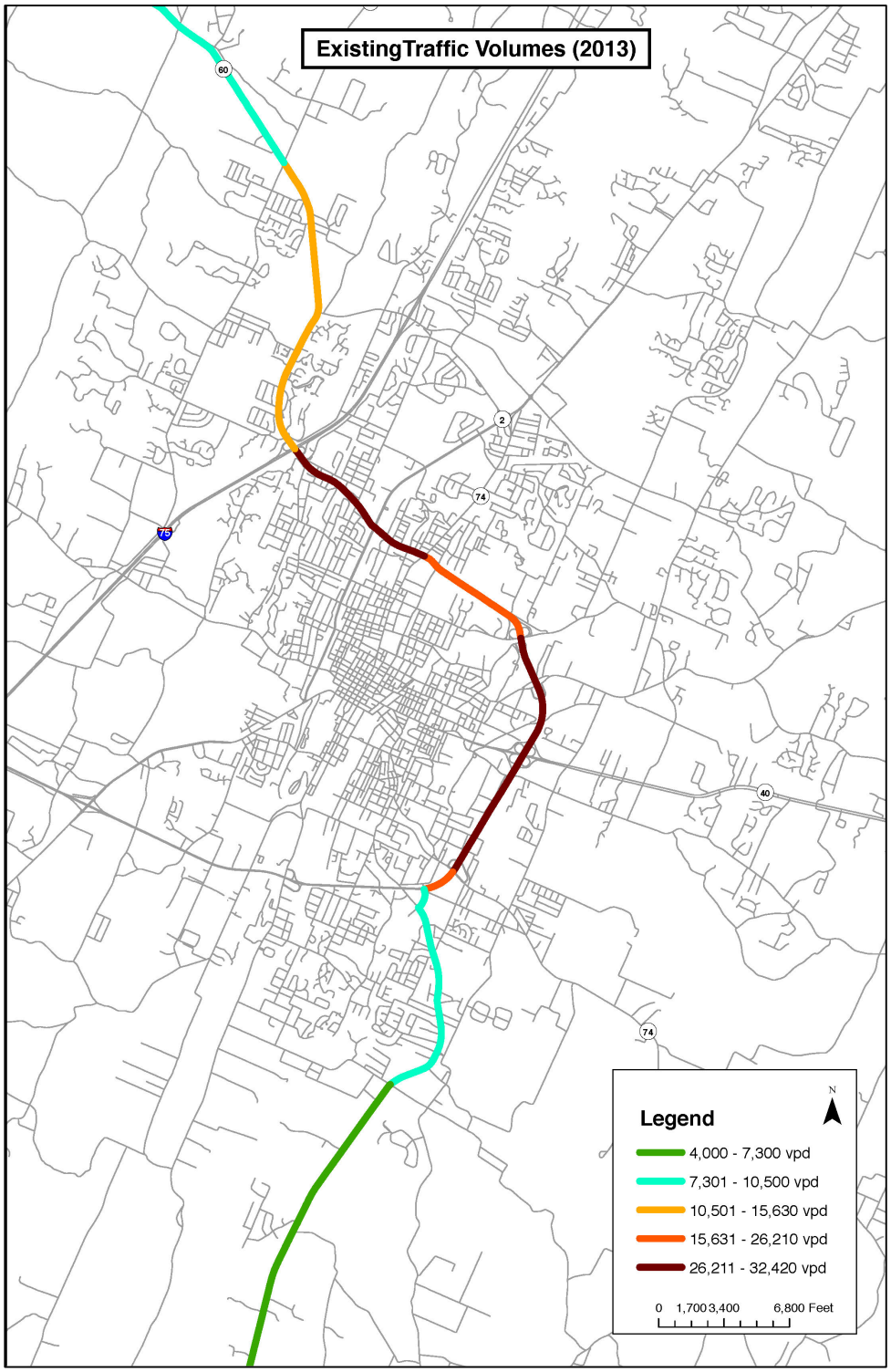



**Figure 10: Existing Traffic Volumes (AADT)**

In the forecast year of 2034, the AADT increases on most road segments. The traffic on the U.S. 64 bypass section, which already shows high volumes in the existing year (26,000 – 32,000 VPD), increases even more, up to 42,418 VPD. Traffic on the section along the Spring Creek Development is also projected to increase.

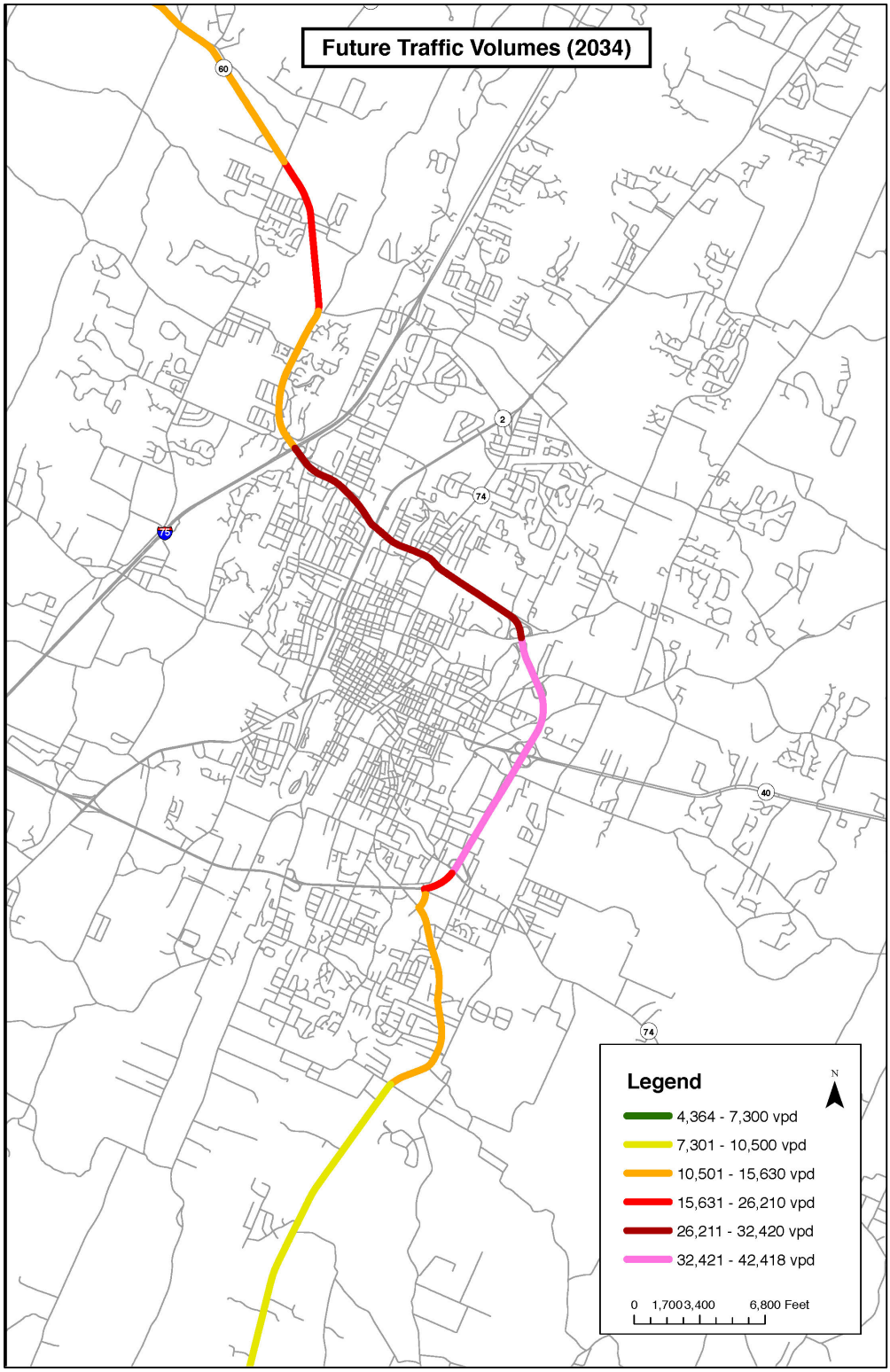



**Figure 11: Future Traffic Volumes (AADT)**

### 2.7.2 Traffic Capacity

Level of service (LOS) is a qualitative measure that is used to gauge the operational performance intersection or roadway segment. There are six levels ranging from LOS A to LOS F. Each level represents a range of operating conditions as shown in the following table.

**Table 6: Level of Service Descriptions**

| LOS | Traffic Flow Conditions |
|---|---|
| A | Motorists are able to travel at free-flow speeds and are almost completely unimpeded in their ability to maneuver within the traffic stream. The effects of incidents or point breakdowns are easily absorbed. |
| B | Free-flow speeds are maintained and the ability to maneuver within the traffic stream is only slightly restricted. The general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents and point breakdowns are still easily absorbed. |
| C | Traffic flows at speeds near the free-flow speed. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes still require more care and vigilance on the part of the driver. Minor incidents may still be absorbed, but the local deterioration in service quality will be significant. |
| D | Speeds begin to decline with increasing flows, with density increasing more quickly. Freedom to maneuver within the traffic stream is seriously limited and drivers experience reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing because the stream has little space to absorb disruptions. |
| E | Highway is operating at capacity. Operations are highly volatile because there are virtually no usable gaps within the traffic stream, leaving little room to maneuver. Any disruption to the traffic stream, such as vehicles entering from propagates throughout the upstream traffic flow. |
| F | Breakdown or unstable flow. |

The following maps show the existing (2013) and future (2034) level of service along SR 60.

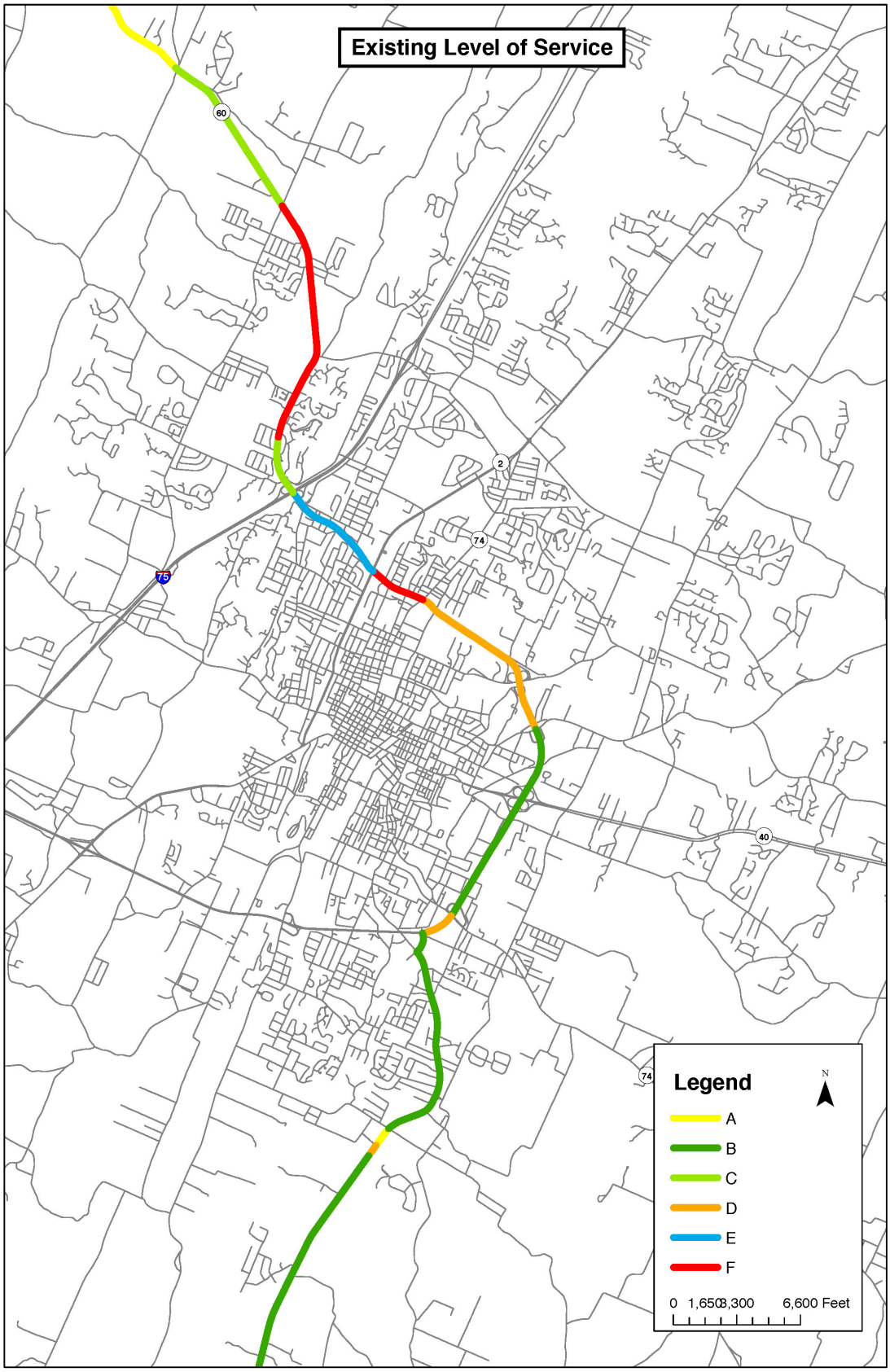



**Figure 12: Existing Level of Service**

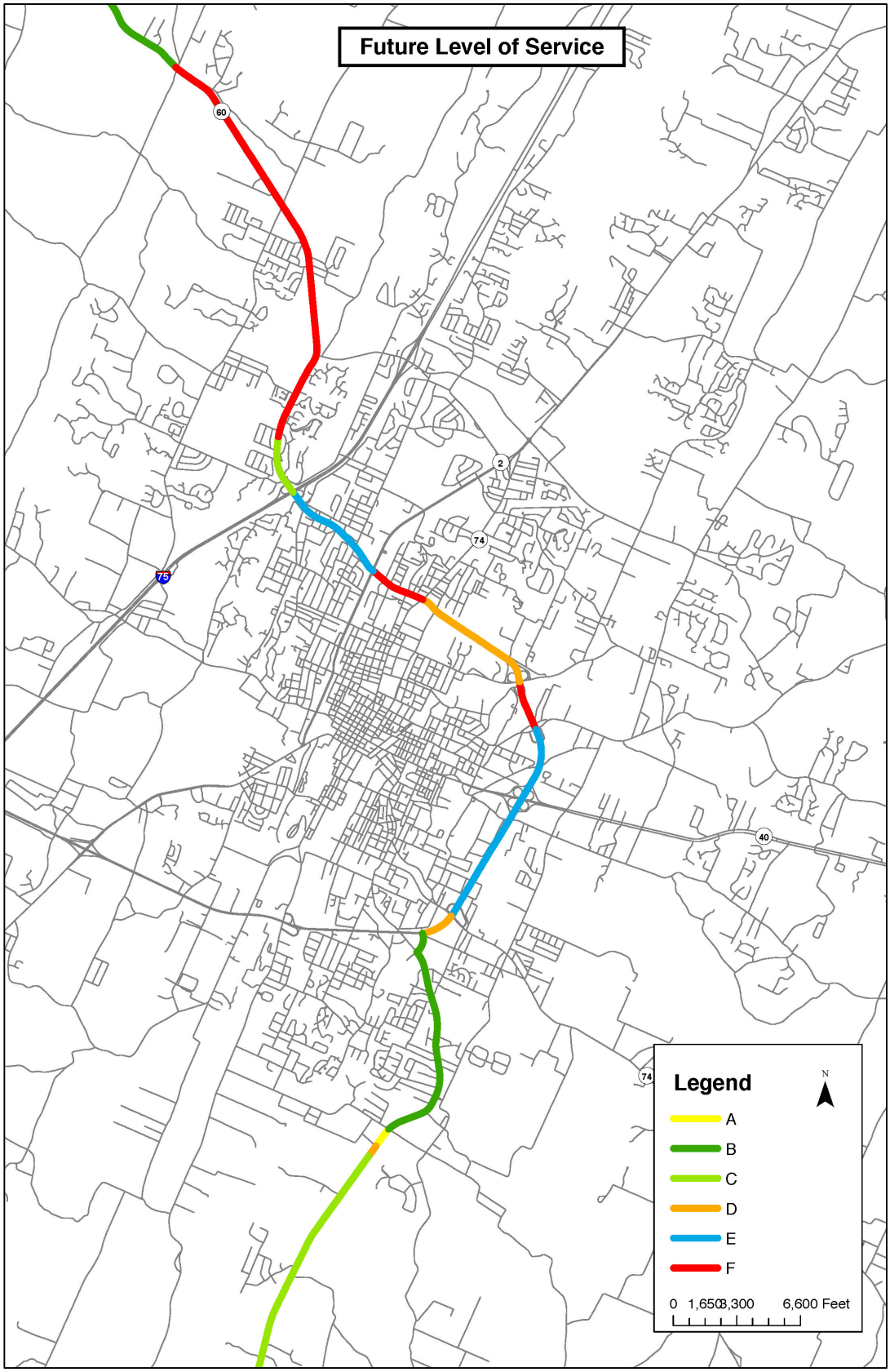



**Figure 13: Future Level of Service**

The analysis of the current level of service indicates that several sections have capacity issues. The worst LOS is on SR 60 starting after the intersection with Ocoee Street to Keith Street, which a LOS F. State Route 60 continues with LOS E up to the I-75 underpass.

The analysis of the future level of service shows that Section III, from SR 74 (Spring Place Road) interchange to 20th Street interchange has a LOS E and F in the forecast. The segment of SR 60 from the 20th Street interchange adjacent to the Spring Creek Development up to the intersection with SR 74 (Ocoee Street) has LOS D in the existing year and in the forecast. This section has to be monitored for potential capacity issues. Like the existing LOS also the future LOS is E and F on the section starting at the intersection of Ocoee Street to the I-75 ramp.

The current and future LOS on Section V is F, since the roadway is two lanes. However, if the section is widened to four lanes, capacity will improve. According to TDOT's Statewide Model, the scenario of four lanes in 2040 would result in the LOS A and B on the section between West Lake Drive and Paul Huff Parkway, and LOS B between Paul Huff Parkway and SR 306 (Eureka Road).

Chapter 2.9 will discuss the impacts from current and/or future projects.

### 2.7.3 Truck Traffic

There is notable truck traffic on the southern section of SR 60 (Sections I + II) up to the city limits of Cleveland. The share of multi-unit trucks on traffic ranges between 13% and 24%. This is due to trucks traveling on SR 60 to/from Dalton (GA) connecting to I-75. Low truck traffic volumes and percentages of truck traffic are between 1-3% within the city and on the northern part of SR 60. See Figure 14.

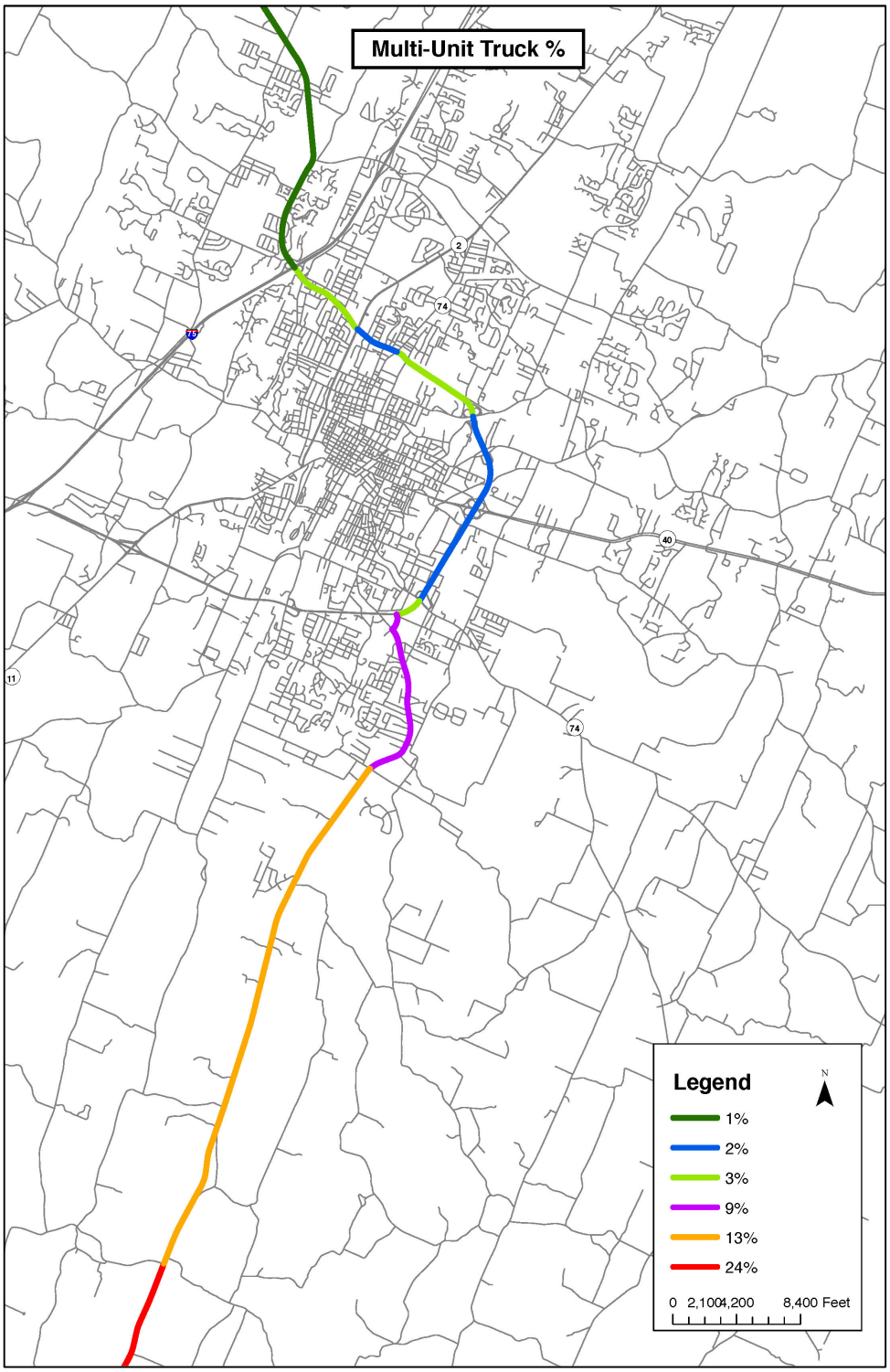



Figure 14: Truck Traffic

Table 7 sums up truck traffic, level of service, and traffic volumes. It also indicates the first year of deficiency, which is when LOS becomes D or worse.

**Table 7: Traffic Volumes, Truck Traffic, and Level of Service**

| Section | Log Mile | SU Truck % | MU Truck % | LOS 2014 | LOS 2019 | LOS 2024 | LOS 2029 | LOS 2034 | LOS 2038 | 1st Year Def. | AADT 2013 | AADT 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I. | 0 - 1.92 | 5 | 24 | B | B | B | B | B | B | N/A | 4,000 | 4,303 |
| | 1.92 - 8.36 | 3 | 13 | B | B | B | C | C | C | N/A | 7,300 | 9,191 |
| | 8.36 - 8.49 | 3 | 13 | D | D | D | D | D | D | 2014 | 7,300 | 9,191 |
| | 8.49 - 8.69 | 3 | 13 | A | A | A | A | A | A | N/A | 7,300 | 9,569 |
| II. | 8.69 - 10.96 | 2 | 9 | B | B | B | B | B | B | N/A | 10,500 | 11,615 |
| III. | 10.96 - 11.31 | 1 | 3 | D | D | D | D | D | D | 2014 | 26,210 | 26,210 |
| | 11.31 - 13.39 | 1 | 2 | B | C | C | D | D | E | 2025 | 32,420 | 40,752 |
| | 13.39 - 13.89 | 1 | 2 | D | D | D | E | E | F | 2014 | 30,090 | 35,753 |
| | 13.89 - 15.01 | 1 | 3 | D | D | D | D | D | D | 2014 | 24,720 | 27,790 |
| IV. | 15.01 – 15.18 | 1 | 3 | D | D | D | D | D | D | 2014 | 24,720 | 27,790 |
| | 15.18 - 15.75 | 1 | 2 | F | F | F | F | F | F | 2014 | 30,020 | 31,581 |
| | 15.75 - 16.97 | 1 | 3 | E | E | E | E | E | E | 2014 | 28,560 | 28,560 |
| V. | 16.97 - 17.46 | 2 | 1 | C | C | C | C | C | C | N/A | 14,350 | 15,406 |
| | 17.46 - 18.35 | 2 | 1 | F | F | F | F | F | F | 2014 | 14,350 | 15,406 |
| | 18.35 - 19.89 | 2 | 1 | F | F | F | F | F | F | 2014 | 15,630 | 19,659 |
| VI. | 19.89 - 21.63 | 3 | 1 | C | D | D | E | E | F | 2015 | 8,930 | 11,663 |
| | 21.63 - 25.06 | 3 | 1 | A | B | B | B | B | B | N/A | 8,930 | 11,663 |

*Source: TDOT. Evaluation of Roadway Efficiency (EVE) Software. 2014.*

## 2.8 Multi-Modal Transportation System

Public Transportation

Cleveland has public transit provided by the Cleveland Urban Area Transit System, which is operated by the Southeast Tennessee Human Resource Agency (SETHRA). Buses run from 6:00 am thru 7:00 pm. There are five different bus routes (blue; red; green; orange; gold) that run through the urban area of Cleveland. *[Cleveland Urban Area Transit System. 2015].*

The bus system utilizes SR 60 at some locations: Two bus stops are located on McGrady Drive (Section I). Along Section IV are four bus stops serviced by three of the five bus routes (gold; yellow; green). A sidewalk system to interconnect with transit is lacking in Section IV where bus stops are located. Transit benches and transit shelters are lacking throughout the system.

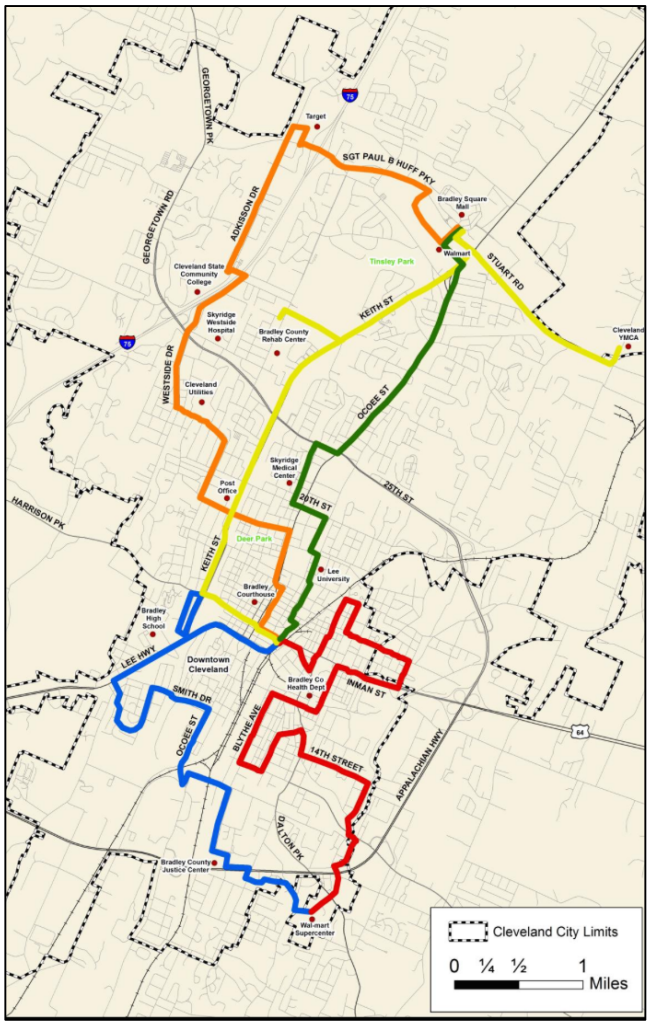



Figure 15: Bus Routes in Cleveland

Greenway

Cleveland has a greenway along South Mouse Creek. There are connections to the greenway from SR 60 at Keith Street. The greenway runs from Willow Street to north of Mohawk Drive through Lee University. It is planned to extend the greenway to the south from 17th Street to Lee Highway, and to extend to the north to Stuart Road. The other existing greenway is shown at the northeast corner of the intersection of Old Tasso Road and Stuart Road.

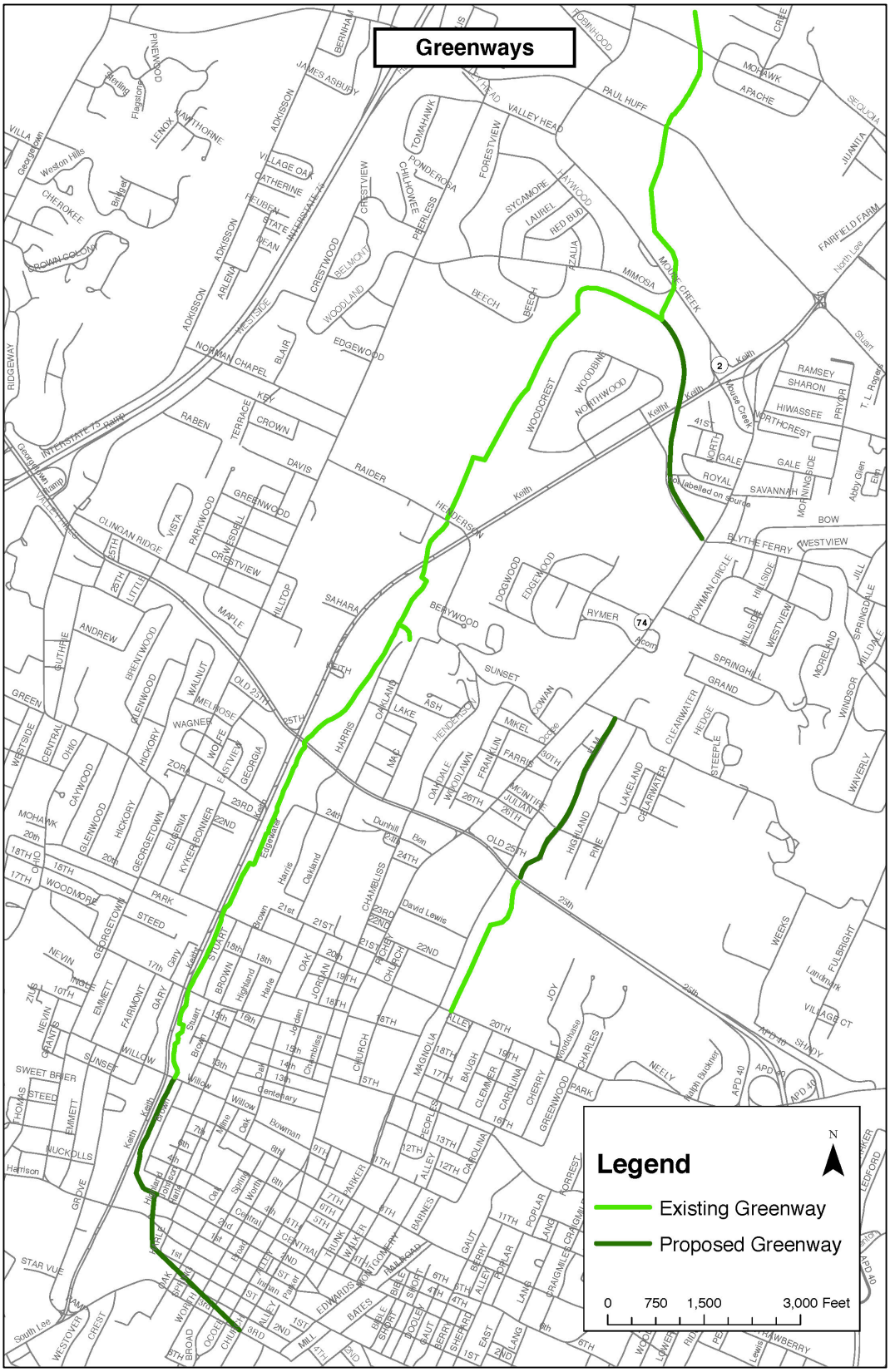



**Figure 16: Existing and Proposed Greenways**

Sidewalks

Sidewalks are most consistently provided in the downtown area of Cleveland; however, the provision of sidewalks is inconsistent for most of the SR 60 route. Sidewalks are consistently provided on SR 60 shortly before the Cleveland Urban Boundary (at the Waterville Elementary School) along McGrady Drive, up to the intersection with SR 60. Then there is a gap of several miles up to the intersection of 25th Street / SR 60 with Spring Creek Drive. New residential and commercial development will be developed in that area. Sidewalks on both sides of the road are provided until the intersections with Old 25th Street (southern lane) and Keith Street (northern lane). Though mixed residential and commercial development continues along the SR 60 corridor, there is no sidewalk provided. At the intersection of SR 60 with Keith Street, the sidewalks connect to the greenway under the state highway overpass.

In a multi-modal access grant proposal (due January 2016), the City of Cleveland proposes a sidewalk in the SR 60 corridor between Keith Street and Georgetown Road/ Westside Drive. This project shall connect the end of the existing sidewalk on Peerless Road and the end of the sidewalk on SR 60 near the intersection of Old 25th Street.

Consistent sidewalks are desirable for most of SR 60, in particular for Section IV due to the mixed-use development adjacent to the roadway. Residential and commercial development consisting of restaurants, retail, hotels, etc. along SR 60 encourages the provision of sidewalks. The following maps show locations for desired sidewalks.

FHWA recommends in their "Pedbikesafe" guidelines for New Sidewalk/Walkway installations, to require sidewalks along roadways classified as rural/suburban highways (ADT > 2,000); suburban highways, major arterials, and minor arterials. Those classifications apply to SR 60.

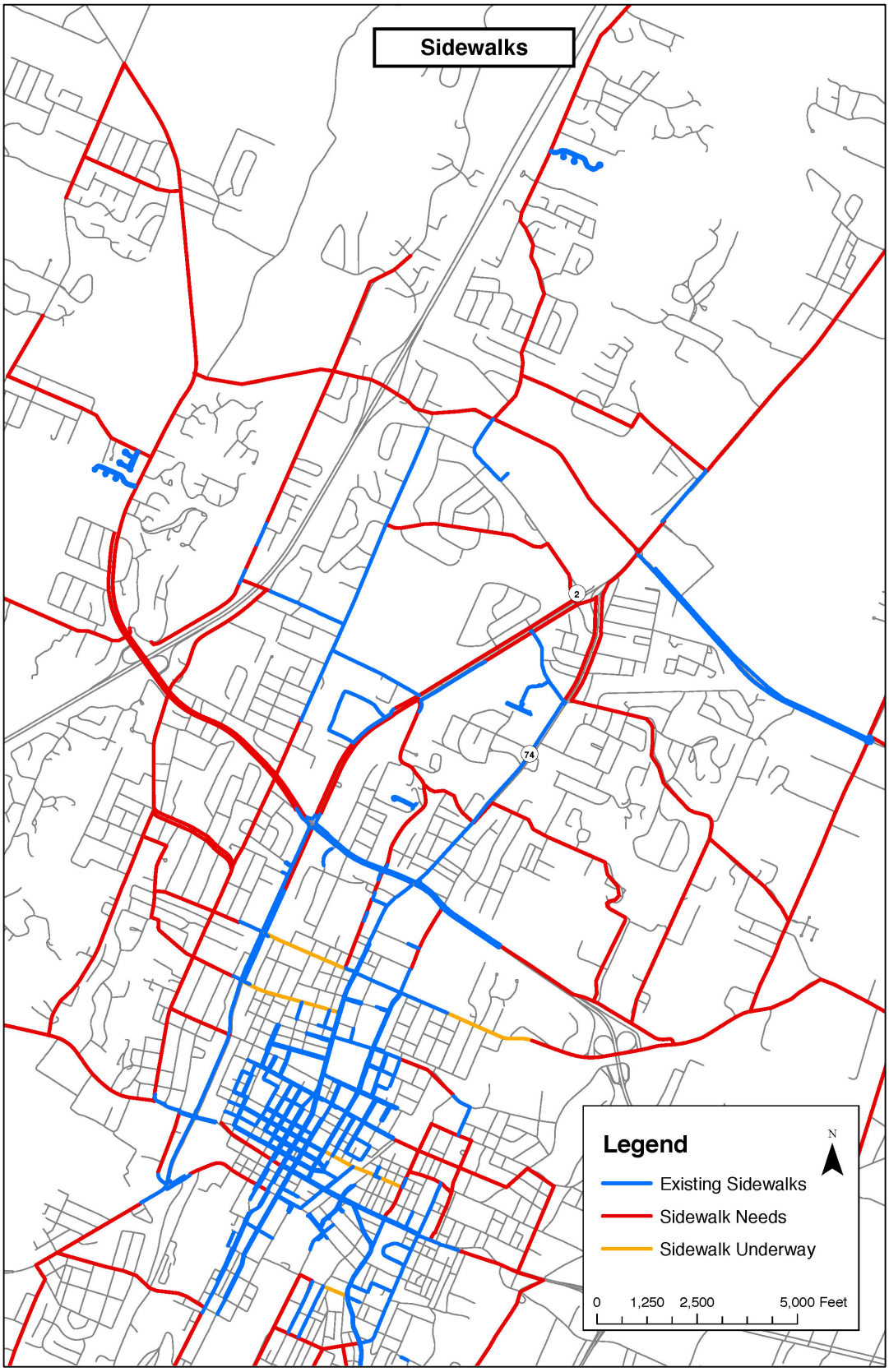



**Figure 17: Existing and Planned Sidewalks**

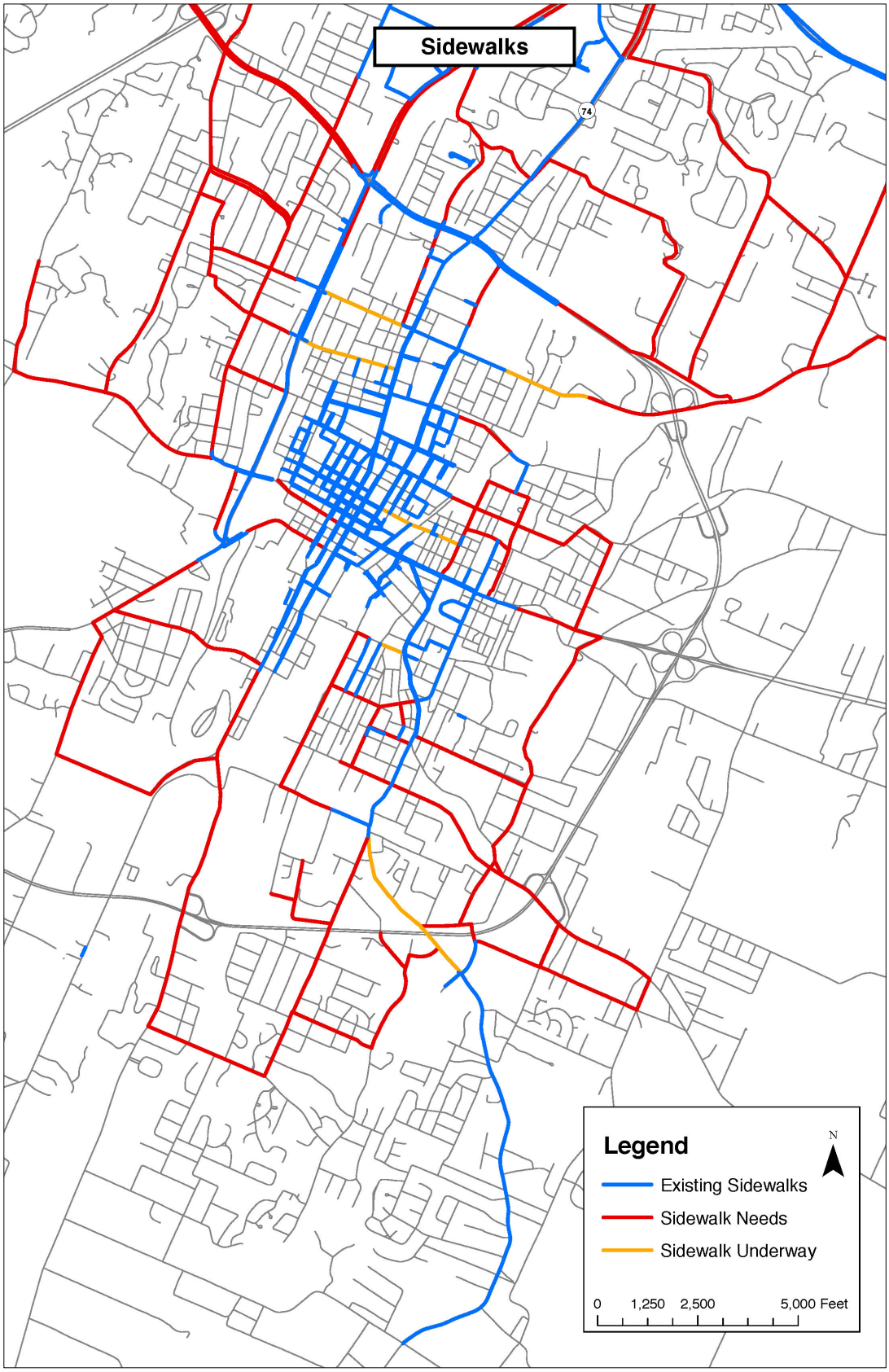



Figure 18: Existing and Planned Sidewalks

Pedestrian Signals:

The section of SR 60 identified for the Access Management study does not provide for any pedestrian signals. There are no crosswalks along sections of SR 60 that do provide sidewalks on both sides. There is a mix of land uses, such as retail, restaurants, hotels, and residential development that support pedestrian activity.

Pedestrians are forced to cross the street without any sort of traffic control devices, which creates a tremendous safety problem. An analysis of bicycle and pedestrian crashes in the Cleveland MPO jurisdiction [*Cleveland Area MPO Bicycle and Pedestrian Plan by RPM Transportation Consultants, 2008*] showed pedestrian crash locations at the intersections of SR 60 with Westside Drive and Ocoee Streets as well as a bicycle crash location at the intersection of SR 60 with Keith Street. The Bicycle and Pedestrian Plan from RPM identified several intersections with the need for pedestrian signals.

The following map (Figure 19) illustrates the greenways and sidewalks and (inter)sections for which signalized pedestrian crossings are recommended.

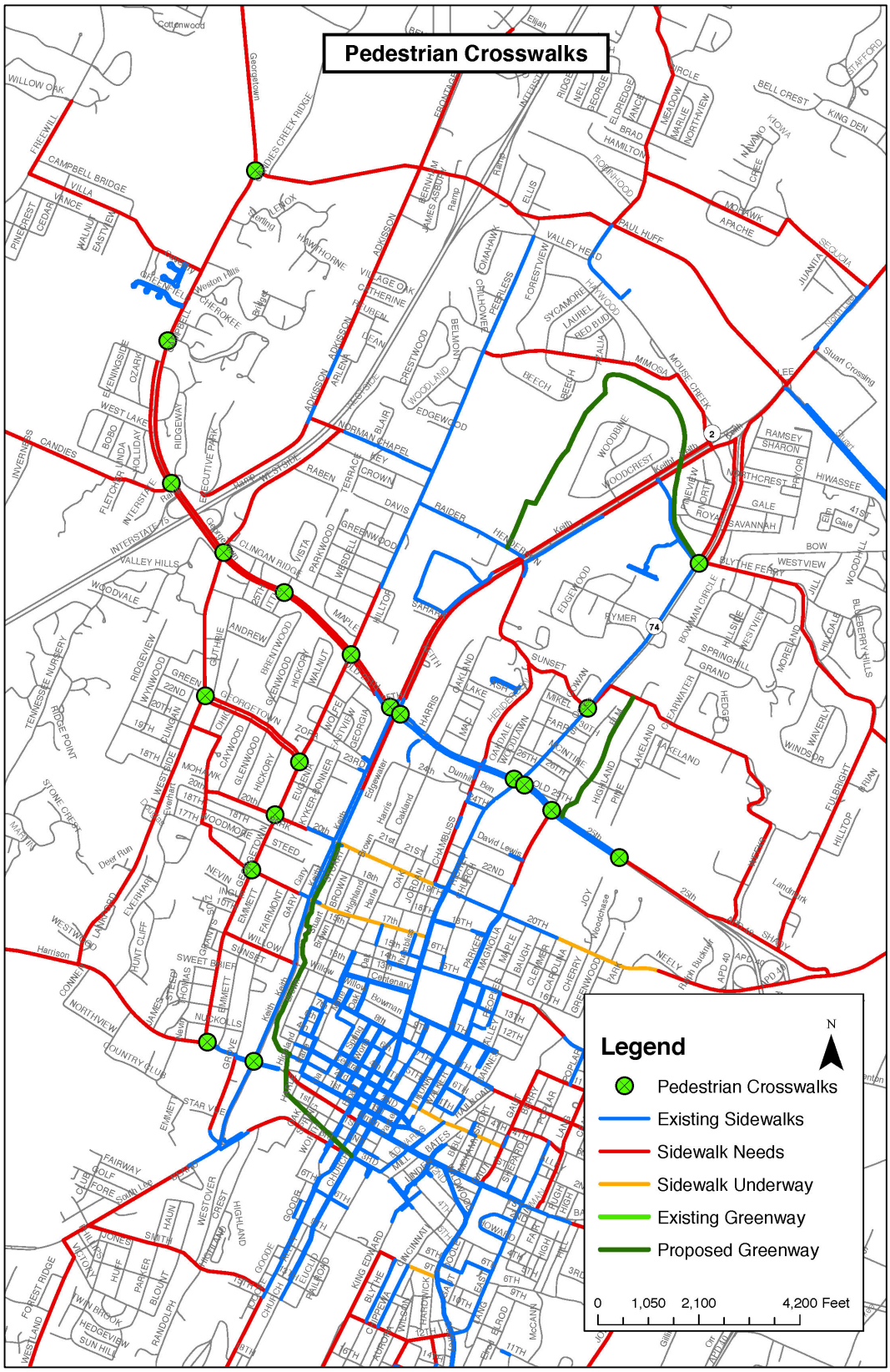



**Figure 19: Recommended Pedestrian Signals/Crossings**

## 2.9 Projects

Transportation projects programmed by TDOT on SR 60 are listed in Table 8.

**Table 8: Transportation Projects on SR 60**

| Section | Log Mile | Location | Project Measures |
|---|---|---|---|
| III. | LM 13.25 – 13.28 | Interchange at Benton Pike<br>*[Phase I: Completed; Phase II: Programmed]* | Interchange modification to improve safety.<br>Project involves signing, pavement markings, and guardrail |
| IV. | LM 15.01 – 15.75 | Between Parker Street and Keith Street *[Programmed]* | Landscaping along 1,500 ft. of existing median<br>Project includes removal of concrete medians and installation of median greens, installation of a bio-swale and irrigation system |
| | LM 16.69 | SR 60 at the Intersection of Georgetown Road / Westside Drive *[Programmed]* | Improvements to the intersection of SR 60 with Georgetown Road and Westside Drive. Measures will include geometric improvements that will increase capacity and improve operations at the traffic signal. Extension of the right-turn lane |
| | | SR 60 at I-75 interchange (Exit 25). *[Under Construction]*<br>Northbound ramps:<br>Southbound ramps: | Improvements to interchanges.<br>Construction of a dual left turn lane to provide more storage length<br>Construction of a dual left turn lane to provide more storage. An additional lane on the southbound on I-75 ramp to accommodate the dual left. Signal phasing changed to a protected only phase.<br>An exclusive right turn lane from SR 60 to the southbound I-75 ramp along with changing the outside through lane to a through/right shared movement. |
| | LM 17.02 | Intersection with Candies Lane/ Ridgeway Drive<br>*[RSAR programmed]* | Signal timing adjustments after improvements to the SR60/I-75 interchange. |

| | | | |
|---|---|---|---|
| V. | LM 17.20 - 20.39 | West Lake Drive to SR 306.<br>*[Awaiting Federal funding]* | Widening of roadway from two lanes to four lanes |

One of the most significant projects in the future is the widening of part of SR 60 to the west of I-75. TDOT plans on widening Section V from two to four lanes. This project begins at the intersection with West Lake Drive and ends at the intersection with SR 306 (Eureka Road). The project is in the preliminary engineering phase. The addition of two lanes and a continuous center turn lane will improve current and forecasted capacity issues on that section.

Other projects in planning stage:

- Pedestrian signal and median refuge island at the intersection of Peerless Road and SR 60.
- Pedestrian signal at Vista Drive for crossing SR 60.
- Development of scope for a Bicycle and Pedestrian Study, from the greenway connection east of Keith Street to Candies Lane, west of I-75.
- Extension of Paul Huff Parkway to the west of SR 60.
- Multi-modal access grant application due in January 2016, proposing a sidewalk in the SR 60 corridor between Keith Street and Georgetown Road/Westside Drive in a phased project.

## 3. Crash Analysis

Between 2011 and 2013 there have been a total of 1,224 crashes along State Route 60 in Bradley County. Of these, 418 occurred in 2011, 415 in 2012, and 391 in 2013, indicating that crashes slightly decreased in this three-year time span.

Of the 1,224 crashes, 699 occurred at an intersection, 459 along a roadway, 61 at ramps, three at underpasses and two at bridges.

Table 9 lists the crashes by each of the study sections. It shows that the four fatal crashes occurred along the rural roadway section of SR 60. Most crashes happened on Section IV. Though this section is the shortest compared to the other study sections with 1.96 miles, it also is the busiest regarding access points and traffic volumes, which increases the potential for crashes.

**Table 9: Total Crashes Along Sections of State Route 60**

| Section | Total Crashes | Location of Crash |
|---|---|---|
| Section I<br>(8.69 miles) | 59 (1 fatal) | 41 Along Roadway<br>18 At an Intersection |
| Section II<br>(2.27 miles) | 161 | 42 Along Roadway<br>119 At an Intersection |
| Section III<br>(4.05 miles) | 230 | 102 Along Roadway<br>81 At an Intersection<br>46 Ramp<br>1 Bridge |
| Section IV<br>(1.96 miles) | 496 | 159 Along Roadway<br>321 At an Intersection<br>12 Ramp<br>1 Bridge<br>3 Underpass |
| Section V<br>(2.92 miles) | 215 (1 fatal) | 69 Along Roadway<br>143 At an Intersection<br>3 Ramp |
| Section VI<br>(5.17 miles) | 63 (2 fatal) | 46 Along Roadway<br>17 At an Intersection |

*Source: TDOT. TRIMS. 2014.*

The following maps show the number of crashes that occurred along SR 60 within the three-year time period, 2011-2013. A higher number of crashes occurred on Sections II – V with most along the Section IV segment. High traffic volumes and denser development adjacent to SR 60 leads to more crashes.

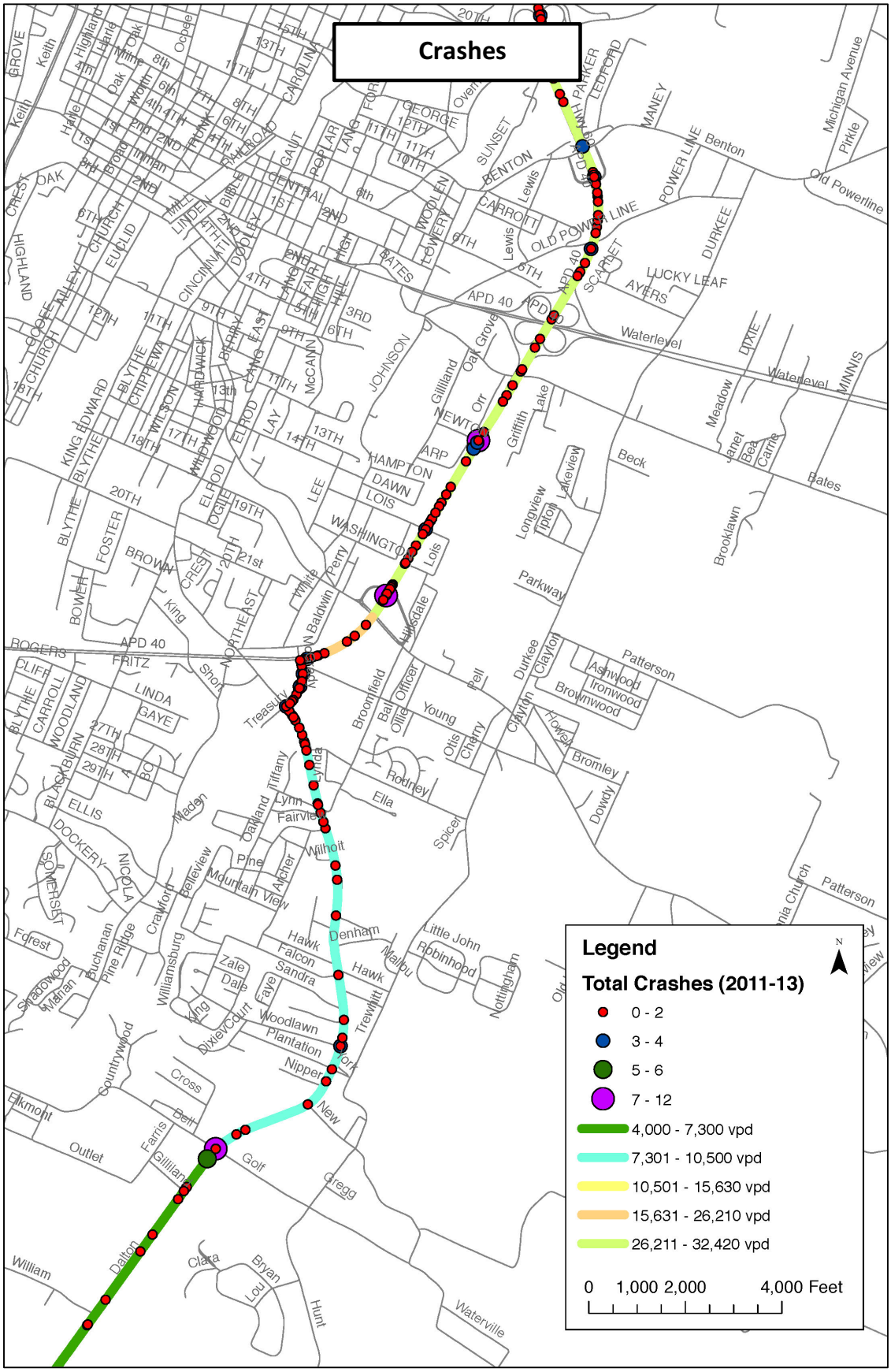



**Figure 20: Crashes on Sections II and III**

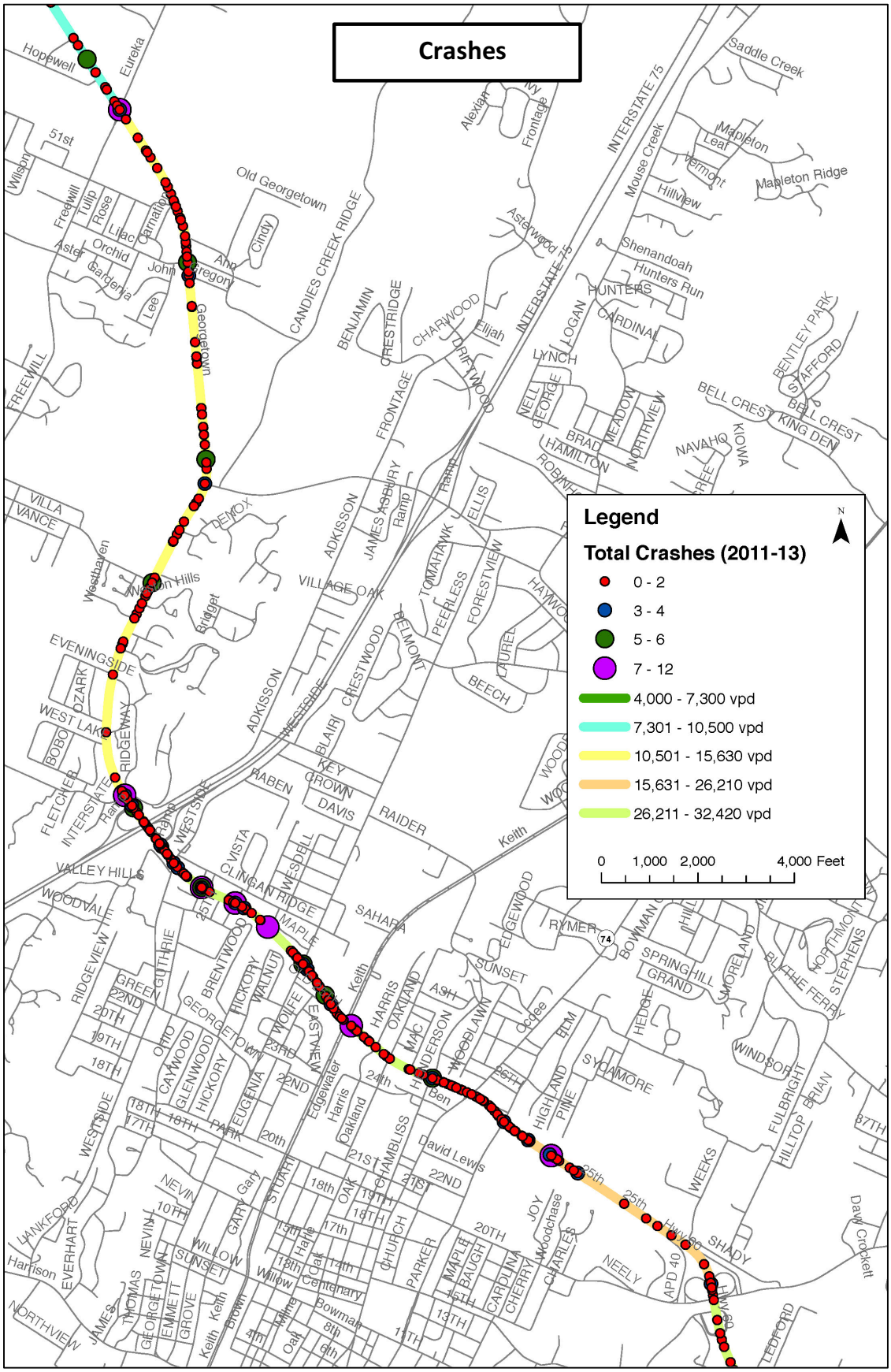



**Figure 21: Crashes along Section IV and V**

The following map indicates sections with crash rates higher than the statewide average.

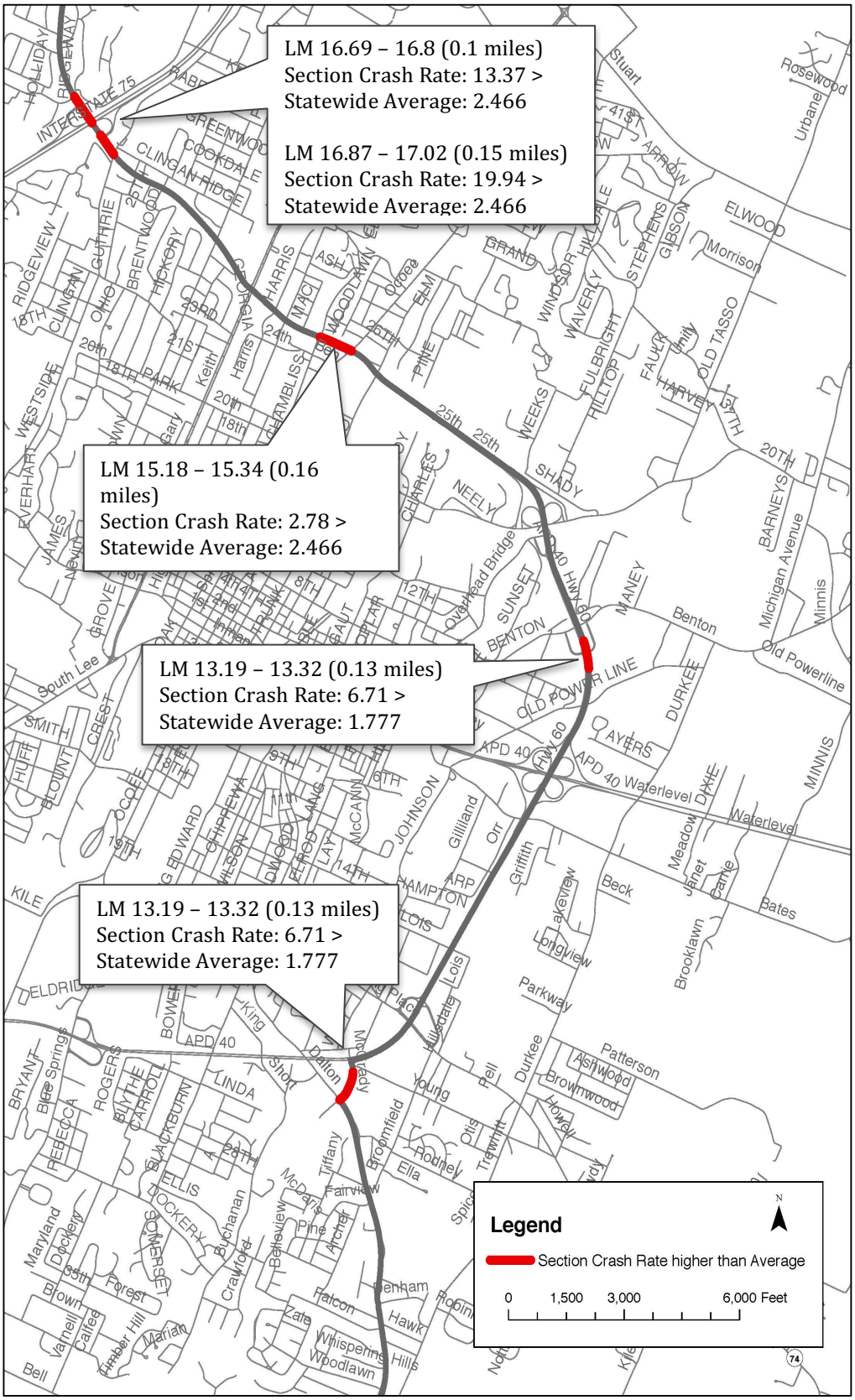



**Figure 22: Sections with Crash Rates higher than Statewide Average**

There are three sections on SR 60 with crash rates that are three times higher than the statewide average and thus qualify for a "Road Safety Audit Review" prepared by TDOT. All of these sections have been reviewed or are under review by TDOT. Safety measures have been undertaken by TDOT and several more improvements are planned.

*SR 60 and Benton Pike Interchange:*

The crash rate on this section is 6.72, which is 3.8 times higher than the statewide average (1.77 for an urban highway, four lanes or more lanes and divided).

A Road Safety Audit Review (RSAR) was completed in December 2014 for SR 60 at Benton Pike, LM 13.25 to LM 13.28. Phase I of the improvements has been completed, which included the installation of signs, pavement markings, and guardrail. Phase II is programmed and currently in the NEPA phase. Phase II measures will include realigning the SR 60 northbound off ramp to Benton Pike as well as the southbound on ramp from Benton Pike and lengthening the deceleration lanes.

**Figure 23: Benton Pike Interchanges**

*SR 60: Westside Drive to Candies Lane*

The crash rates along the I-75 interchange sections are more than three times higher than the statewide average of 2.466 (urban highway; four or more lanes with turning lane).

TDOT is undertaking improvements to the intersection of SR 60 with Georgetown Road/ Westside Drive and the I-75 interchanges. There have been intersection capacity and traffic operation issues identified along that section. Intersection turning movement counts were conducted and traffic operations at each intersection have been analyzed. Intersection capacity is severely restricted by control delay at the Georgetown Road/ Westside Drive intersection.

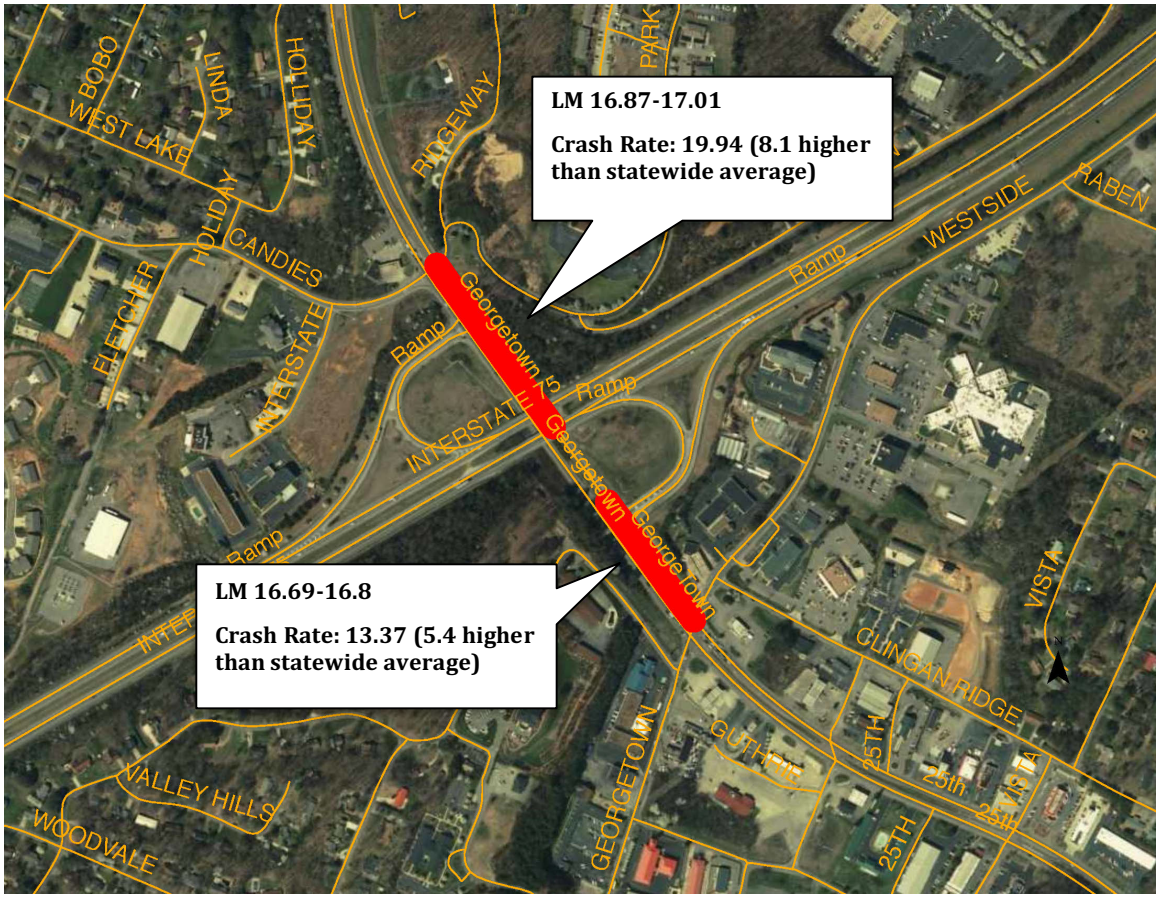



Figure 24: High Crash Rate Sections at the I-75 Interchanges

Geometric improvements are to be made to Georgetown Road and Westside Drive that will increase capacity and improve operations at the traffic signal. In addition, the right turn lane will be extended to approximately 340 ft.

For the SR 60 at I-75 northbound ramps a dual left turn lane providing more storage length (390 ft.) is planned. The right turn lane storage would increase to 275 ft. As a consequence, intersection capacity will improve.

The I-75 southbound ramps operate at a LOS D at certain times. A dual left turn lane has been proposed providing a total storage length of 480 ft. The southbound I-75 on ramp will require an additional lane to accommodate the dual left. With the dual left, signal phasing should be changed from protected/permitted to a protected only phase. Also, an exclusive right turn lane from SR 60 to the southbound I-75 ramp will be built along with changing the outside through lane to a through/ right-shared movement. *[TDOT. Technical Report. State Route 60, Westside Drive to Candies Lane. 2013].*

The intersection of SR 60 with Candies Lane/ Ridgeway Drive (LM 17.02) is programmed for a RSAR. The RSAR is currently on hold, awaiting the completion of the adjacent I-75 interchange project after which the project investigation will resume to evaluate traffic in its new configuration.

TDOT's vicinity map illustrates the project location for the above-mentioned improvements.

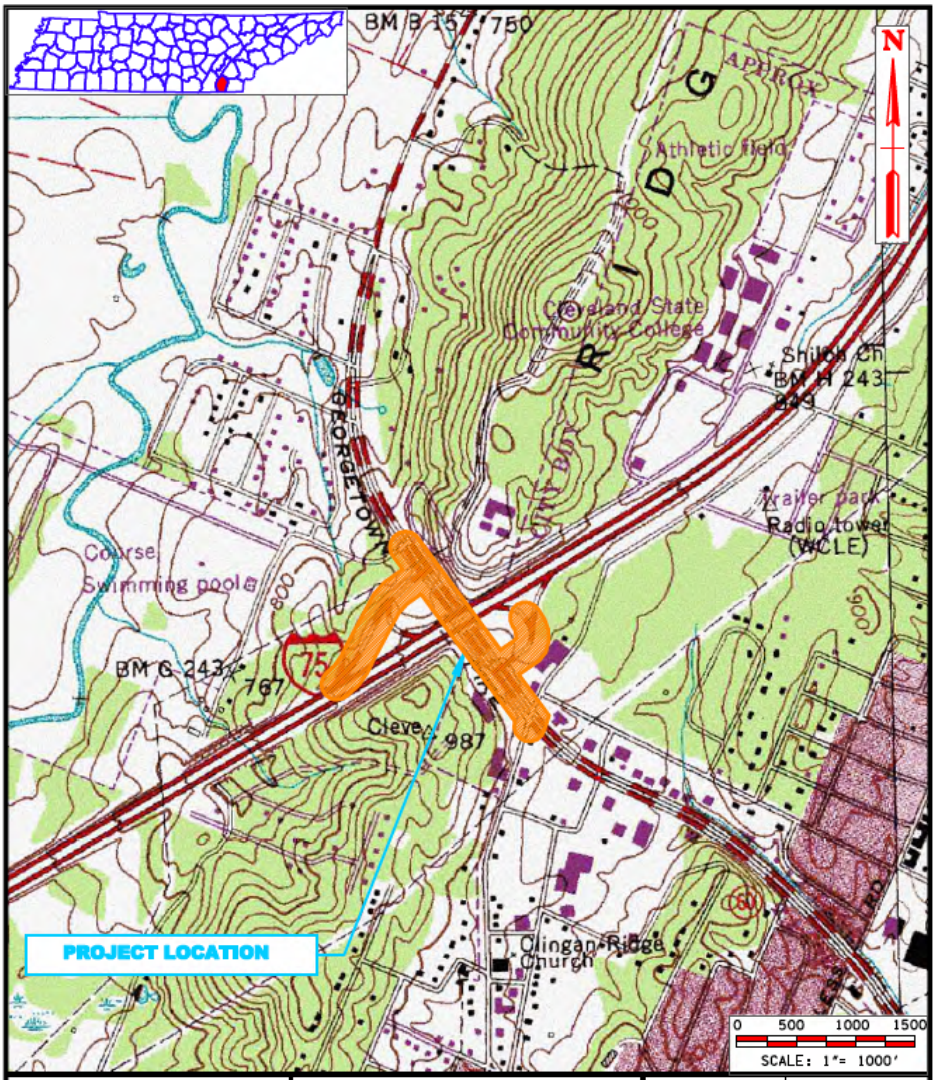



**Figure 25: TDOT's Vicinity Map of Project Location**

# 4. Analysis of Access Control on SR 60

## 4.1 Access Management Measures: Existing and Desired

Access management along SR 60 is discussed in Table 10 by listing current and desired access management conditions.

**Table 10: Existing Access Management Measures and Objectives**

| Section | Access Control | Current Accessibility Conditions | Access Management Objectives |
|---|---|---|---|
| I. | None | Sparse development and few driveways accessing SR 60. Potential issue could be direct access of elementary school onto highway (without management measures). | Preserve existing access points<br>Minimize individual driveway cuts<br>Restrict driveway access to SR 60 |
| II. | None | Mostly residential collector roads accessing SR 60 for providing access to neighborhoods.<br>Treasury Drive provides access to Walmart (no conflicts).<br>Several driveways along McGrady Drive pose potential conflicts with accessing SR 60. | Minimize individual driveways accessing SR 60<br>Encourage residential development with driveways accessing local roads<br>Consider shared driveways for commercial development |
| III. | Partial Access Control on U.S. 64 bypass (APD 40) | Few roads or driveways have access to this section of SR 60, as there are several major interchanges that allow access to development adjoining the highway.<br>Two areas: After the intersection with McGrady Drive and between the interchanges with SR 74 and SR 40 [LM 11.81-11.94] there are several individual driveways accessing SR 60 from commercial buildings<br>Four-lane divided highway with mostly continuous green median.<br>There are some median openings.<br>At Spring Creek Development, roads and driveways access SR 60; for all are median-left turn lanes provided. | APD 40 is classified as expressway/ freeway and should not be accessed by driveways or local roads<br>Access should be limited to interchanges only<br>No median openings permitted |

| | | | |
|---|---|---|---|
| IV. | None | Lots of retail and commercial development with driveways accessing SR 60. Driveway cuts in short distances apart.<br>Residential development with individual driveways accessing SR 60 (between Ocoee Street and Keith Street).<br>Between Keith Street and I-75 are wide shoulders on both sides that provide additional capacity for the road and turning movements.<br>Raised curb island in the middle provides separation.<br>Median left turn lanes provided for access to commercial/retail development.<br>Landscaped median between Keith Street to near Guthrie Street | Plan no additional driveway cuts<br>Desired consistency of pedestrian ways and connection to greenway<br>Desired provision of crosswalks |
| V. | None | This section will be widened from two to four lanes with a continuous center turn lane and will provide for additional capacity.<br>Local roads access residential neighborhoods. Some houses have individual driveways accessing SR 60.<br>Currently one lane in each direction and a continuous center turning lane for most sections (narrow shoulders for most sections). | Additional access to existing elementary school has been requested<br>Minimize individual driveways accessing SR 60<br>Encourage residential development with driveways accessing local roads<br>Consider shared driveways for commercial development |
| VI. | None | Rural setting and low dense residential development along SR 60.<br>Some residential driveways access SR 60. | Limit individual driveways accessing the highway<br>Encourage residential development with driveways accessing local roads |

Besides Section III (U.S. 64 bypass), which is mostly access controlled, there is no enforced access control on SR 60. Along most of SR 60 are many, closely spaced driveways access the highway from adjacent residential and commercial developments (see next chapter on "Access Spacing").

Some common access control treatments are used on sections of SR 60.

As Section II becomes a four-lane highway, it has a continuous two-way left-turn lane (TWLTL) in the center, providing access to local roads and properties accessing SR 60.

**Figure 26: Section II**

On Section IV, which is a busy four-lane road segment with many access points, raised medians with access cuts are provided to control access of turning vehicles to the other roadside. Raised medians are also implemented at signalized intersections.

**Figure 27: Median on Section IV**

Between Keith Street and Guthrie Street the raised median becomes wider with less access cuts and is attractively landscaped. It is planned to continue landscaping the median between Keith Street and Parker Street.

**Figure 28: Landscaped Median on Section IV**

## 4.2 Access Spacing

### 4.2.1 Spacing of Access Points

The spacing of access points, medians, and signalized intersections are critical elements of access management impacting traffic operations and traffic safety. Each access point causes conflicts and friction into the traffic stream. With more conflicts comes a higher potential for crashes, and the friction results into longer travel times and greater delay. At high traffic volumes, the gaps between successive vehicles are short and a driver has little opportunity to reduce the gap with a preceding vehicle. A vehicle turning from a through-traffic lane can cause following vehicles to break, causing rear-end and lane-change crashes.

Studies show that the number of accidents rises as the access point density increases. For example, doubling the access frequency from 10 to 20 access points per mile would increase accident rates by 40%. It has been shown that roadways with full access control generally had between 25% and 50% of the accidents per million vehicle miles traveled of roads without access control. *[TRB Circular E-C019: Urban Street Symposium. Urbitran Associates: Access Spacing and Traffic Safety. 1999]*

Table 11 illustrates crash rates for unsignalized access connection spacing.

**Table 11: Relative Crash Rates for Unsignalized Access Connection Spacing**

| Unsignalized Access Points per Mile* | Average Spacing** (ft) | Relative Crash Rate |
|---|---|---|
| 10 | 1,056 | 1.0 |
| 20 | 528 | 1.4 |
| 30 | 352 | 1.8 |
| 40 | 264 | 2.1 |
| 50 | 211 | 2.4 |
| 60 | 176 | 3.0 |
| 70 | 151 | 3.5 |

* Total access connections on both sides of the roadway.
** Average spacing between access connections on the same side of the roadway.
*Source: TRB. Access Management Manual. 2014.*

Spacing requirements generally apply to new developments and redevelopments and they do not have to be consistent with existing access characteristics. Access management policies can be implemented to improve access spacing and design as abutting properties are redeveloped.

A roadway intended primarily to serve traffic movement (i.e. principal arterial) will have fewer access connections and longer access spacing than a roadway with greater access function (i.e. collector).

**Street Spacing**

Capacity at an intersection of two major urban arterials ultimately can become a problem as an area develops and traffic volumes increase. For example, with a ½-mile signal spacing interval, major urban arterials would be spaced one mile apart, allowing continuous minor arterial or collector streets to be located between the arterials.

**Signal Spacing**

Increased spacing of signalized intersections can produce major improvements in traffic flow and safety, resulting in reduced congestions and fewer crashes. Optimal signal spacing depends on traffic speeds, volumes, and directional distribution. Generally, signal spacing of at least 0.5 miles is recommended.

Long and uniform signal spacing allow timing plans that can efficiently accommodate varying traffic conditions during peak and off-peak periods as well as adoption of control system. Therefore, selecting a long and uniform signalized intersection spacing is an essential element in establishing access spacing standards.

Signal spacing has a direct effect on roadway efficiency. For example, ½-mile signal spacing could reduce vehicle-hours of delay by over 60% and vehicle-hours of travel by over 50%, compared with signals at ¼-mile intervals. Several studies have found that accident rates increased as signalized access density increased. *[TRB Circular E-C019: Urban Street Symposium. Urbitran Associates: Access Spacing and Traffic Safety. 1999]*

### 4.2.2 Access Points on State Route 60

**Section I:** There are many access points along the SR 60 corridor. There are many residential driveways accessing the road in the rural areas, often spaced closely together.

**Figure 29: Stretch of Section I**

**Section II:** This section has mostly residential driveways accessing SR 60 with the exception of McGrady Drive, where commercial businesses have driveways onto SR 60. There is also a high number of cross streets on this segment that leads to residential neighborhoods, most of them not signalized. The only signalized intersections are those on McGrady Drive.

**Section III:** Only the segment of SR 60, from McGrady Drive to Spring Creek Boulevard, is partially access controlled. There are six interchanges, which control the access on and off the freeway.

However, there are also some sections where commercial businesses access SR 60.

Figure 30: Section III (U.S. 64 Bypass)

**Section IV:** After Spring Creek Blvd. and entering Section IV, the land use development along the corridor becomes mixed-use with increased commercial. All the retail/commercial businesses that border the highway have driveways to directly access SR 60. Numerous businesses also have more than one driveway accessing the road. There are several sections where the driveways are spaced very close together. This segment has a high number of signalized intersections as several major highways cross SR 60.

Figure 31: Driveways accessing SR 60 from businesses

**Section V:** This section, which is part of the TDOT widening project, has several residential driveway cuts.

Figure 32: Stretch of Section V

**Section VI:** The rural section that leads into Hamilton County has a high number of residential driveways accessing SR 60.

Table 12 summarizes the access points on corridor 60.

**Table 12: Number of Access Points on SR 60**

| Section | Driveways | Cross-streets | Ramps | Traffic Signals | Access Points per mile |
|---|---|---|---|---|---|
| I. | 132 | 17 | 0 | 0 | 17.1 |
| II. | 45 | 28 | 0 | 3 | 33.5 |
| III. | 17 | 13 | 24 | 2 | 13.3 |
| IV. | 75 | 27 | 4 | 9 | 58.7 |
| V. | 60 | 20 | 0 | 4 | 28.8 |
| VI. | 96 | 14 | 0 | 0 | 21.3 |

The following maps illustrate the spacing of access points on the six sections of SR 60. It is differentiated between driveway, cross street, and ramp access points.

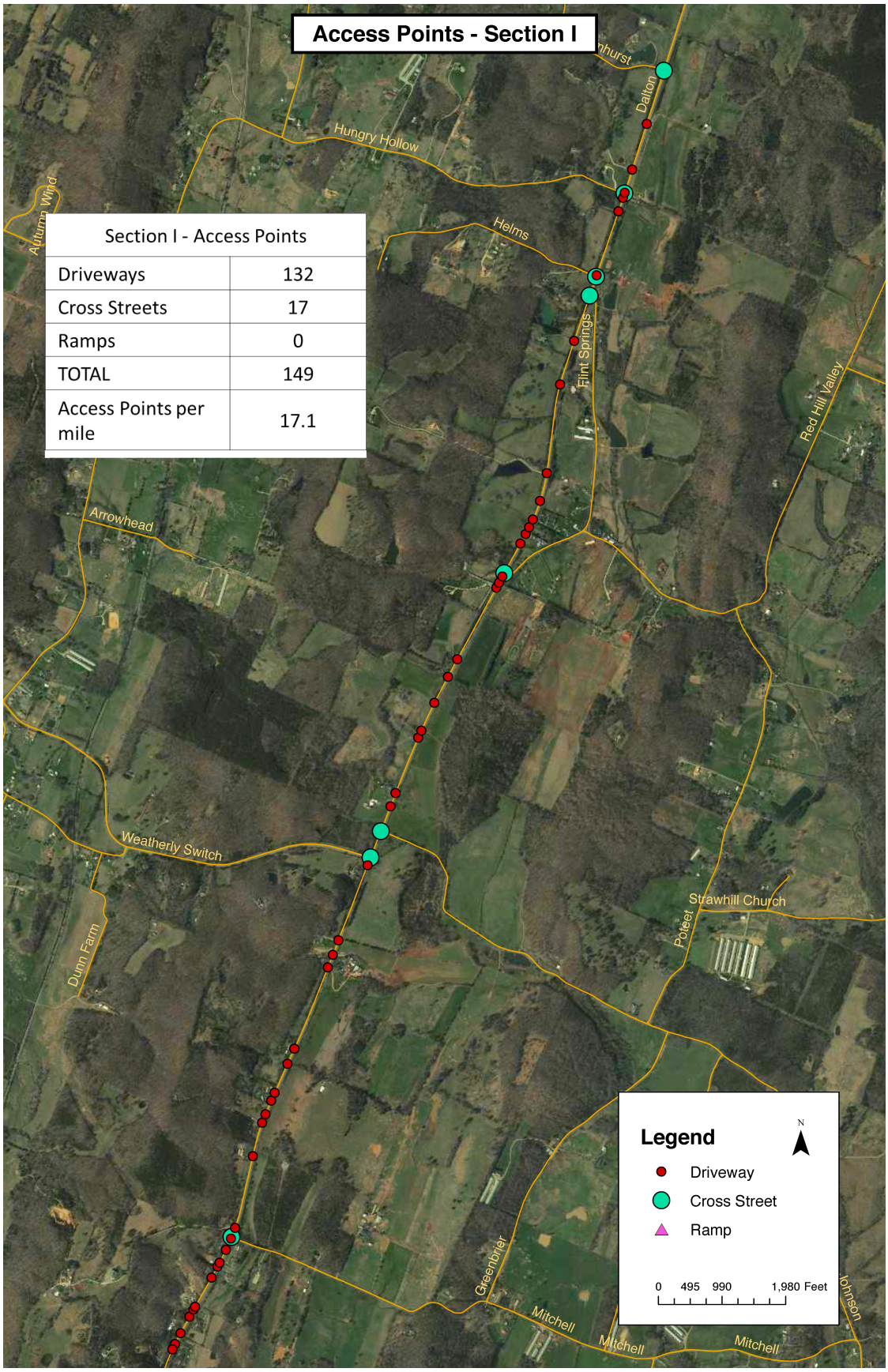



**Figure 33: Access Points on lower Section I**

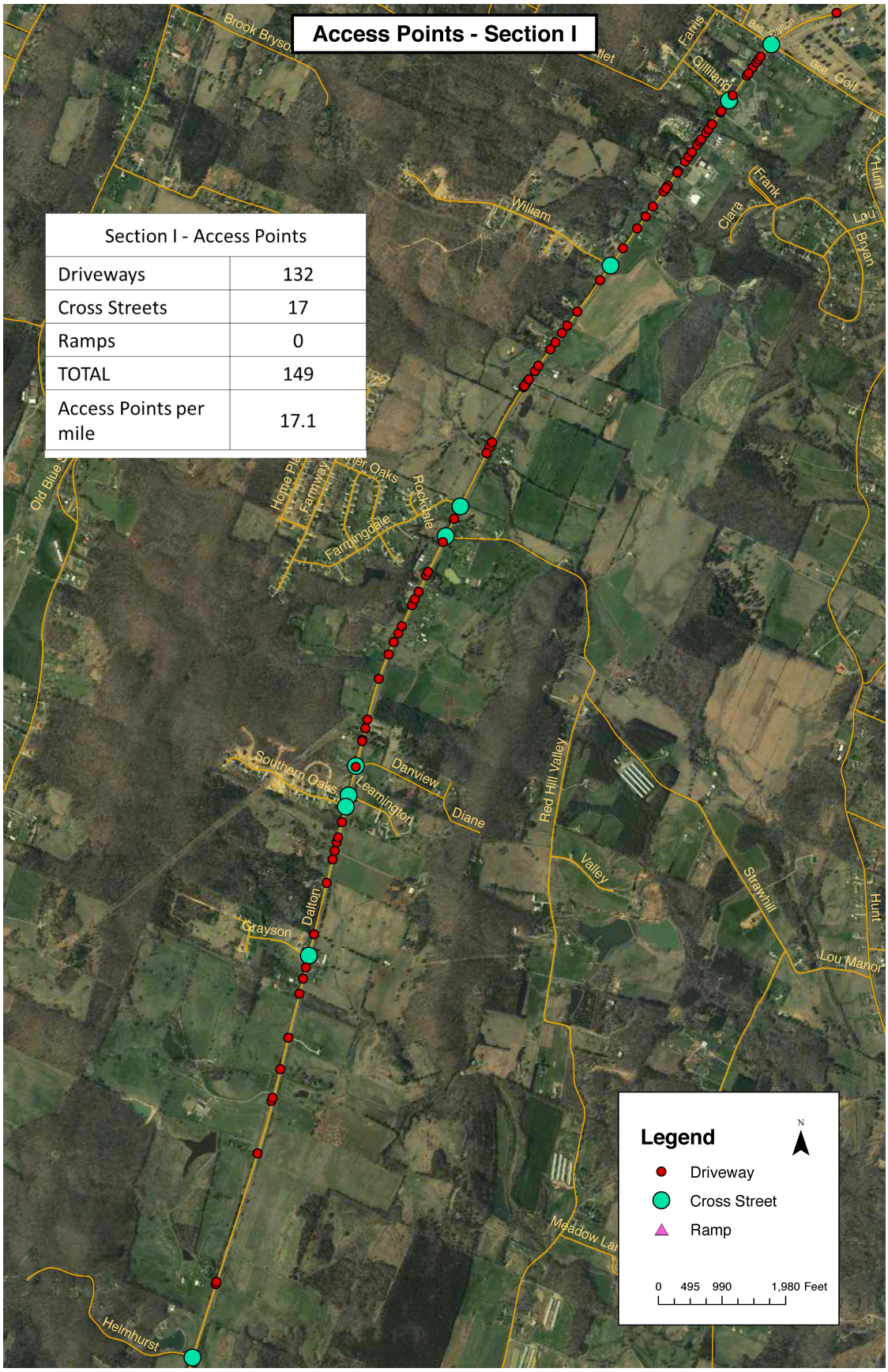
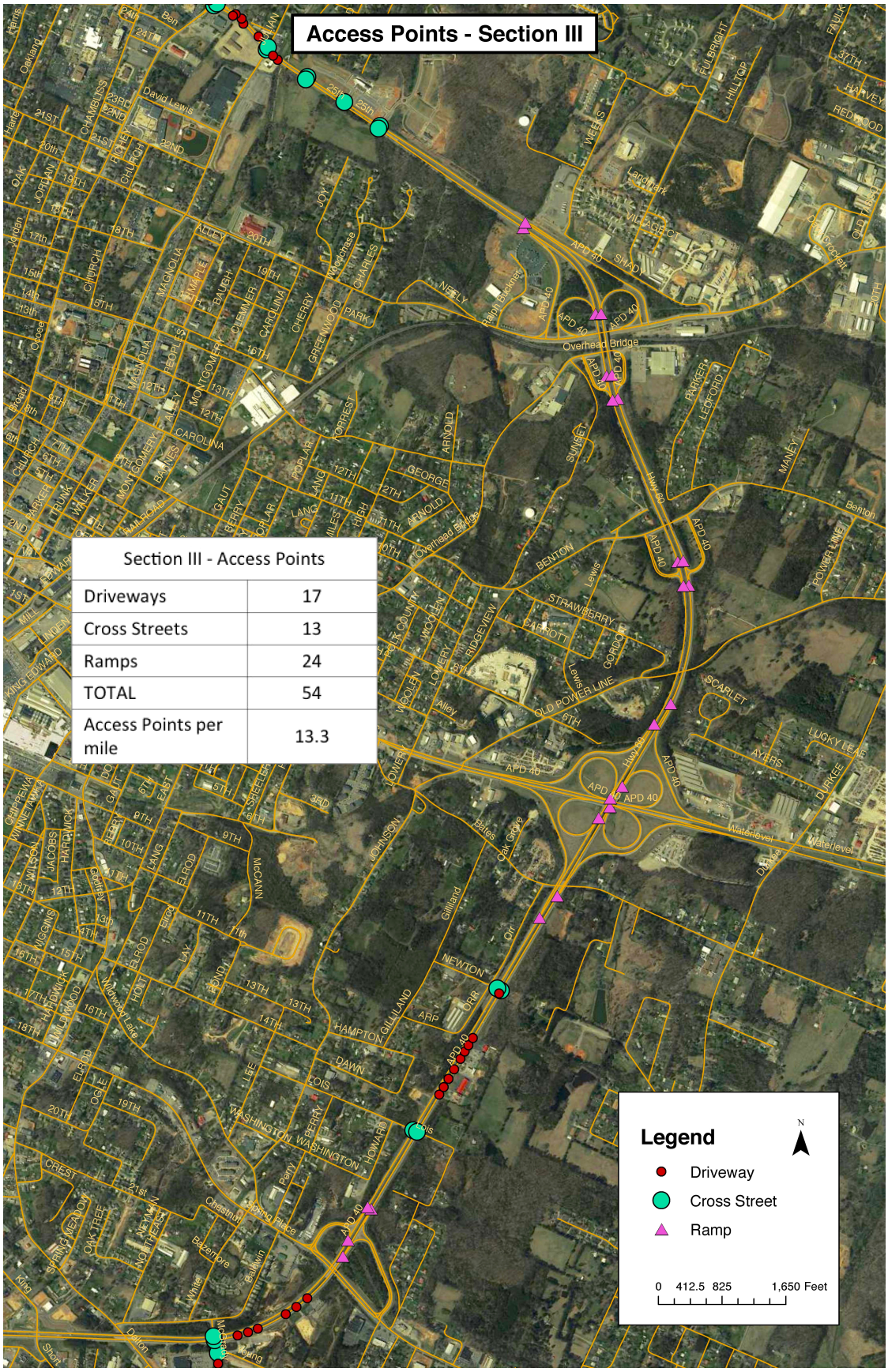



**Figure 34: Access Points on upper Section I**

| Section II - Access Points | |
|---|---|
| Driveways | 45 |
| Cross Streets | 28 |
| Ramps | 0 |
| TOTAL | 73 |
| Access Points per mile | 32.3 |

**Figure 35: Access Points on Section II**




| Section III - Access Points | |
|---|---|
| Driveways | 17 |
| Cross Streets | 13 |
| Ramps | 24 |
| TOTAL | 54 |
| Access Points per mile | 13.3 |

**Figure 36: Access Points on Section III**

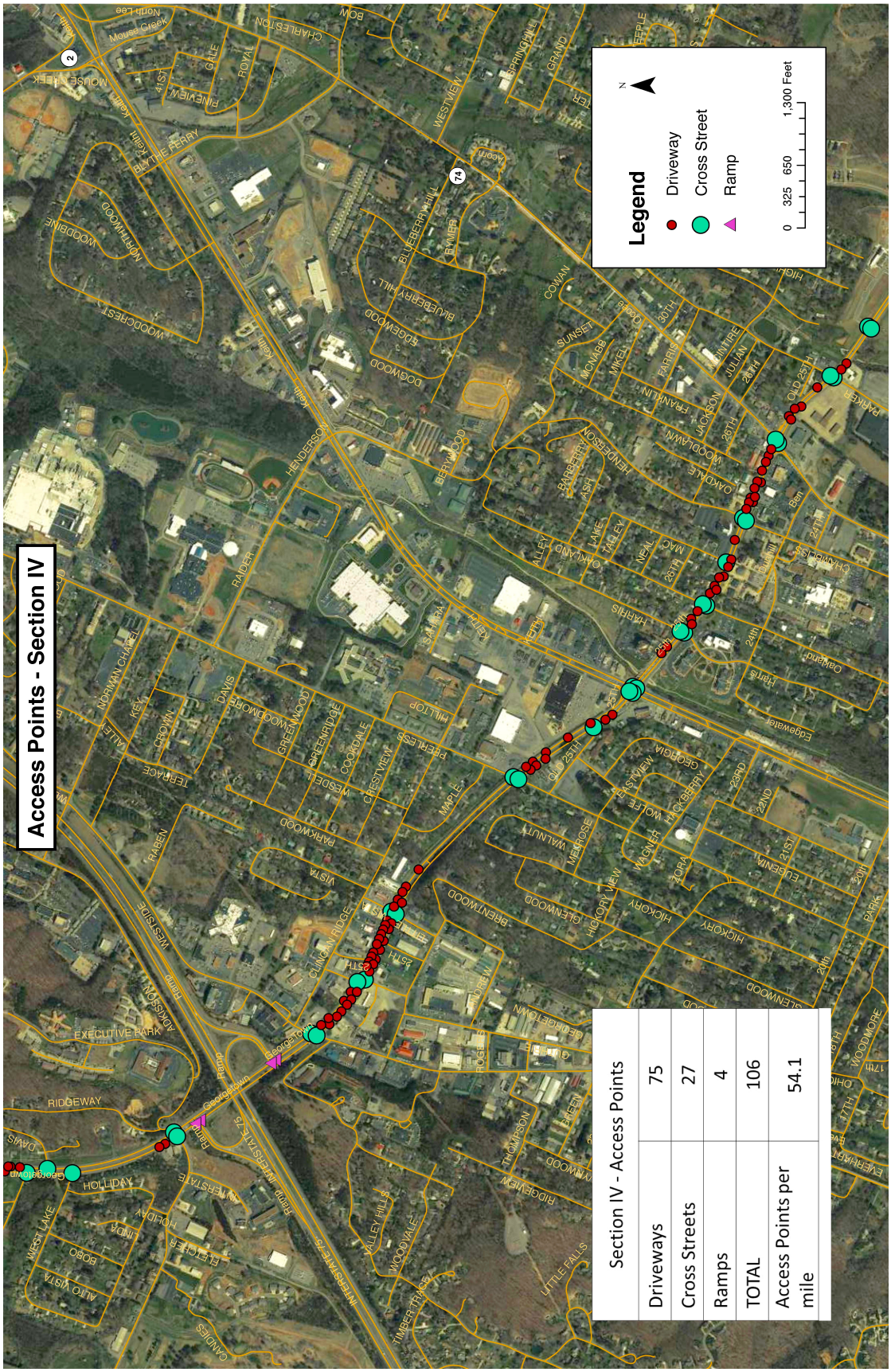



**Figure 37: Access Points on Section IV**

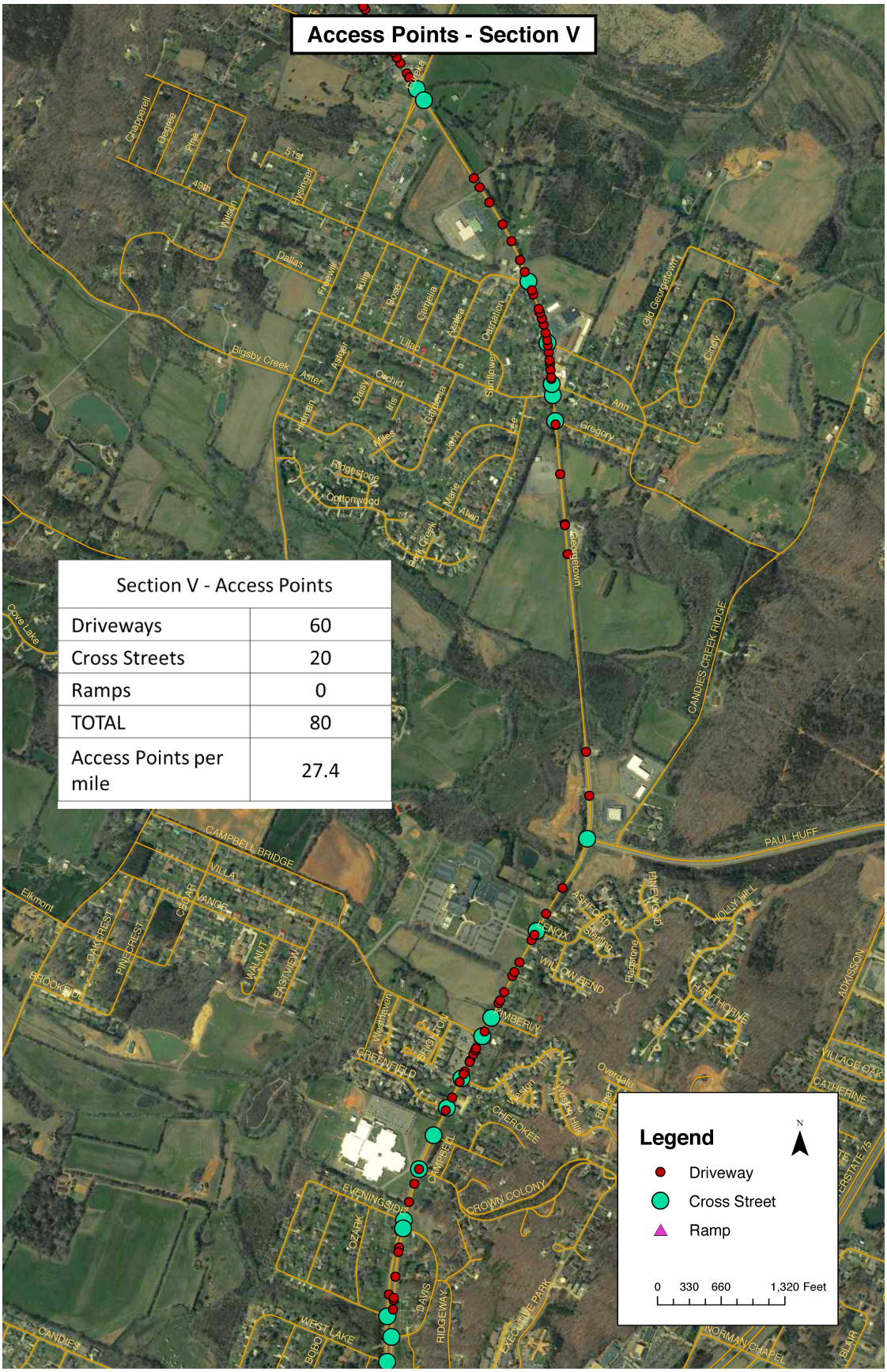



Figure 38: Access Points on Section V

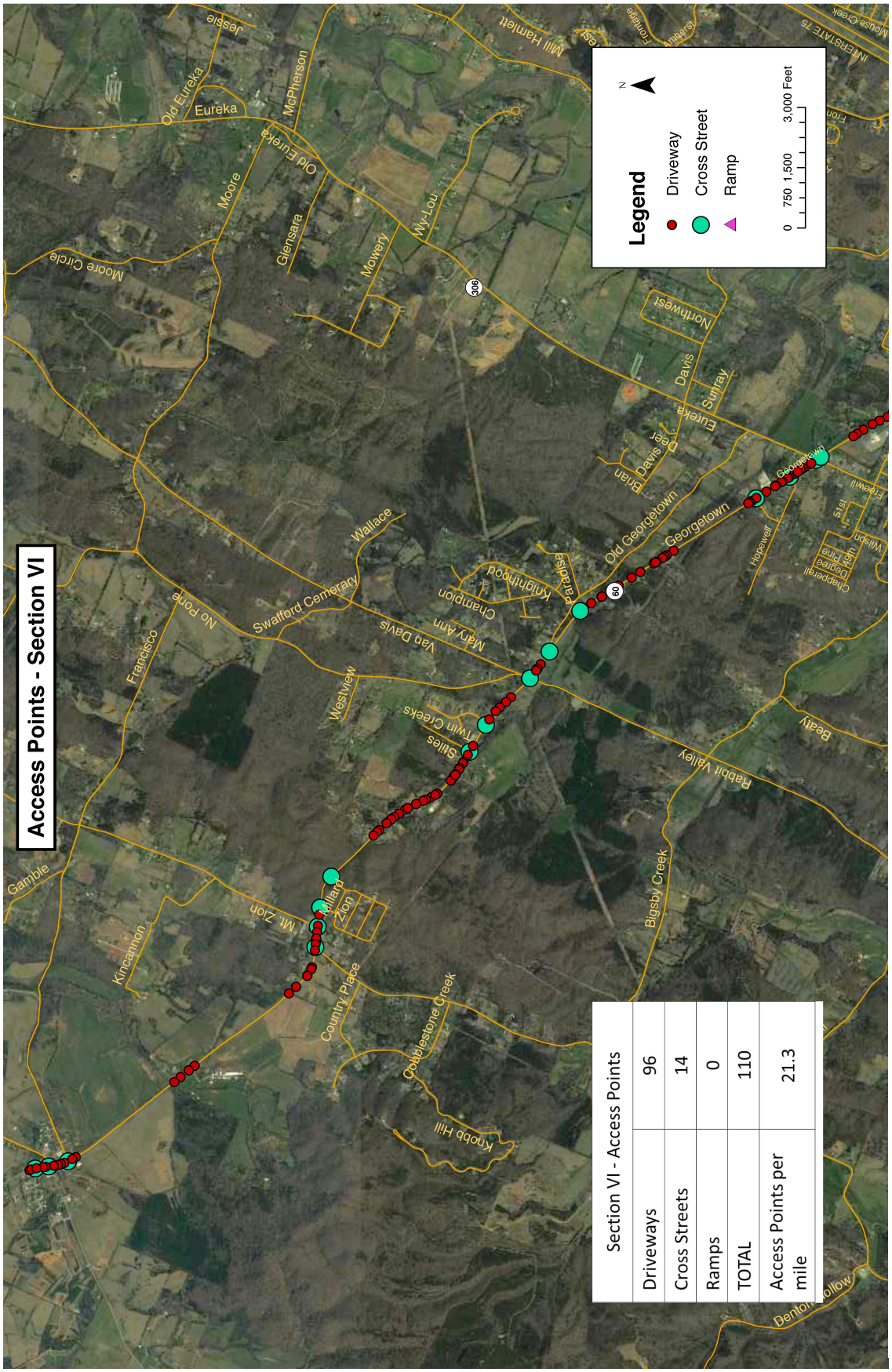



**Figure 39: Access Points on Section VI**

It becomes apparent that there is a high density of access points along the SR 60 corridor. Even though some sections are classified as arterial roadway, which should be "access controlled" or just have "limited access", those have a large density of access points.

Section III of SR 60 has a low amount of access points due to its classification as a freeway/expressway, which has limited access through ramps. However, even on this section, there are a couple commercial establishment clusters that have several driveways accessing the road in short distance spacing. This is not adequately addressing the access limitations for this roadway class.

## 4.3 Conflict Points

Some of the goals of access management is to limit access conflicts and separate conflict points. Every access point is fundamentally a safety problem. Conflict points are locations in or on the approaches to an intersection where vehicles paths merge, diverge, or cross.

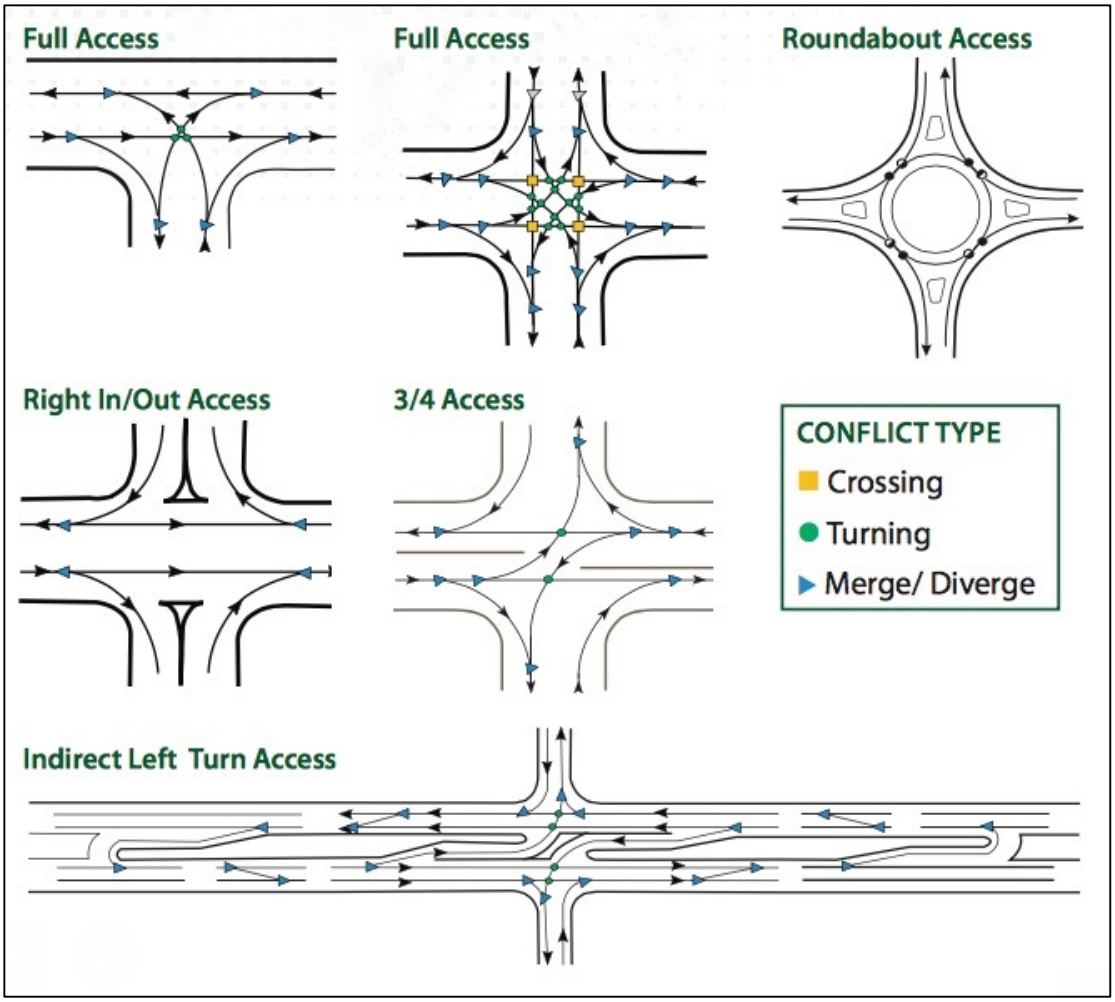



**Figure 40: Intersection Types and Conflict Points**

Data indicates that minor street crossing movements and left turns on a major street are the most hazardous. Left turns from the major street are less hazardous than the minor street movements, and right turn movements are the least hazardous. Analysis of crash data has proven that the most frequent type of severe intersection crash is the right-angle crash.

Crash rates at restricted access intersections (3/4 access design and right-in/out) are typically lower than at similar four-legged intersections.

**Table 13: Number of Conflict Points by Intersection Type**

| | Crossing | Turning | Merge/ Diverge | Total | Typical Crash Rate* |
|---|---|---|---|---|---|
| Full Access (+) | 4 | 12 | 16 | 32 | 0.3 |
| Full Access (T) | 0 | 3 | 6 | 9 | 0.3 |
| ¾ Access | 0 | 2 | 8 | 10 | 0.2 |
| Right-in/out Access | 0 | 0 | 4 | 4 | 0.1 |
| Roundabout | 0 | 0 | 8 | 8 | 0.2 |
| Indirect Left Turn | 0 | 4 | 20 | 24 | 0.1 |

** Crashes per million entering vehicles*

*Source: Minnesota Department of Transportation. Minnesota's Best Practices and Policies for Safety Strategies on Highways and Local Roads. September 2011.*

Eliminating or restricting turning maneuvers by providing channelization or closing median openings is considered a proven strategy. Turning vehicles should be separated from through traffic by access management measures, for example by providing left and right turn lanes.

Medians are also measures to achieve a reduction of conflicts. The average crash rate on roadways with a TWLTL is less than that for undivided roadways. Roadways with non-traversable medians have been found to have lower average crash rates than those with a TWLTL. NCHRP Report 420 found the crash rate for a roadway with a non-traversable median to be about 30% less than a two-way left turn lane configuration. Research indicated that the safety advantage of a non-traversable median over a TWLTL increases when the ADT exceeds 24,000 to 28,000 VPD. *[TRB. Access Management Manual. 2014].*

Encouraging the use of shared common access drives between adjacent properties abutting major roadways helps to reduce the number of conflict points and separate the conflict areas, thus increasing roadway safety. *[TRB. Access Management Manual. 2014].*

As a result of implementing access management and a reduction of the rate and severity of conflicts the motorist encounters, the crash and injury rates can be reduced, and the smooth flow of traffic can be increased.

The following photos show intersections and road sections that have lots of conflict points.

**Figure 41: Intersection with Keith Street**

**Figure 42: Section of SR 60 with several conflict points and intersection with Ocoee Street**

**Figure 43: Section of SR 60 with several conflict points**

## 4.4 Speed Limit

The speed limit varies between 45 and 55 mph on different sections of SR 60 as shown in Table 14.

There are several sections along SR 60 where the spacing of access points is close together despite high traffic volumes and a speed limit around 45 mph, in particular on Section IV.

See Ch. 5.1.2 for guidelines on access spacing in relation to speed.

**Table 14: Speed Limit on SR 60**

| Section | Log Mile | Speed Limit |
|---|---|---|
| I. | 0 – 8.36 | 55 mph |
| | 8.36 - 8.69 | 45 mph |
| II. | 8.69 – 10.96 | 45 mph |
| III. | 10.96 - 15.01 | 55 mph |
| IV. | 15.01 – 5.18 | 55 mph |
| | 15.18 – 16.97 | 45 mph |
| V. | 16.97 – 21.63 | 45 mph |
| VI. | 21.63 - 25.06 | 55 mph |

*Source: TDOT. TRIMS. 2015.*

The following map shows the different speed limits along SR 60.

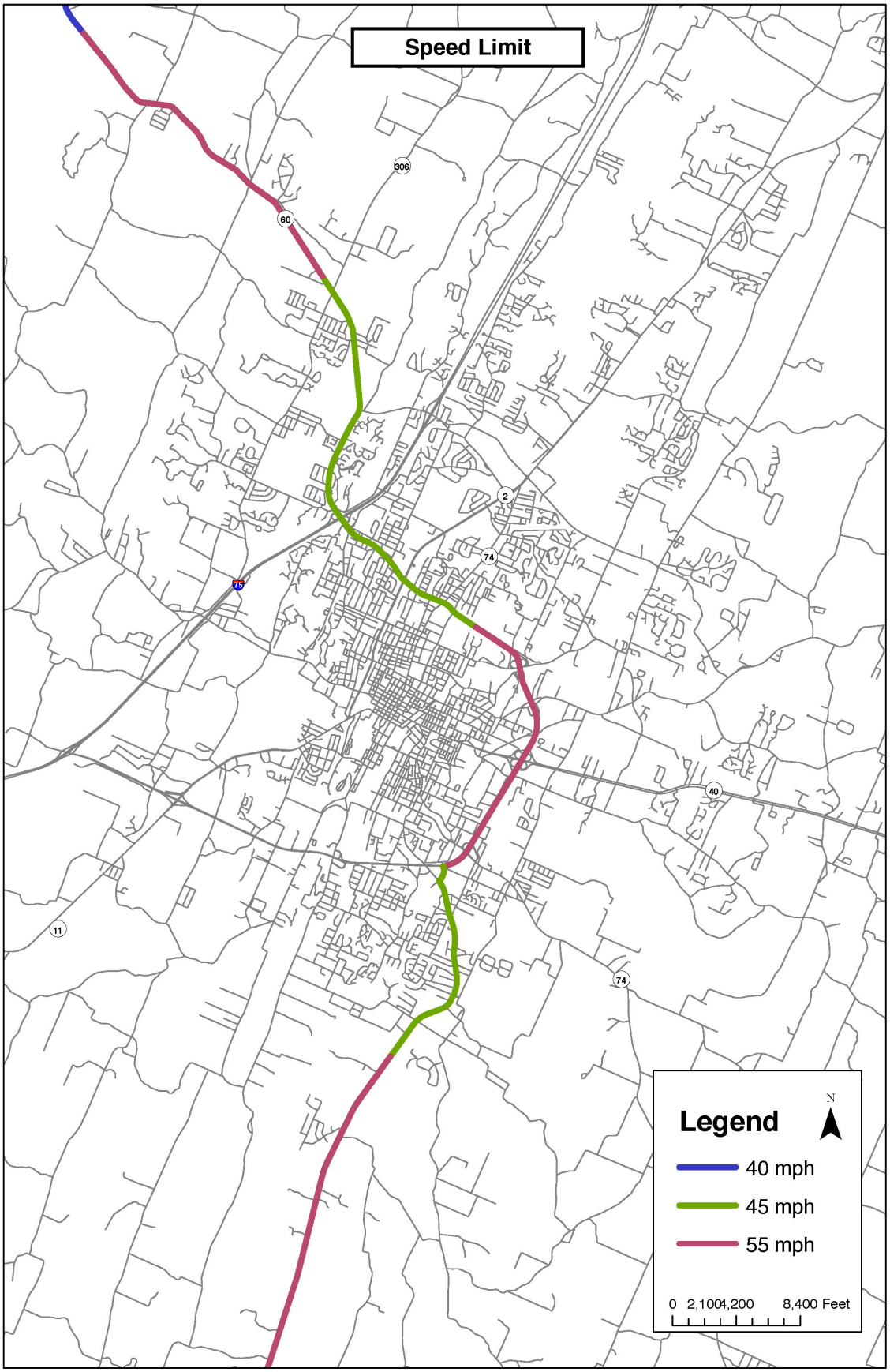



Figure 44: Speed Limit on SR 60

# 5. Recommendations for Access Management Standards and Guidelines

## 5.1 Recommended State Access Management Standards

### 5.1.1 TDOT's Driveway Entrance Standards

The following standards are excerpts from TDOT's draft "Manual for Constructing Driveway Entrances on State Highways", which is currently being developed. These standards need to be reviewed after TDOT adopts the new Manual. It is recommended that the City of Cleveland and Bradley County adopt these standards into their access management policies.

***Number of Entrances***

- Typically, only one entrance shall be permitted per single-family property.
- For frontages of 200 feet to 400 feet, an additional entrance may be permitted based on need demonstrated in a Traffic Impact Study.
- For frontages in excess of 400 feet, more than two entrances may be permitted based on need demonstrated in a Traffic Impact Study. The additional entrances may be allowed at the rate of one entrance per every 200 feet of continuous frontage, over 400 feet.
- Where corner lots are involved, the regulations described above shall apply separately to each roadway.

***Edge Clearance***

- All portions of a driveway, including radii, shall lie within the frontage boundary lines.
- At no time shall the edge clearance be less than the radius of curvature for the junction of the driveway and the edge of pavement
    - Rural - Residential: 10 ft. / Commercial: 20 ft.
    - Urban - Residential: 5 ft. / Commercial: 20 ft.

***Driveway Angle***

- Driveways for two-way operation should be 90° to the centerline of the roadway.
- Driveways for one-way operation:
    - Driveways used by vehicles turning from both directions on the highway shall be 90° to the centerline of the roadway

- Driveways used by vehicles traveling in one direction on the highway (right-in, right-out only): 60° to the centerline of roadway preferred; may be reduced to 45°

### *Radius of Curvature*

- The radii of driveways and street entrances will vary, depending on the type of establishment and the type of vehicle using the entrance.

| **Table 15: Radius of Curvature** | | |
|---|---|---|
| | Residential | Commercial |
| Rural Driveways | 10 ft. minimum; 20 ft. maximum | 20 ft. minimum |
| Urban Driveways | 5 ft. minimum; 15 ft. maximum | 20 ft. minimum |
| Street-Type Entrances | For entrances servicing passenger cars almost exclusively: 25 ft. minimum, 30 ft. recommended | |
| For entrances with a significant portion of single-unit trucks or WB-40 tractor trailers | 40 ft. minimum | |
| For entrances servicing WB-50 tractor trailers or larger | 40 ft. minimum, 75 ft. maximum, 50 ft. recommended | |
| *Source: TDOT. Manual for Constructing Driveway Entrances on State Highways. Draft. 2015 Edition.* | | |

### *Entrance Width*

- The recommended entrance widths are listed in the following table:

| **Table 16: Driveway Widths** | | | | |
|---|---|---|---|---|
| Entrance Type | One-Way Driveways | | Two-Way Driveways | |
| | Minimum | Maximum | Minimum | Maximum |
| Single Family or Duplex | N/A | N/A | 14 ft. | 20 or 24 ft. |
| Multi Family | 12 ft. | 20 ft. | 24 ft. | 40 ft. |
| Commercial or Industrial | 12 ft. | 24 ft. | 24 ft. | 40 ft. |
| *Source: TDOT. Manual for Constructing Driveway Entrances on State Highways. Draft. 2015 Edition.* | | | | |

### *Corner Clearance*

- Corner clearance is the minimum distance required between an intersection and an upstream or downstream driveway, extending beyond the physical area of the intersection to include the portions of the roadway that are influenced by the intersection.
- The purpose of corner clearance is to physically separate the functional area of an intersection from the conflicting movements in the area of influence of an adjacent.
- The recommended corner clearance distances are listed in the following table:

**Table 17: Corner Clearance Requirements**

| Classification of Intersecting Street | Functional Classification of Road to be Accessed by Driveway | | |
|---|---|---|---|
| | Arterial | Collector | Local |
| Arterial | 200 ft. | 150 ft. | 100 ft. |
| Collector | 150 ft. | 100 ft. | 50 ft. |
| Local | 100 ft. | 50 ft. | 50 ft. |

*Source: TDOT. Manual for Constructing Driveway Entrances on State Highways. Draft. 2015 Edition.*

### *Distance between Double Driveways (Rural and Urban)*

- Rural: 40 ft. minimum
- Urban: 40 ft. minimum

### *Sight Distance*

- Highway entrances should be located to provide adequate sight distance for all traffic movements allowed. Sight distance requirements shall be in accordance with TDOT's design standards.

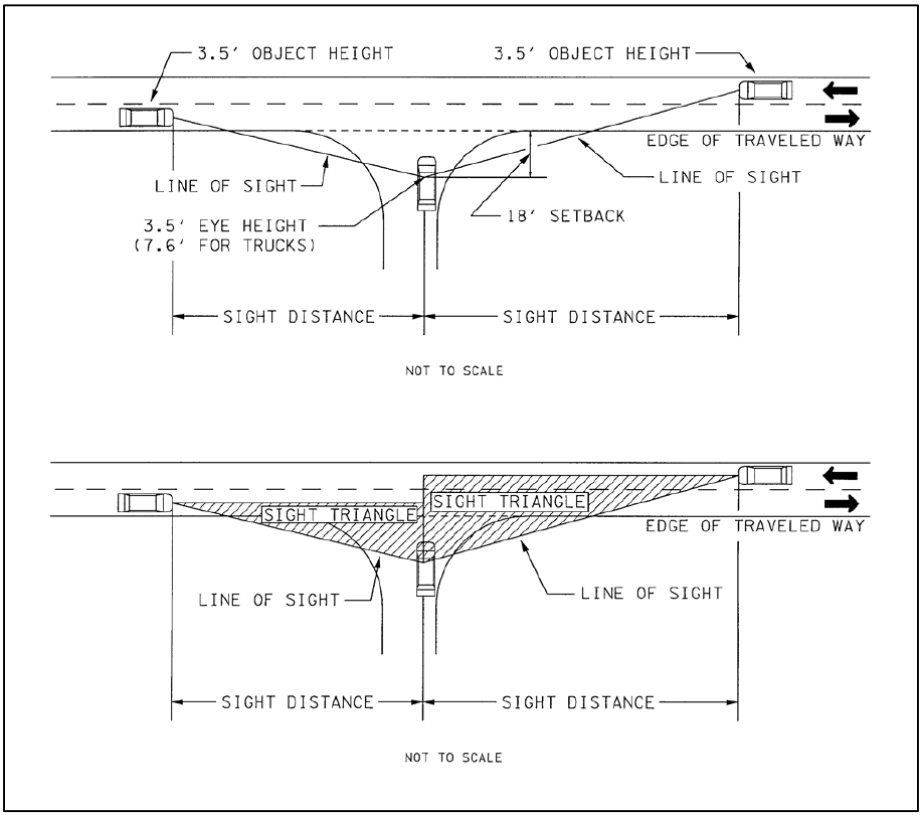



**Figure 45: Sight Triangle**

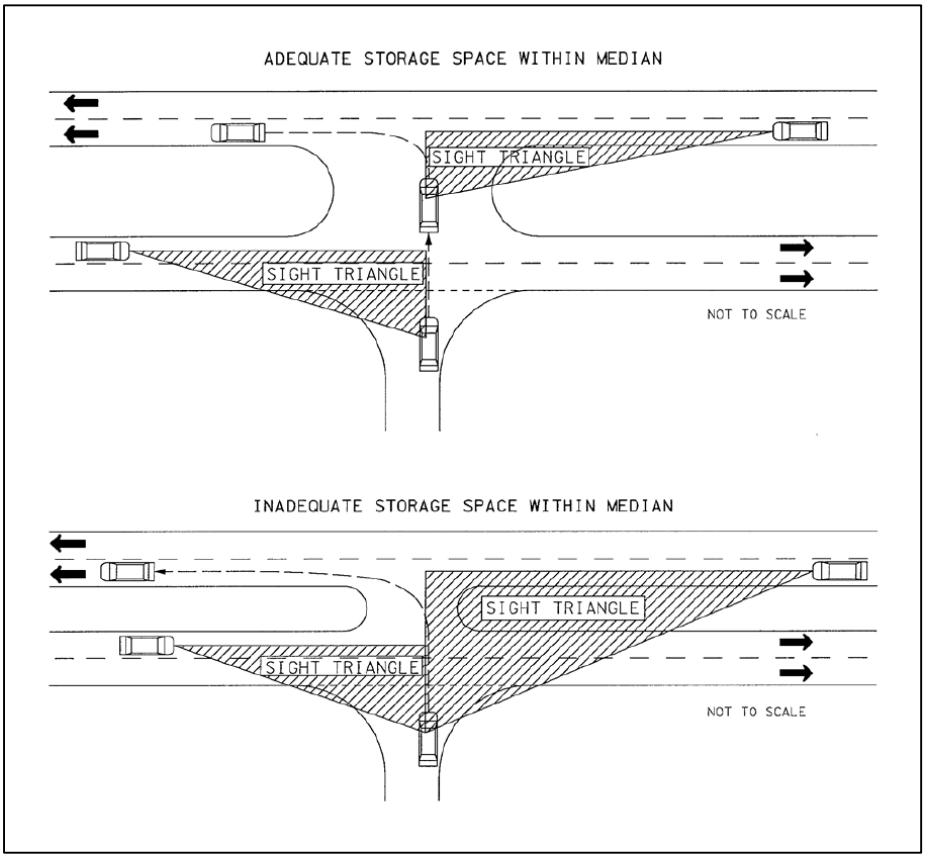



**Figure 46: Sight Distance at Divided Highways**

### *Driveway Construction and Grading Standards*

All driveways connecting to state routes shall be constructed according to either local government or TDOT standards, whichever standards are the strictest. Driveways shall be designed to minimize storm water flow from the driveway onto the public roadway. If there is a curb, the design should also minimize the diversion of storm water flowing against the curb into the driveway. Driveway side slopes shall be no steeper than 6:1. If there are culvert ends facing oncoming traffic, a side drain end-wall with grates may be required.

### *Median Openings and Spacing*

- Medians provide safety along with improved traffic operations.
- Median openings should be designed with auxiliary lanes that allow left turning vehicles to decelerate without interfering with the through movement of the left-most lane.
- Openings shall be permitted at predetermined uniformly spaced specific locations.
- The recommended uniform spacing is 1,320 ft. (a range of 880 ft. – 1,760 ft. is acceptable) in rural areas. It is 660 ft. (a range of 440 ft. – 880 ft. is acceptable) in urban areas.
- Where possible, driveways should be located so that they are aligned with pre-existing median openings. When this is not possible, driveways should be located a minimum of 100 ft. from the nearest median opening to minimize wrong-way movement and conflicts with traffic using the median opening.

### *Auxiliary Lanes*

TDOT requires that the need for any type of auxiliary lane should be documented in a Traffic Impact Study. However, in certain situations an auxiliary lane can be constructed without requiring a Traffic Impact Study.

When adding auxiliary lanes, the entire roadway at the site should be resurfaced to prevent differential settlement, eliminate undesirable pavement contrast, and provide proper pavement markings.

- The installation of any auxiliary lane shall not adversely impact the access of adjacent property.
- If an auxiliary lane is required based on the recommendations of a Traffic Impact Study, the owner of the property shall install the lane(s) within the public right-of-way.
- Acceleration and deceleration lane lengths should be designed to meet AASHTO guidelines where physically possible.

### 5.1.2 Access Management Standards from other Sources

#### *Unsignalized Access Spacing*

The Transportation Research Boards (TRB) Access Management Manual 2014 lists the following points to be considered in the selection and application of unsignalized access connection spacing:

1. Longer spacing standards are generally applied to roadways of a higher functional classification.
2. Higher classifications of roadways typically have higher speeds than roadways of a lower classification.
3. Higher classifications of roadways tend to carry higher traffic volumes than roadways of a lower classification.
4. Interference with through traffic increases as traffic volume increases. A small number of turning vehicles can interfere with a large number of through vehicles on high-speed, high-volume suburban and urban roadways, especially during peak periods. A single vehicle turning from a through lane can totally disrupt platooned flow and traffic progression.
5. Roadways with speeds of 45 mph or more are typically more critical than those with speeds of 40 mph or less.

Shorter unsignalized access connection spacing may be justified for lower categories of roadway given driver expectations, slower speeds, acceptance of a higher speed differential between a turning vehicle and following through traffic, and acceptance of an overlap in the functional distances of adjacent access connections.

Access spacing maximizes the capacity of passenger cars that re-enter the roadway from unsignalized drives.

**Table 18: Unsignalized Access Spacing**

| Speed (mph) | Minimum Access Spacing (ft.) |
|---|---|
| 20 | 120 |
| 25 | 200 |
| 30 | 330 |
| 35 | 470 |
| 40 | 630 |
| 45 | 870 |

*Source: TRB. Access Management Manual. 2014*

### *Access Spacing on Rural Roads*

TRB's 2014 Access Management Manual recommends the following spacing standards for rural roads.

| **Table 19: Guidelines for Access Spacing on Rural Roads** | | | | |
|---|---|---|---|---|
| Functional Class of Roadway | Undivided Roadway | Divided Roadway | | |
| | | Full Median Opening | Right In/ Out Only | Directional Median Opening |
| Strategic Arterial | Not applicable | 2,640 ft. | Typically not permitted | Typically not permitted |
| Principal Arterial | 2,640 ft. | 2,640 ft. | 990 ft. | 1,320 ft. |
| Minor Arterial | 1,500 ft. | 1,320 ft. | 660 ft. | 660 ft. |
| Collector | 660 ft. | Not applicable, medians typically not used | | |
| Local Road | 600 ft. | | | |
| *Source: TRB. Access Management Manual. 2014* | | | | |

### *Access Spacing on Suburban Roads*

TRB's Access Management Manual recommends the following spacing standards for suburban roads.

| **Table 20: Guidelines for Unsignalized Access Spacing on Suburban Roads** | | | | |
|---|---|---|---|---|
| Functional Class of Roadway | Undivided Roadway | Divided Roadway | | |
| | | Full Median Opening | Right In/ Out Only | Directional Median Opening |
| Strategic Arterial | Not applicable | 2,640 ft. | Typically not permitted | Typically not permitted |
| Principal Arterial | 2,640 ft. | 2,640 ft. | 1,320 ft. | 1,320 ft. |
| Minor Arterial | 660 ft. | 1,320 ft. | 330 ft. | 660 ft. |
| Collector | 330 ft. | Not applicable, medians typically not used | | |
| Local Road | 100 ft. | | | |
| *Source: TRB. Access Management Manual. 2014* | | | | |

### *Spacing Standards for Commercial Entrances, Intersections, and Crossovers*

The following Table on minimum spacing standards is from the Virginia Department of Transportation and has been used by the City of Cleveland.

**Table 21: Minimum Spacing Standards for Commercial Entrances, Intersections, and Crossovers**

| Highway Functional Classification | Legal Speed Limit | Centerline to Centerline Spacing in feet | | | | |
|---|---|---|---|---|---|---|
| | | Signalized Intersections/ Crossovers | Unsignalized Intersections/ Crossovers & Full Access Entrances | | | Partial Access One or Two Way Entrances |
| | | | Xover | Both | Entrance | |
| Urban Principal Arterial | ≤ 30 mph | 1,050 | 880 | 1,050 | 440 | 250 |
| | 35 to 45 mph | 1,320 | 1,050 | 1,320 | 565 | 305 |
| | ≥ 50 mph | 2,640 | 1,320 | 1,320 | 750 | 495 |
| | | | Xover | Both | Entrance | |
| Urban Minor Arterial | ≤ 30 mph | 880 | 660 | 660 | 355 | 200 |
| | 35 to 45 mph | 1,050 | 660 | 660 | 470 | 250 |
| | ≥ 50 mph | 1,320 | 1,050 | 1,050 | 590 | 425 |
| | | | Xover | | Entrance | |
| Urban Collector | ≤ 30 mph | 660 | 440 | | 225 | 200 |
| | 35 to 45 mph | 660 | 440 | | 335 | 250 |
| | ≥ 50 mph | 1,050 | 660 | | 425 | 360 |
| | | | Xover | Both | Entrance | |
| Rural Principal Arterial | ≤ 30 mph | 1,050 | 880 | 1,320 | 440 | 250 |
| | 35 to 45 mph | 1,320 | 1,050 | 1,320 | 565 | 305 |
| | ≥ 50 mph | 2,640 | 1,320 | 1,760 | 750 | 495 |
| | | | Xover | Both | Entrance | |
| Rural Minor Arterial | ≤ 30 mph | 880 | 660 | 880 | 355 | 200 |
| | 35 to 45 mph | 1,050 | 660 | 1,050 | 470 | 250 |
| | ≥ 50 mph | 1,320 | 1,050 | 1,320 | 590 | 425 |
| | | | Xover | | Entrance | |
| Rural Collector | ≤ 30 mph | 660 | 440 | | 225 | 200 |
| | 35 to 45 mph | 660 | 440 | | 335 | 250 |
| | ≥ 50 mph | 1,050 | 660 | | 445 | 360 |

*Source: Virginia Department of Transportation. Background on the Revisions to VDOT's Access Management Spacing Standards. Page: 3. December 2011.*

### *Sidewalks*

As mentioned in Cleveland's Zoning Ordinance, where a proposed development includes improvements or new construction of collector or arterial facilities, sidewalks should be included within the right-of-way on both sides of the street.

Residential projects within 2,000 feet of an activity center comprised of commercial, office, service, recreation activities, or public primary and secondary schools shall provide sidewalks on both sides of the street.

### *Pedestrian Crossing Safety*

There are safety concerns when pedestrians cross an undivided roadway or a roadway with two-way-left-turn-lanes (TWLTL). A non-traversable median provides a physical refuge for pedestrians as they cross the roadway. The number of crashes involving pedestrians is much lower on divided roadways with non-traversable medians than at locations with a TWLTL or undivided roadways. The need for pedestrian signals depends on various conditions, such as roadway width, speed, vehicle-pedestrian crash history, and pedestrian volume. [*TRB. Access Management Manual. 2014*].

## 5.2 Access Management "Transect" Guidelines

Currently there is an undergoing access management study for State Route 109 in middle Tennessee. Like this study it is a result of the Corridor Management Agreements (CMA) between TDOT, affected MPO's and local stakeholders. The SR 109 study is intended to provide Nashville Area MPO, TDOT and local government partners a set of customized access management strategies and a plan for coordinating access management decisions along SR 109. A consultant team consisting of Gresham, Smith & Partners (GSP), Kimley-Horn and Associates (KHA), and access management expert, Phil Demosthenes is undertaking the study.

The SR 109 Access Management Study suggests "Access Management Categories" in a "transect" concept. Those categories establish different sets of access point standards depending on the type of roadway/ type of development.

This study suggests applying these access management categories to the SR 60 corridor as well, which would provide statewide consistency. Each study section of SR 60 falls into a certain category mainly determined by the functional class and adjacent land uses.

The following illustration depicts the access management "transect" concept and spacing standards for medians, traffic signals, streets, and driveways. [*Nashville MPO. State Route 109 Corridor Management Committee. January 23, 2015*].

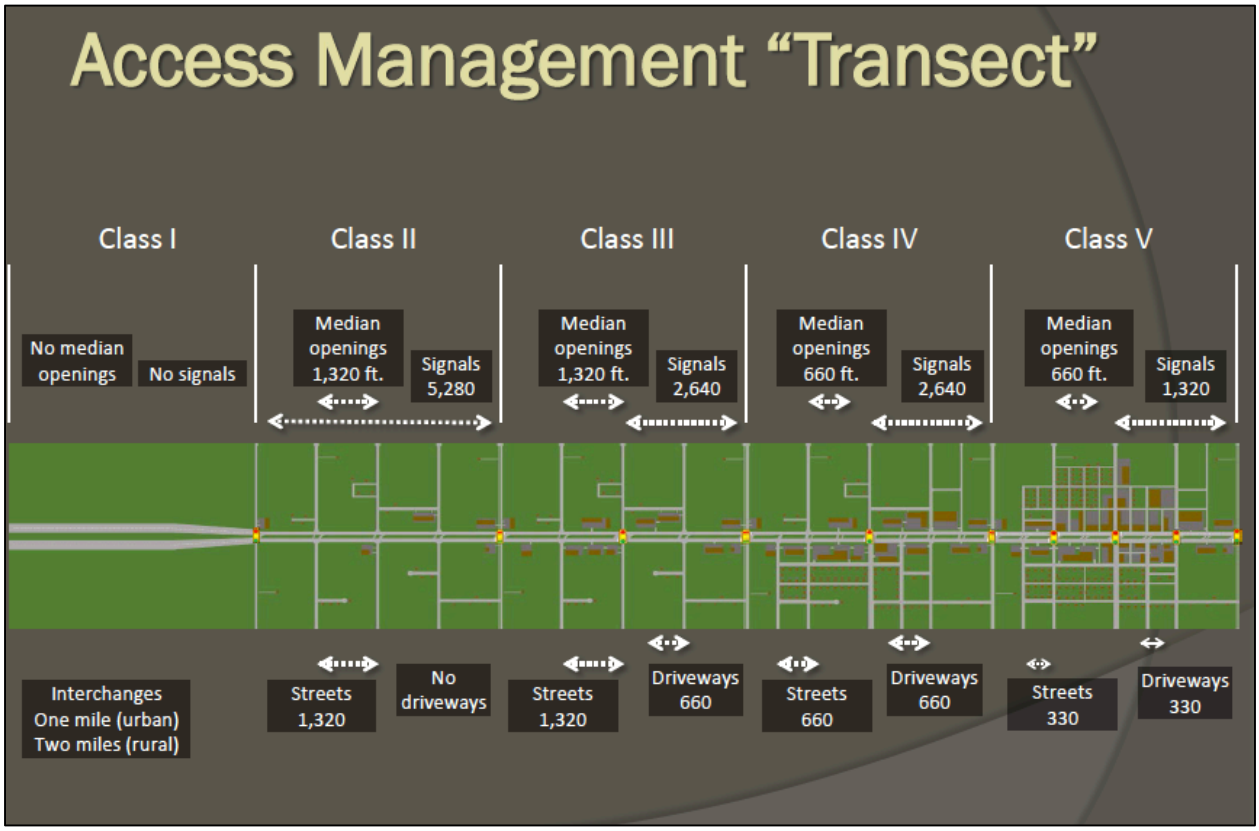



**Figure 47: Access Categories**

Table 22 describes the access management categories.

| Table 22: Access Management Categories | | | | | |
|---|---|---|---|---|---|
| **Access Category** | **Mobility and Safety** | **Access Spacing** | **Driveways** | **Traffic Signals and Street Spacing** | **Median** |
| **Class I** | Most restrictive with access<br>Mobility is only priority<br>Speeds: 55 mph<br>With proper access design provides the safest travel<br>Lower crash rate | Access only by grade-separated interchanges | No direct public or private access | No traffic signals<br>Interchange spacing should be one mile (urban) and two miles (rural)<br>Consider interchange ramp roundabouts | A non-traversable median is required |
| **Class II** | Restrictive with access<br>Mobility is priority<br>Speeds: 45 mph and higher<br>With proper access design provides the safest travel<br>Lower crash rate | Access only by public street | No private driveways<br>Temporary driveways would be allowed until local network alternative are available | Street spacing: 1,320 ft.<br>Consider roundabouts in place of traffic signals<br>Traffic signal spacing: 5,280 ft. | Non-traversable median preferred<br>Median openings: 1,320 ft. |
| **Class III** | Transition to suburban area<br>Mobility and safety are priorities<br>Speeds: 45 mph and higher | Full movement at one-half mile spacing<br>Spacing is more flexible | Driveways should only be built by necessity until alternative is available<br>Driveway spacing: 660 ft. | Street spacing: 1,320 ft.<br>Consider roundabouts in place of traffic signals<br>Traffic signal spacing: 2,640 ft. | Non-traversable median is preferred<br>Median openings: 1,320 ft. |
| **Class IV** | Suburban Area<br>Balance between mobility and adjacent land use | Full movement at one-half mile spacing<br>Spacing is more | Driveway spacing: 660 ft. | Street spacing: 660 ft.<br>Consider roundabouts in place of traffic | Non-traversable median is preferred<br>Median |

| | | | | | |
|---|---|---|---|---|---|
| | access allowances<br>Lower mobility<br>Speeds: 35 mph<br>Higher crash rate than in Class III | flexible | | signals<br>Traffic signal spacing: 2,640 ft. | openings: 660 ft. |
| **Class V** | Urban / Compact Areas<br>More accommodation of abutting access needs<br>Lowest mobility<br>Speeds: 35 mph<br>Highest crash rate of the five classes | Full movement at quarter mile spacing<br>Spacing is more flexible | Driveway spacing: 330 ft. | Street spacing: 220 ft.<br>Consider roundabouts in place of traffic signals<br>Traffic signal spacing: 1,320 ft. | Non-traversable median still preferred<br>Median openings: 660 ft. |

The transect concept can be applied to SR 60. Each of the study sections can be assigned to an access category as shown on Illustration 48.

Section I, V, and VI of the study area have been assigned Class III "Transition to Suburban." All of the road sections are in a rural or suburban setting with rather low-density development adjacent to the road. Mainly local collector roads have access to the corridor, but also several driveways. According to the access category, driveways should be built only by necessity until an alternative is available. Mobility and safety are priorities in this category.

Section II is assigned Class IV "Suburban." This class is supposed to allow the balance between mobility and adjacent land use. This section has several access points leading to the adjacent residential and commercial development (McGrady Drive). Due to the access points and turning vehicles, there are traffic conflicts expected. According to the access category, a non-traversable median is preferred, whereas this section has a median turning lane for the most part.

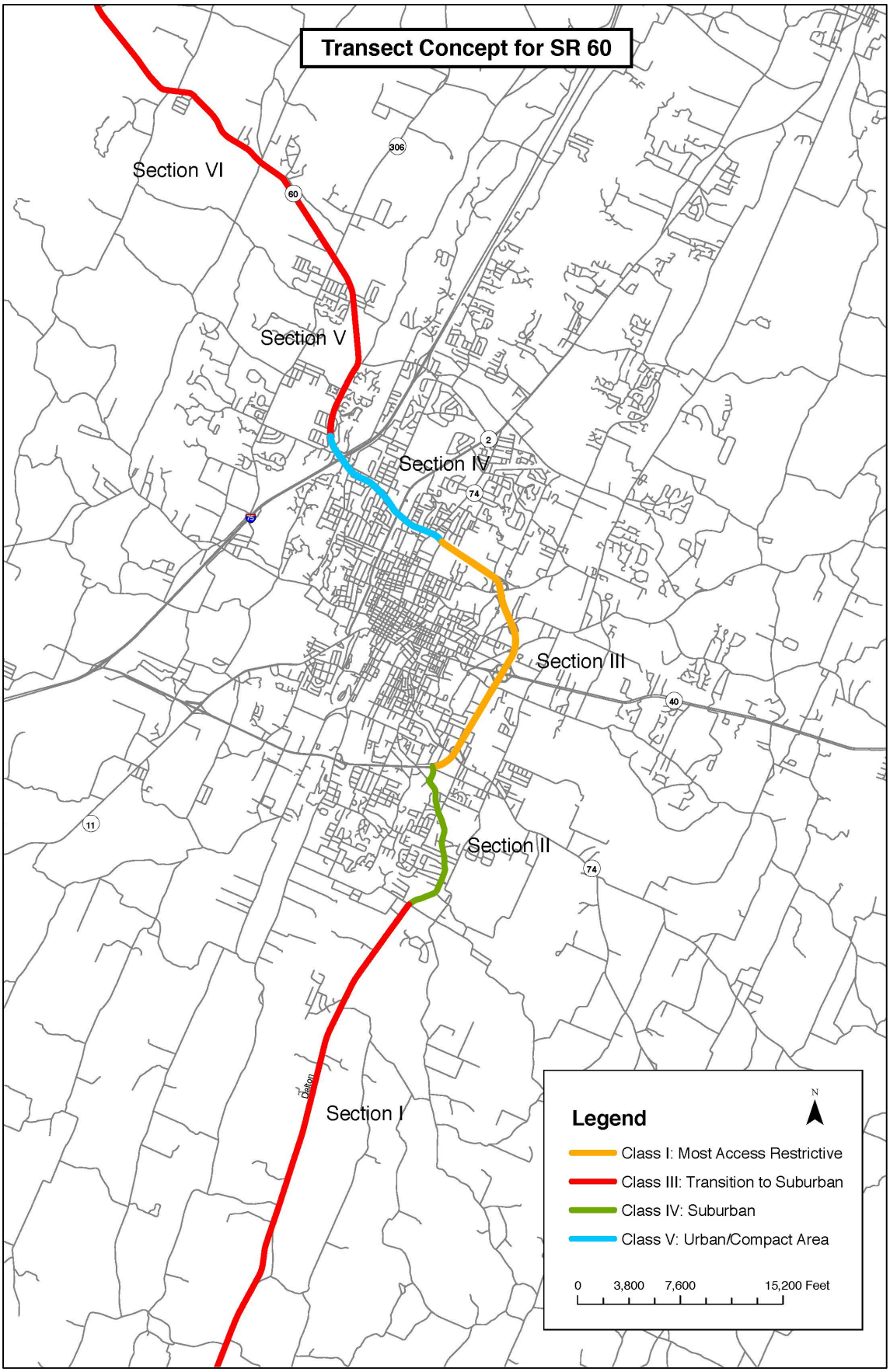



**Figure 48: Transect Access Categories transferred to SR 60**

Section III of SR 60 is assigned to Class I, the most restrictive access category. Since this road section has the functional classification of "expressway / freeway" for APD 40 it should be access restricted. Class I provides the safest travel and highest operating speeds. No traffic signals and no direct public or private access is allowed; only grade-separated interchanges can provide access. While this section has a mostly continuous non-traversable median there are few local roads, and commercial driveways that access this section.

Section IV is the busiest stretch of SR 60 and is assigned Class V "Urban/Compact Area." This class accommodates abutting access needs more in comparison to any other of the access categories. However, this also has the highest conflict potential and crash rate.

It is recommended to the CMA Committee to review those guidelines and consider implementing them as policies for State Route 60.

## 5.3 Access Management Tools

The following list of access management measures and treatments are suggested for use on State Route 60. The use of any of these treatments depends on the character of the road (e.g. functional class, traffic volume, rural/urban) and type of development requiring access.

The tools were selected based on applicability for corridor 60. The source is the "Access Management Toolkit" developed by the Center for Transportation Research and Education, Iowa State University, and TRB's Access Management Manual, 2014.

<u>Driveway Grade:</u>

The maximum practical grade for driveways varies between 8-14% for low-volume driveways and 5% for high-volume driveways (a 30-foot long driveway with a 14% grade would rise or fall about 4 ft. along its length). The maximum practical change in grade is about 12%. While this may be the maximum practical grade, it is much safer to use a smaller grade.

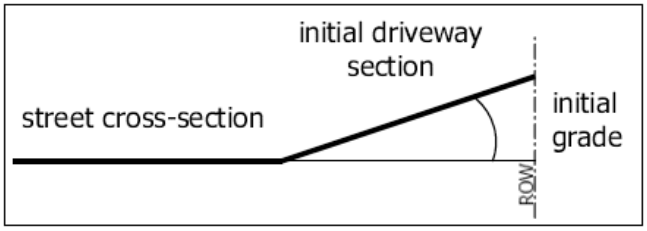



**Figure 49: Driveway Grade**

Driveway Width:

Commercial driveways may vary in size depending on the number of lanes needed. The optimal width for a one-way in or out driveway is 14 to 16 feet. Maximum width driveways usually have two inbound and three outbound lanes, with each lane being at least 11 feet wide. Where more than one inbound and outbound lane is provided, a median divider is generally desirable. This median should be at least 4 feet wide.

Driveways that enter the public roadway at a traffic signal should have at least two outbound lanes - one for right turns and one for left turns and one inbound lane of 14 feet minimum width.

All noncommercial (residential) driveways should normally have a width between 14 feet and 24 feet. Where larger vehicles will use a driveway, at least a 20-foot width should be provided.

Clearing Driveways Away from Corners

Clearing driveways away from corners is the simplest and probably most critical access management treatment.

Ideally, corner clearances on major roadways should be the same as driveway spacing requirements. When this cannot be achieved because of a lack of frontage, the upstream corner clearance should be longer than the longest expected queue at the adjacent intersection.

Shared/Joint Driveways and/or Cross Access

The use of shared common access driveways between adjacent properties abutting major roadways helps to reduce the number of conflict points and separate the conflict areas. The smoother traffic flow on the abutting street helps to reduce vehicular crashes and increase egress capacity. Joint access and interparcel circulation can be readily implemented in the subdivision and site plan approval process if the local agency adopts the appropriate ordinances, policies, and procedures.

Adjacent property owners may be encouraged to share a common access if it can be shown that customer convenience and safety can be improved. Reconstruction projects in which a non-traversable median is added or a median opening is modified also offer opportunities for encouraging joint access agreements.

Commercial developments that can be expected to have substantial interparcel traffic and therefore would benefit from interparcel connections are:

- High-turnover restaurants and gas stations;
- A discount store and a large shopping mall located in close proximity;
- A specialty store and a shopping mall located in close proximity;

- Shopping centers anchored by competitive supermarkets or that have complementary shops;
- Neighborhood shopping centers and gas stations; and
- Neighborhood shopping centers and branch banks.

*[TRB. Access Management Manual. 2014]*

Continuous Two-Way Left-Turn Lanes

Continuous two-way-left-turn-lanes (TWLTL) are a common access management treatment when combined with driveway consolidation and corner clearance. TWLTLs simultaneously provide a separate lane for left turning vehicles and property access. Typically, they are used as the center lane of a five-lane roadway. A less common design involves three lanes, a TWLTL in the center for left turns and one lane in each direction for through traffic.

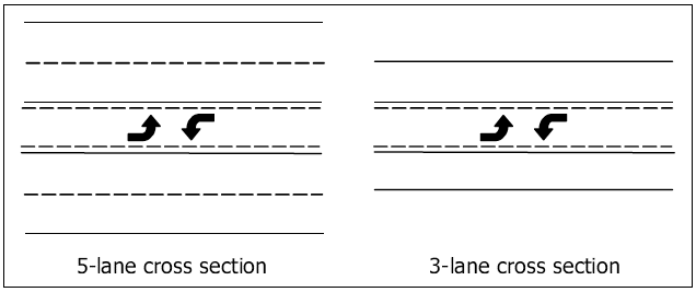



**Figure 50: Continuous Two-Way-Left-Turn Lanes**

In general, TWLTL projects function well when traffic levels are moderate, the percentage of turning volumes is high, and the density of commercial driveways is low to moderate.

Evaluations indicate that a TWLTL may be appropriate for the following roadways:

- Roadways in urban and suburban areas with projected ADT of fewer than 24,000 VPD,
- Collector streets in developing residential areas in which residence front onto local streets that intersect with the collector street,
- Collector streets in developing suburban areas on which direct access is to be provided to small abutting properties, and
- Collector streets in developed urban and suburban areas on which there is no crash pattern that would be correctable by a raised-curb median.

Three-Lane Roadways with Two-Way Left-Turn Lanes

Continuous two-way left-turn lanes (TWLTL) in the center of a three-lane roadway for left turns are being used more and more frequently. Three-lane roadway designs with TWLTLs should generally not be used in situations where the through traffic volume is substantial – if more than 17,000 vehicles per day. In such cases, four-lane roadways with raised medians or five-lane roadways with TWLTLs may be more appropriate designs.

Raised Medians at Intersections

Raised medians with left-turn lanes at intersections offer a cost-effective means for reducing accidents and improving operations at higher volume intersections. The left-turn lanes separate slower turning vehicles from through traffic and provide a protected space for these vehicles to decelerate and turn. The raised median prohibits left turns into and out of driveways that may be located too close to the functional area of the intersection.

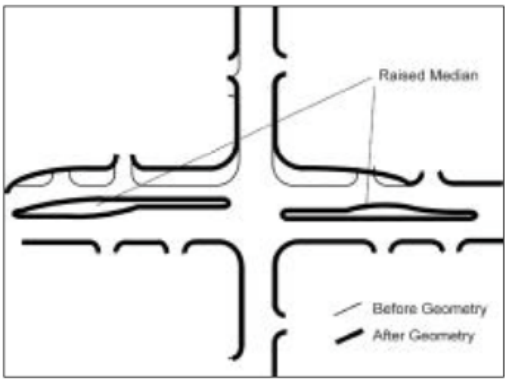



**Figure 51: Raised Median at an Intersection**

Raised medians at intersections may be most effective in retrofit situations where high volumes of turning vehicles have degraded options and safety. Raised medians are used in situations where more extensive approaches would be too expensive because of limited right-of-way and the constraints of the built environment.

Because raised medians limit property access to right turns only, they should be used in conjunctions with efforts to provide alternative access ways and promote driveway spacing objectives.

Continuous Raised Median

Physical medians prevent accidents caused by crossover traffic; reduce headlight glare distraction, and separate left-turning traffic from through lanes when combined with left-turn lanes. By removing left-turning vehicles from through traffic, continuous raised medians with left-turn lanes at intersections and major driveways help maintain roadway operating speed.

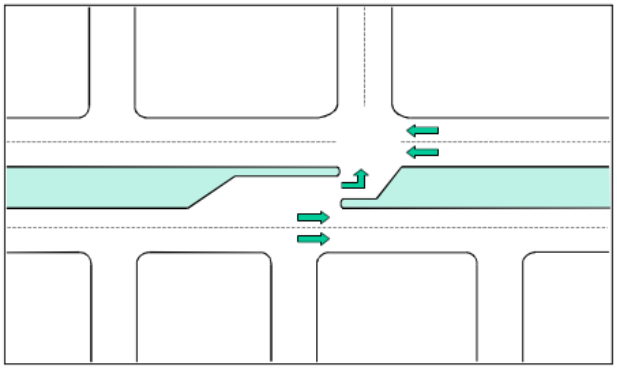


**Figure 52: Continuous Raised Median**

Additional advantages of continuous raised medians are that they (1) discourage strip development, (2) allow better control of land uses by local government, (3) provide better pedestrian protection than undivided roadways, painted islands or two-way left turn lanes, and (4) provide space for landscaping and other aesthetic treatments.

A non-traversable median is more desirable than a TWLTL in the following situations:

- All new multilane urban arterial roadways;
- Existing multilane urban arterial roadways with an ADT in excess of 24,000 to 28,000 VPD or a projected ADT of 28,000 VPD during the next 20 years;
- Rural multilane roadways;
- Bypasses of urban areas;
- Between closely spaced roundabouts in areas with moderate or greater commercial development;
- Roadways on which aesthetic considerations are a high priority;
- Multilane roadways with a high level of pedestrian activity; and
- High-crash locations or areas in which it is desirable to limit left turns to improve safety.

Studies have shown that adding a non-traversable median can reduce crashes by 55%, decrease delays by 30% and increase capacity by 30%. Replacing a TWLTL with a non-traversable median can reduce crashes by 15-57% on 4-lane roads; reduce crashes up to 75% at unsignalized accesses; and increase capacity by 25%.

Dedicated left and right turning lanes

Dedicated turning lanes allow through traffic to keep moving, thus avoiding some potential rear-end collisions. The combination of medians and turning lanes provides protection for turning traffic, thus reducing the number of broadside collisions.

Designated turn lane designs can be effectively used in situations where there are moderate to high levels of through traffic, yet concerns exist regarding conflict points and crashes caused by turning traffic. Designated turning lanes can either be designed that way originally or can be created by widening an existing two or four-lane route. Raised medians can be added along the entire roadway or at and near intersections with other roads to provide additional safety.

The main benefits of turn lanes are improved traffic safety and increased travel speed, reduced delay, and reduced congestion.

Driveway Turn Radius

Turn radius refers to the extent that the edge of a commercial driveway is “rounded” to permit easier entry and exit by turning vehicles. Driveway entrances with longer

turn radii help slower, turning traffic move off the arterial more quickly. They also help traffic leaving a driveway turn and enter the stream of traffic more efficiently.

Longer radii are most desirable in situations where vehicles are exiting from a higher speed roadway or when a high volume of driveway traffic is expected. Sufficiently long turn radii can be achieved by designing the driveway to accommodate the largest vehicles expected to use the driveway.

NCHRP Report 348 recommends a minimum of 25-foot turn radius in urban areas, although a 35-foot radius may be needed to accommodate buses and single unit trucks. In most suburban settings, 25 to 50 foot radii are desirable; however, longer radii are desirable where turning islands or dual turning lanes are provided. A minimum 15-foot radius is recommended in areas of heavy pedestrian traffic such as business districts and school crossings. Shorter radii are recommended only for residential drives from low-speed roadways.

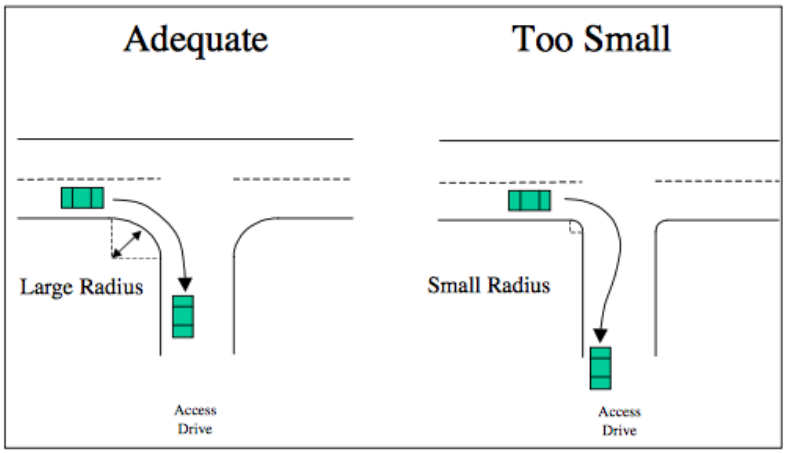



**Figure 53: Driveway Turn Radii**

<u>Internal circulation in land developments</u>

Internal site design is probably the most neglected discussion point in access management.

The internal circulation of a land development functions well when it is designed with respect to highway access point(s) rather than the building(s). Design should start from the outside in and finish with the parking and building.

Here is the optimal internal circulation design approach:

1.) Provide safe and reasonable access to and from the street to motorists and pedestrians.

2.) Provide a reasonable transition between the access and the internal circulation, especially by making sure the driveways are wide and long enough.

3.) Design the parking area and individual parking spaces.

4.) Design the building footprint within the constraints of the internal circulation and the parking.

Inadequate driveway throat length is the number one problem that occurs when internal land development circulation is poorly designed. "Throat length" is the distance between the street and the end of the driveway inside the land development.

Table 23 illustrates the recommended driveway throat length for different commercial development types.

**Table 23: Driveway Throat Length by Development Type**

| Commercial Development Type | Recommended Driveway Throat Length |
|---|---|
| Large and medium shopping centers with greater than 200,000 gross leasable square feet in floor area | 200 to 250 feet (about 15 car lengths) |
| Small commercial developments with signalized access driveways | 80 to 90 feet (five to six car lengths) |
| Small commercial developments with unsignalized commercial driveways | 30 to 50 feet (two to three car lengths) |

*Source: Center for Transportation Research and Education. Iowa State University. Access Management Toolkit. 2007.*

Most commercial developments do not include a two to three car length driveway leading to situations in which traffic circulation within the commercial development is chaotic. It can also lead to situations in which traffic turning into a development queues on the arterial roadway while waiting for vehicles to clear the short driveway.

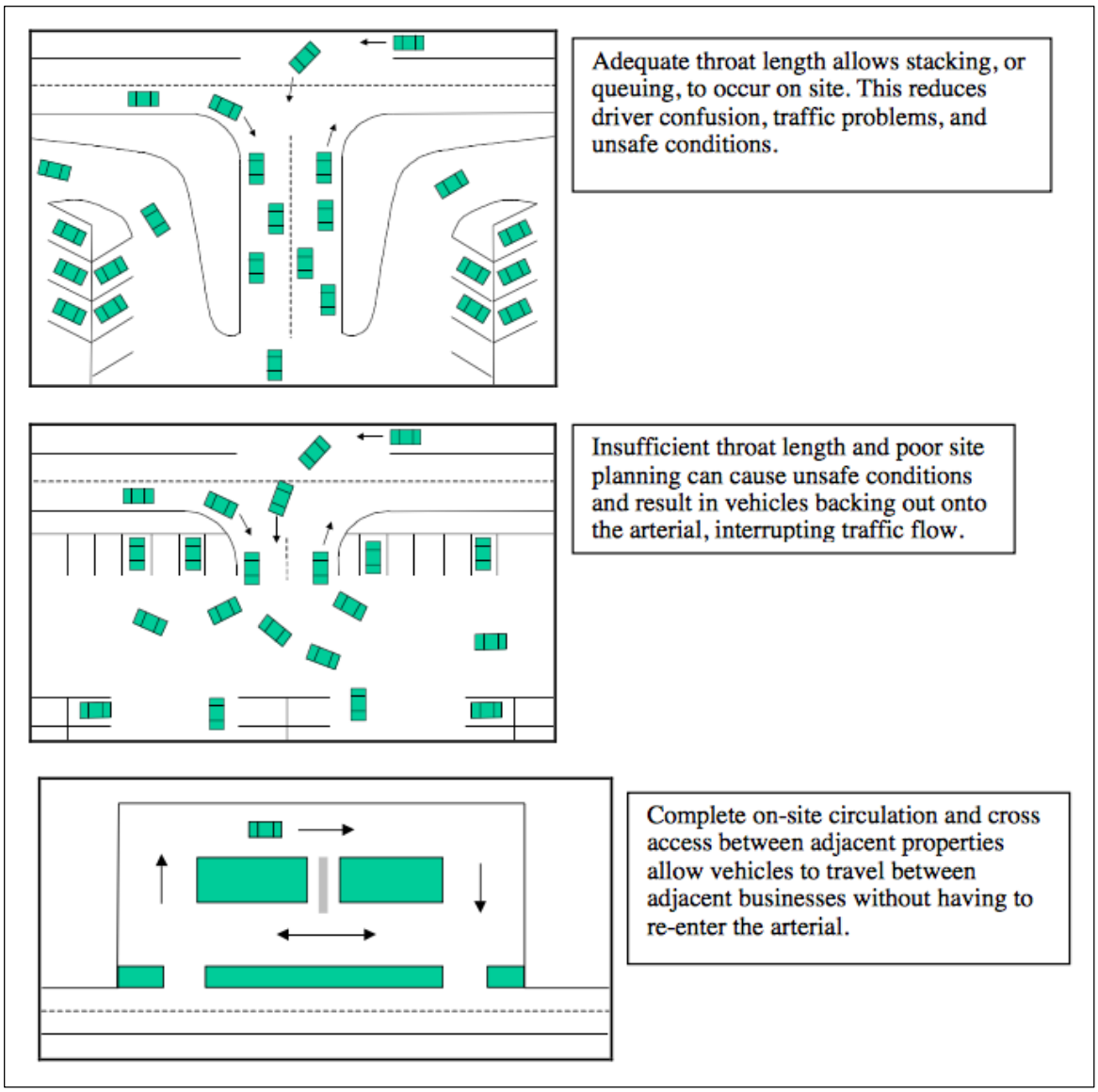



**Figure 54: Internal Circulation in Developments**

<u>Incorporating Aesthetics into Access Management</u>

Access management projects often involve widening existing roadways to add either an additional two-way-left-turn lane (TWLTL) or a raised median. Those projects can lead to a wide expanse of concrete and asphalt. Aesthetically pleasing treatments can and should be incorporated into access management project plans.

In conjunction with access management improvements such as consolidating driveways, installing raised medians, or constructing TWLTLs, many aesthetic treatments are possible. These include:

- Landscaping the raised median
- Adding pavement textures and designs to parking areas
- Adding well designed retaining walls where needed to prevent erosion
- Planting street trees and other vegetation outside the clear zone
- Removing signs from the clear zone and otherwise modifying commercial signs to make them less obtrusive
- Adding uniform, well designed street lights and other hardware
- Placing utility lines underground to eliminate them from view and reduce the need for utility poles

Aesthetic treatments can, when combined with access management, create a much more attractive roadway corridor that is also highly functional and safer.

Roundabouts

A roundabout is a form of circular intersection in which traffic travels counterclockwise around a central island and in which entering traffic must yield to circulating traffic.

Figure 55 shows a typical roundabout identifying the key characteristics.

Roundabouts have been demonstrated to be safer than other forms of at-grade intersections. The safety benefit is particularly notable for fatal and injury crashes. The safety performance of a roundabout is a product of its design. At roundabouts, vehicles travel in the same direction, eliminating the right-angle and left-turn conflicts associated with traditional intersections.

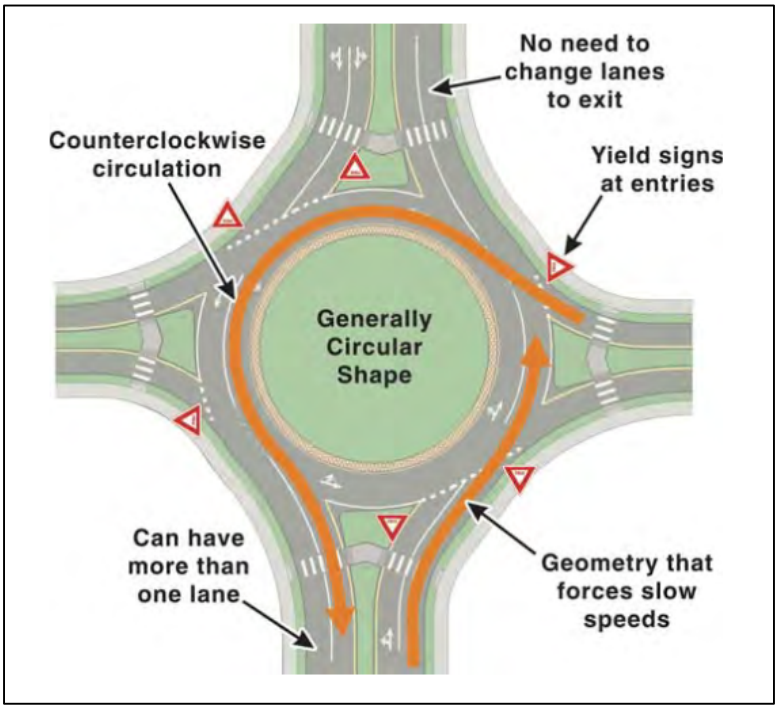



Figure 55: Roundabout with Key Characteristics

There are generally three roundabout categories as shown in Table 24.

| **Table 24: Design Characteristics of the Three Roundabout Categories** | | | |
|---|---|---|---|
| ***Design Element*** | ***Mini-Roundabout*** | ***Single-Lane Roundabout*** | ***Multilane Roundabout*** |
| Desirable maximum entry design speed | 15 to 20 mph | 20 to 25 mph | 25 to 30 mph |
| Maximum number of entering lanes per approach | 1 | 1 | 2+ |
| Typical inscribed circle diameter | 45 to 90 ft. | 90 to 180 ft. | 150 to 300 ft. |
| Central island treatment | Fully traversable | Raised (may have traversable apron) | Raised (may have traversable apron) |
| Typical daily service volumes on 4-leg roundabout below which may be expected to operate without requiring a detailed capacity analysis (VPD) | Up to approximately 15,000 | Up to approximately 25,000 | Up to approximately 45,000 for two-lane roundabout |
| *Source: TRB. NCHRP Report 672. Roundabouts: An Informational Guide. Second Edition. 2010.* | | | |

## 5.4 Recommendations for Access Management Measures on SR 60

The following recommendations regarding the spacing or driveways, streets, and traffic signals are in reference to future development or redevelopment along the SR 60 corridor. The cited access spacing standards are taken from the Transect guidelines as described in Ch. 5.2.

### 5.4.1 Recommendations for Section I

- **Functional Class: Minor Arterial**
- **Setting: Rural Area**
- **Accessibility: Some access control**
- ***Access Management "Transect" Category: Class III [see Ch. 5.2]***

- Maintain and implement the standards for spacing of driveways and streets for a minor arterial in a rural setting according to the recommendations in the previous chapters.
- Mobility should be preserved as much as possible.

- Driveways should only access SR 60 by necessity, and should be spaced apart at least 660 ft. Streets should also be spaced at least ¼ mile apart.
- Currently there is not much development along this section and therefore hardly any access point issues. Closer to Section II, where development gets denser, the spacing of driveways becomes too close. As development continues it is advised to follow the spacing guidelines. Individual driveways accessing SR 60 should be limited and shared driveways or local roads that provide access to development should be encouraged.

### → *Section of SR 60*

On this particular section of SR 60, where the road transitions from two to four lanes, the spacing of driveways is too close together. The recommended minimum spacing distance of 660 ft. is not met. Several of those driveways could be consolidated into shared driveways.

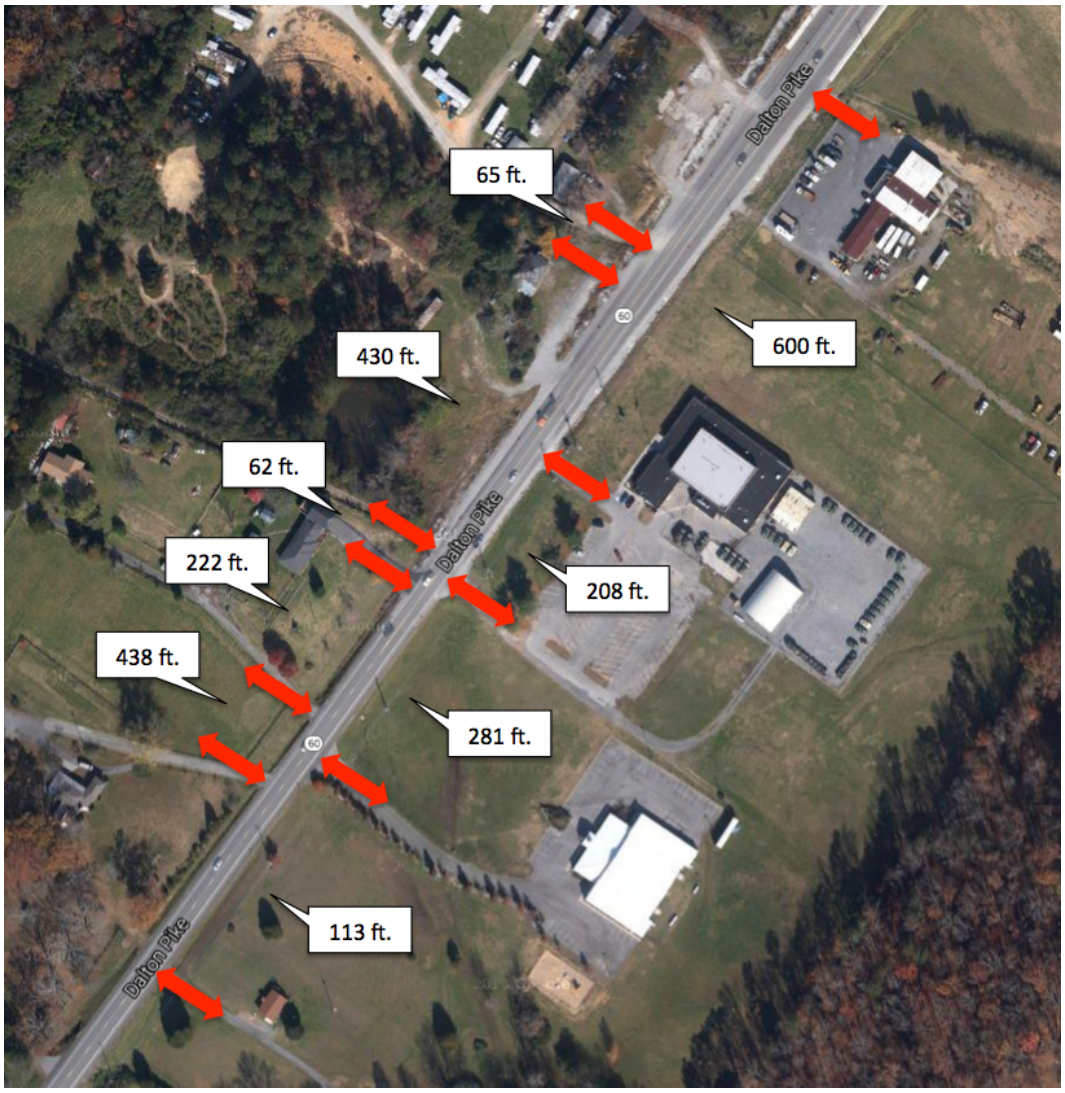



**Figure 56: Driveways from adjacent Land Uses accessing SR 60**

### 5.4.2 Recommendations for Section II

- **Functional Class: Minor Arterial**
- **Setting: Suburban Area**
- **Accessibility: Limited access control**
- ***Access Management "Transect" Category: Class IV [see Ch. 5.2]***

- Keep the continuous two-way-left-turn lane (TWLTL). Consider a continuous raised median as traffic volumes increase on this section. Currently traffic volumes are between 7,301 and 10,500 VPD. A raised median is recommended at traffic volumes of more than 28,000 VPD.
- Driveways should be built only by necessity. If possible residential driveways should access to a side street. Any driveways should be spaced at least 660 ft. apart.
- Accessing streets should be spaced at least 660 ft. apart.

***→ Section of SR 60:***

Some residential streets are spaced less than 660 ft. apart. It is advised to maintain the minimum spacing requirements to reduce conflict points.

**Figure 57: Residential Neighborhoods on Section II**

### → *McGrady Drive:*

The short section of McGrady Drive has lots of commercial development adjacent to it. Several driveways are accessing the road. It is suggested to combine driveways for shared access and provide connections between the individual businesses.

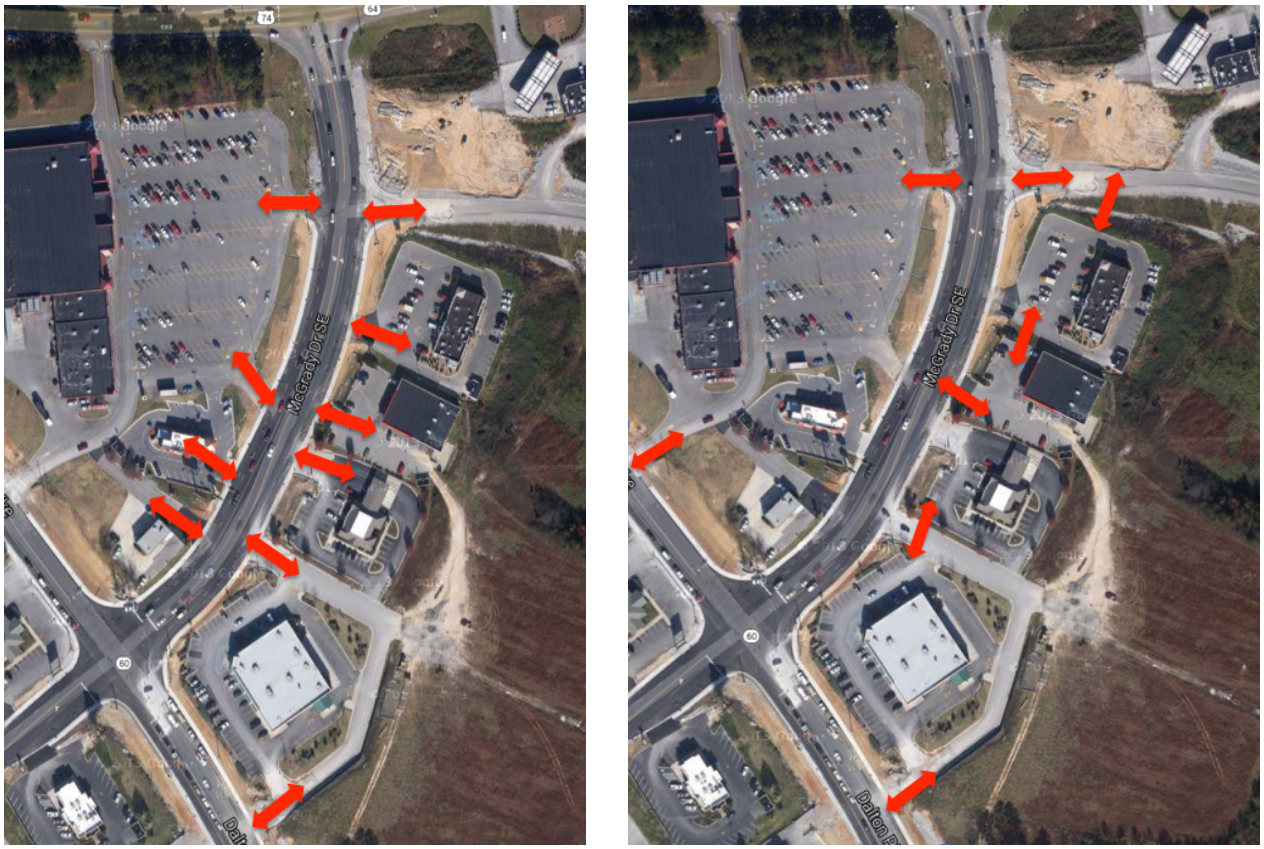



**Figure 58: Driveways on McGrady Dr and proposed Solutions**

- Consider roundabouts instead of traffic signals. AADT on McGrady Drive is between 7,301 – 10,500 VPD and therefore a mini-roundabout (see Ch. 5.3 on "Roundabouts") could be a solution to improve traffic flow and safety.

### 5.4.3 Recommendations for Section III

- **Functional Class: Principal Arterial and Freeway/Expressway**
- **Setting: Suburban Area**
- **Accessibility: Restrictive access control**
- ***Access Management "Transect" Category: Class I [see Ch. 5.2]***

- Provide full access control all along SR 60 that is functionally classified as freeway/ expressway.
- Access should be only provided by grade-separated interchanges.
- No traffic signals
- Provide a non-traversable median.
- No driveways permitted.
- Reduce the existing driveway cuts for commercial businesses by combining into one shared driveway (one enter/exit driveway). There should not be any driveways accessing SR 60 along this section. Consider an alternative, such as a secondary street to access those establishments.

***→ U.S. 64 Bypass (South):***

This section of SR 60 is next to the intersection with McGrady Drive. Individual driveways of commercial businesses are accessing the highway, and it appears that more development with driveways is planned. Similar to the other existing commercial business cluster on U.S. 64 bypass further north, the alternative of an access road parallel to the main road should be explored.

Figure 59: Commercial Driveways accessing U.S. 64 Bypass

***→ U.S. 64 Bypass (North):***

U.S. 64 bypass is an expressway and there should be no median openings, no traffic signals, and no driveways. There are some sections though where driveways access the road as depicted in the following illustrations. It is recommended to consolidate the driveways to only one enter-and-exit opening. The median opening should be restricted to serve only as an access point for emergency vehicles entering and exiting the fire station. The median opening could be removed if the land use ever changes.

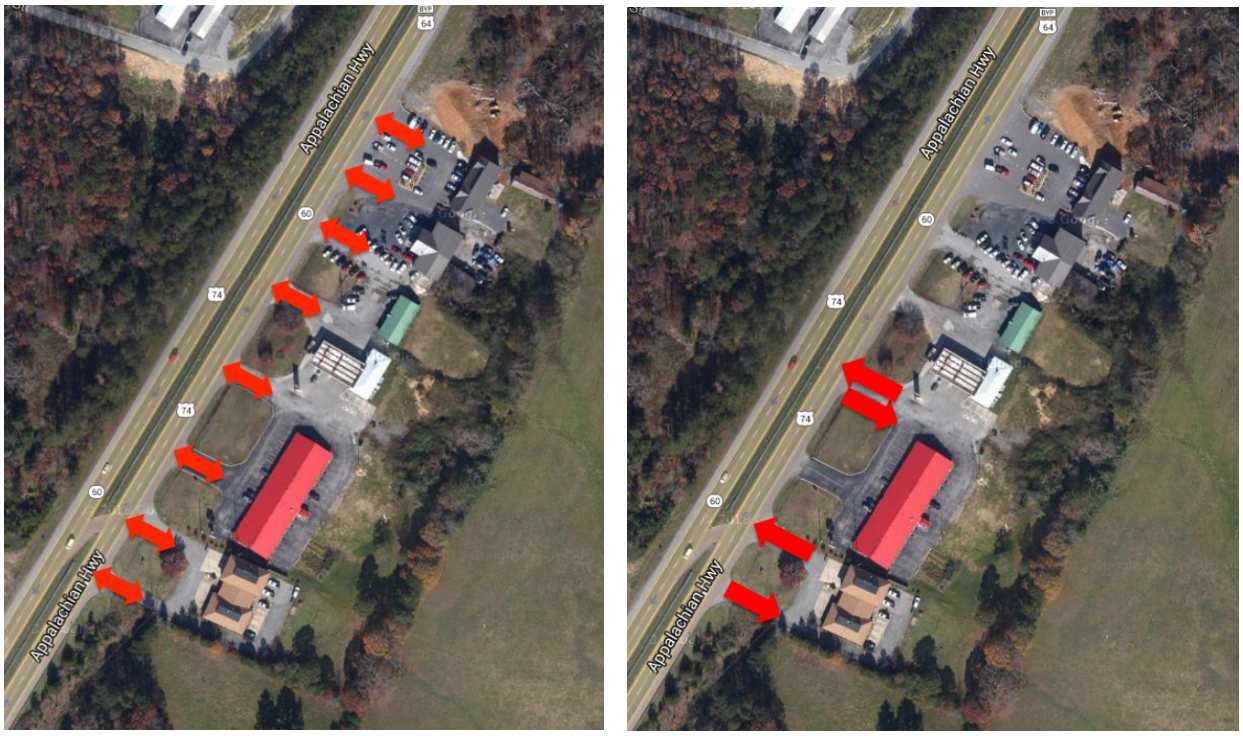



**Figure 60: Commercial Driveways accessing SR 60 and proposed Solution**

### 5.4.4 Recommendations for Section IV

- **Functional Class: Major Arterial**
- **Setting: Urban Area**
- **Accessibility: Less restrictive access control**
- ***Access Management "Transect" Category: Class V***

- For any new development, infill, or redevelopment encourage shared driveways for businesses or, if possible driveways accessing a side street. Limit the number of driveways to one per business.
- For existing development, promote reducing the number of driveways per business (one per establishment) and promote shared driveways.

- For new residential development encourage driveway access to side streets instead of SR 60 where possible.

### → *Driveways on SR 60 between Keith Street and Peerless Road:*

The driveway spacing is too close on the section between Keith Street and Peerless Road Several driveways can be eliminated by consolidation or shared driveways. The driveways should be spaced at least 330 ft. apart from each other.

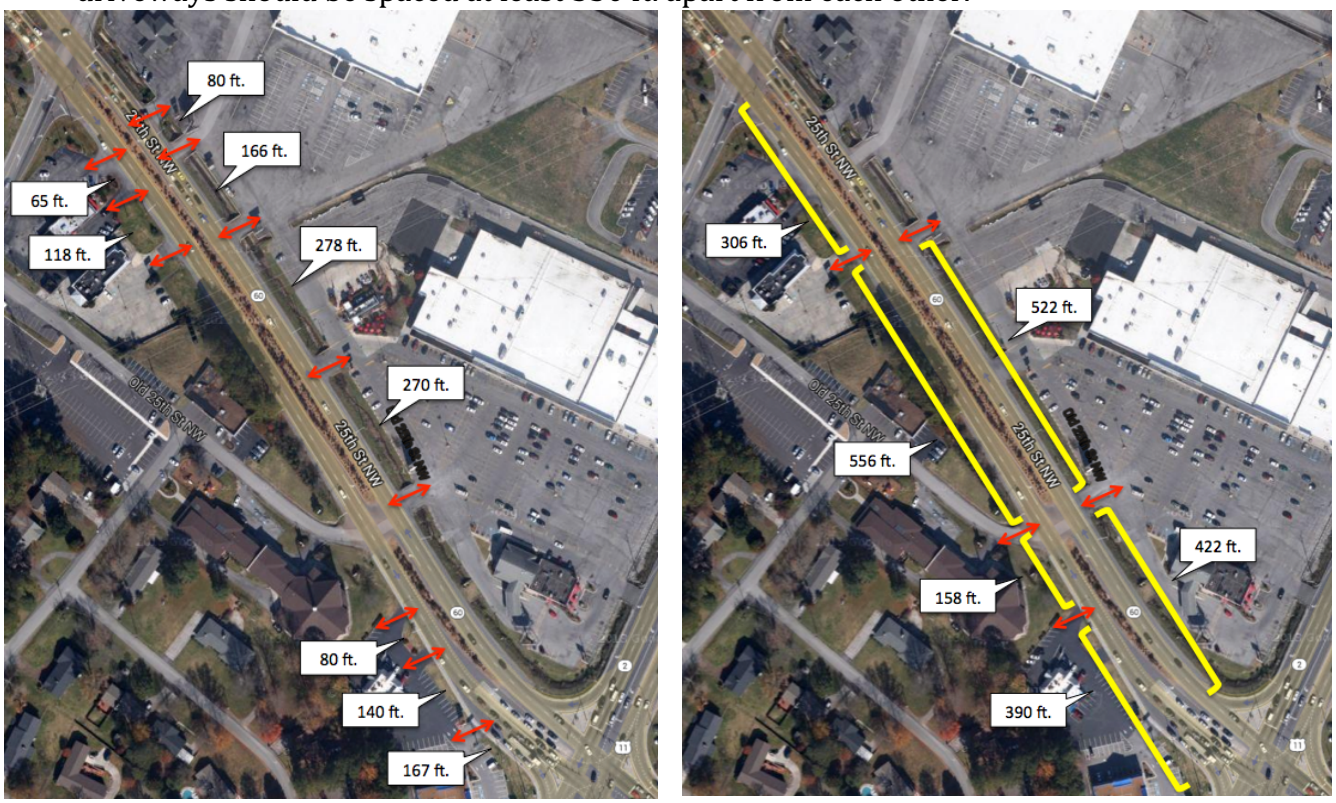



Figure 61: Driveways between Keith Street and Peerless Road: Issues and Proposed Solutions

The photo (Figure 62) shows an example of a former driveway, which is just north of Keith Street on SR 60. Similar treatment could be done for other driveways.

The removal of some driveways, including pipes underneath them, would enhance stormwater storage in the channelized creek adjacent to the northern lane of SR 60 from east of Vista Drive to Keith Street

Figure 62: Former Driveway covered with Grass

***→ Driveways on SR 60 between Vista Drive and Georgetown Road/ Westside Drive:***

There are a multitude of driveways from businesses, hotels, and restaurants that access SR 60 which creates many conflict points. Most driveways are insufficiently spaced less than 100 ft. apart.

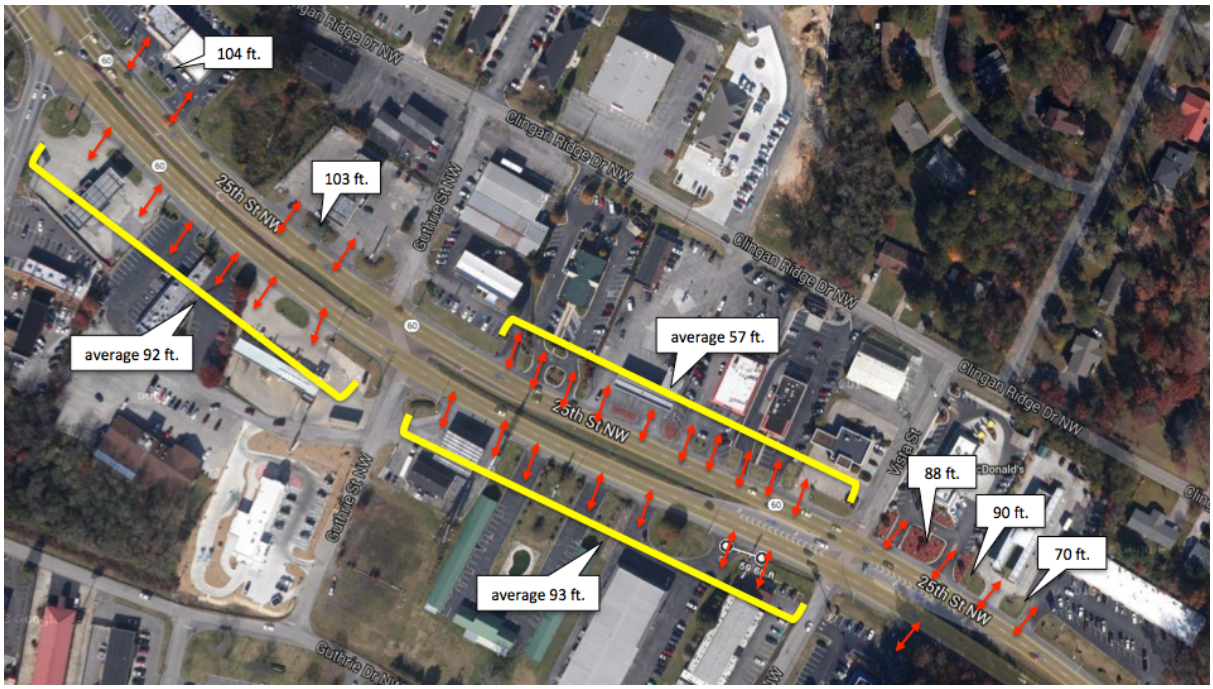



**Figure 63: Closely Spaced Driveways between Vista Street and Georgetown Road/ Westside Drive**

It is recommended to consolidate driveways into shared driveways, utilize the existing side and back streets to provide access to business establishments, and provide connections between the commercial properties. In this densely developed section it is desirable that driveways are spaced at least 330 ft. apart.

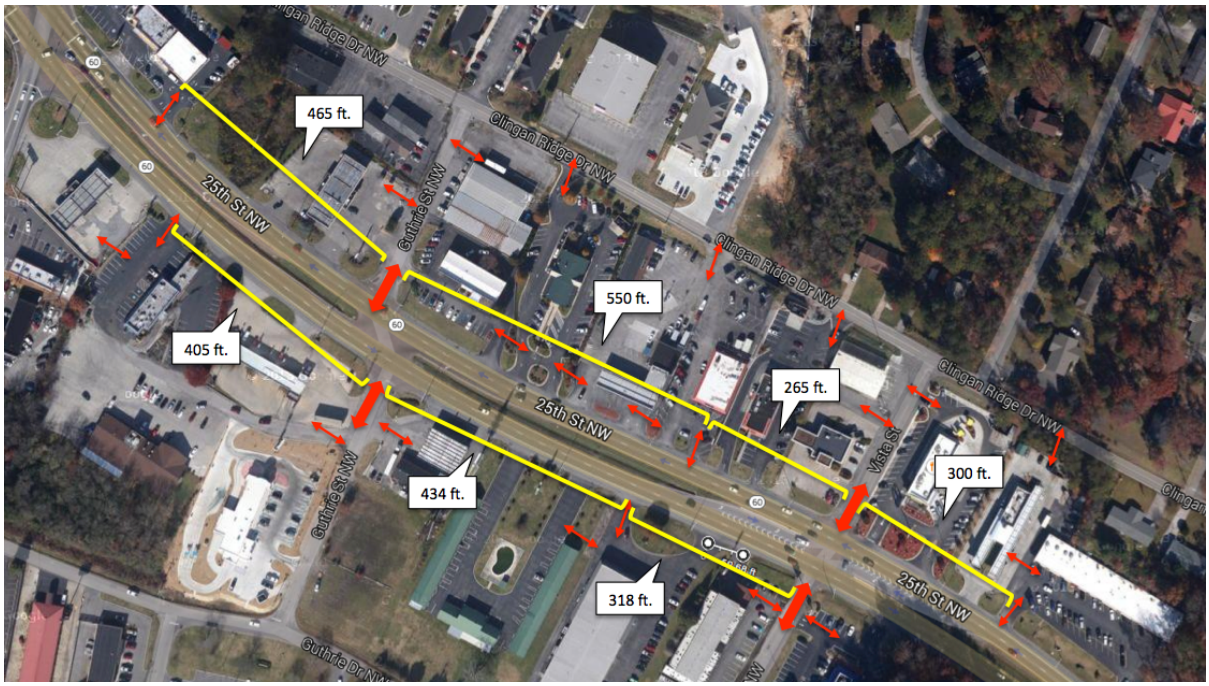



**Figure 64: Proposed Solutions on consolidating Driveways**

- Provide a continuous raised median between the intersections. As shown in the recommendations, continuous medians are most effective on roadways with high traffic volumes and high driveway densities, such as Section IV of SR 60.
- Median openings should be provided only at signalized intersections and side streets accessing SR 60.

**Figure 65: Proposed Continuous Raised Median**

- Along Section IV are lots with corner clearance issues resulting in the minimum distance requirements not being met between intersections and driveways on SR 60.
- As mentioned in the previous chapter, the minimum distance between a driveway on SR 60 and an intersecting arterial road (e.g. Ocoee Street, Keith Street, Peerless Road, and Georgetown Road/Westside Drive) should be 200 ft.
- It is recommended to look at alternatives to eliminate driveways that are too close to an intersection due to safety issues caused by a lack of sight distance.

***→ Intersection with Ocoee Street:***

Ocoee Street is a minor arterial intersecting with SR 60 at log mile 15.18. There are currently capacity issues, indicated by LOS D to the east of the intersection and LOS F to the west of the intersection. In addition, as shown in Ch. 3 (Crash Analysis), the section between Ocoee Street and Chambliss Ave. indicates a high crash rate.

TDOT developed a project to improve this intersection. The proposed planned measures included dual left-turn lanes, exclusive right-turn lanes and additional through lanes for all approaches (see Fig. 66).

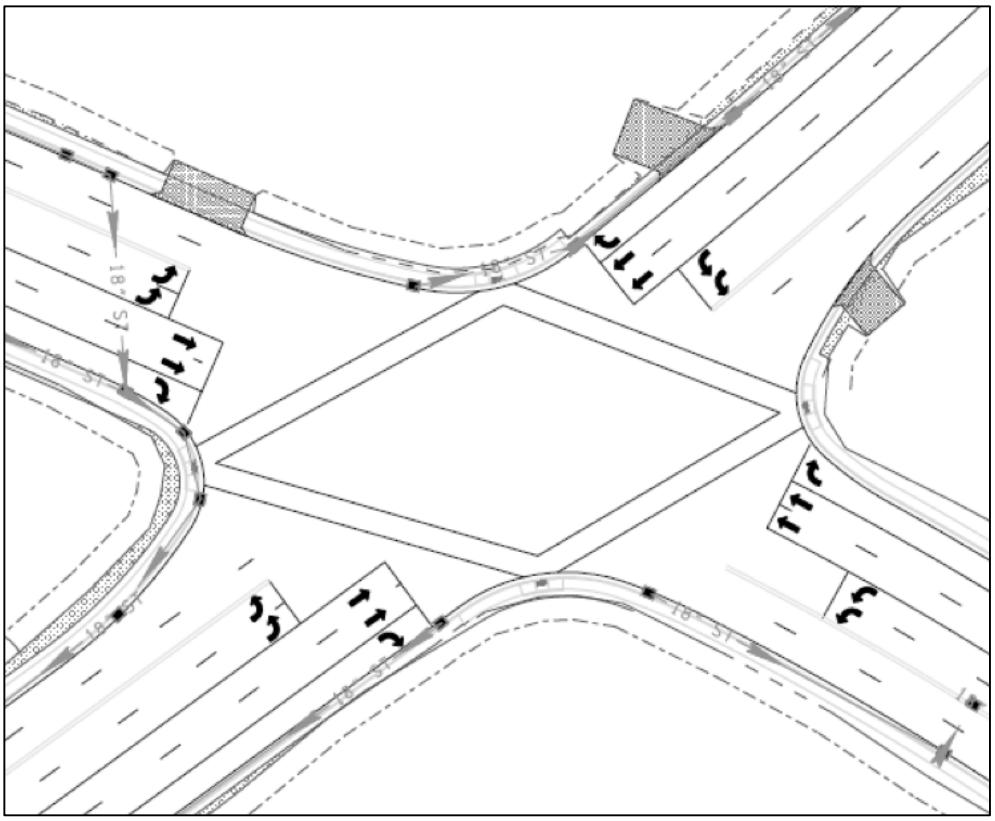



**Figure 66: Proposed Layout of the Intersections**

Other measures include the installation of a retaining wall in front of Walgreen's, the addition of curb and gutter with sidewalks, and updating the stormwater drainage system.

This project includes the ROW acquisition of several adjacent properties. The construction was originally planned to begin in June 2013. However, the City of Cleveland canceled the local cost share of funding for this project and it never proceeded to the ROW acquisition phase.

Another problem is that several driveways access SR 60 and Ocoee Street, close to the intersection, which doesn't provide sufficient corner clearance. The corner clearance should be 200 ft. for arterials. For example, the businesses on the corner north of SR 60 have three to four driveways each and some of them are just 35 or 44 ft. away from the intersection.

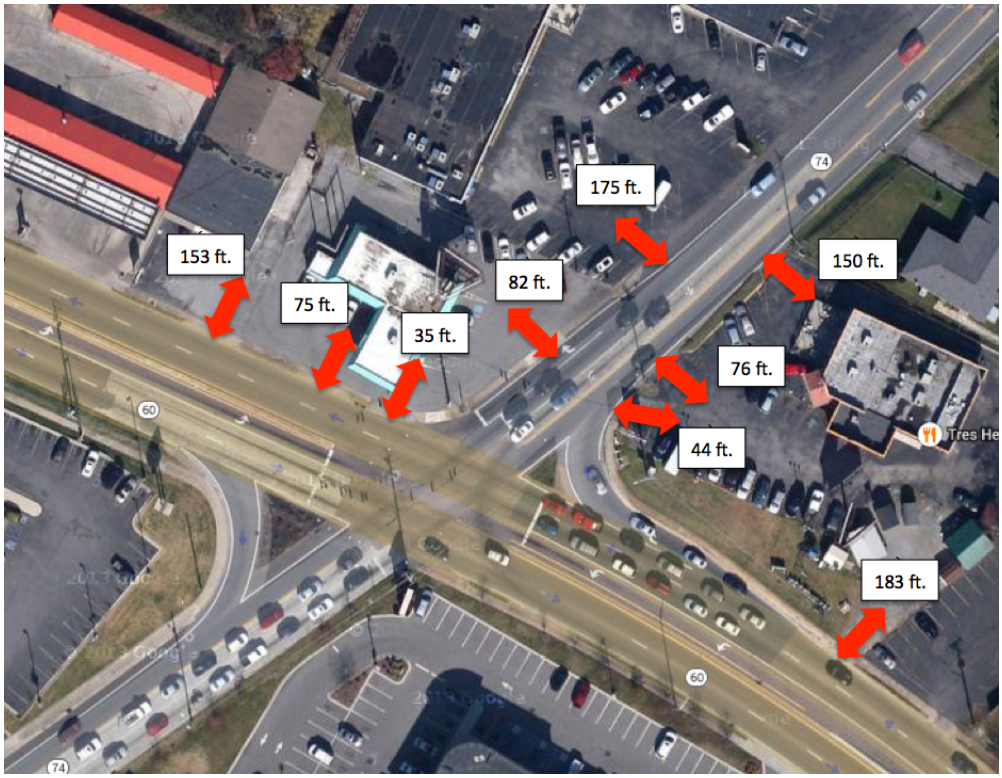



**Figure 67: Corner Clearance Issues at the Intersection of SR 60 and Ocoee Street**

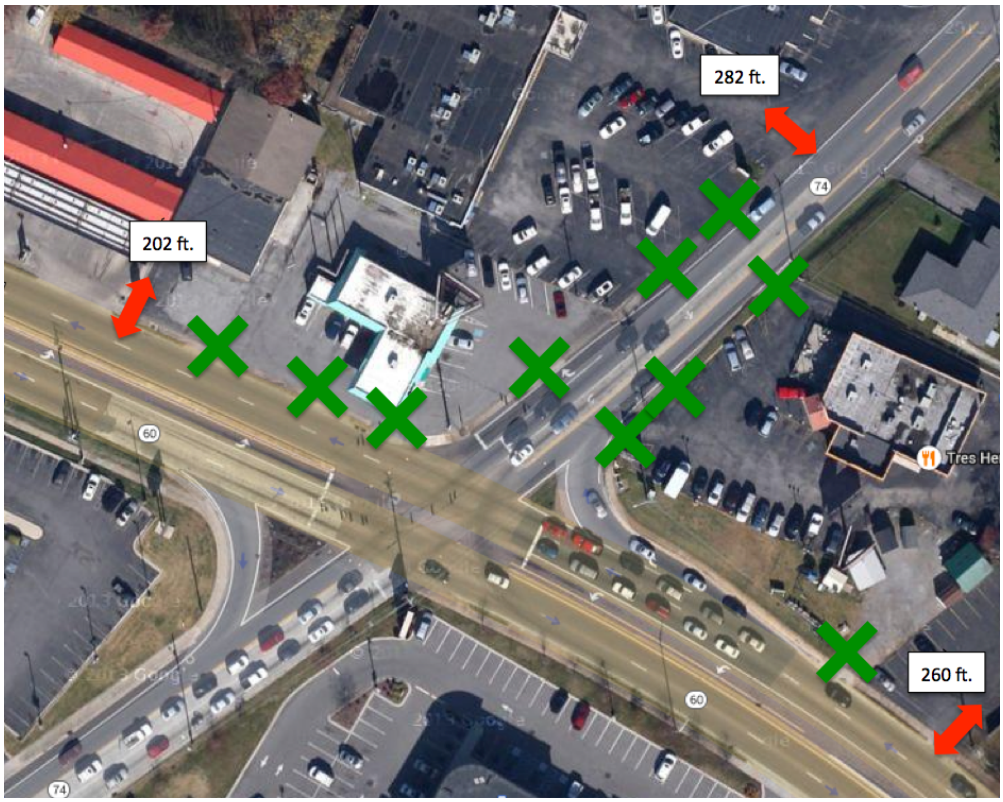



Figure 68: Recommended Solutions for Corner Clearance Issues

### → *Intersection with Peerless Road:*

Peerless Road is a minor arterial that intersects with SR 60 and thus the corner clearance should be at least 200 ft. Several driveways are within the required clear zone on SR 60, as well as on Peerless Road. Those corner businesses have a minimum of three driveways that provide access to the highways and therefore it is recommended to eliminate those that are within the minimum space of 200 ft.

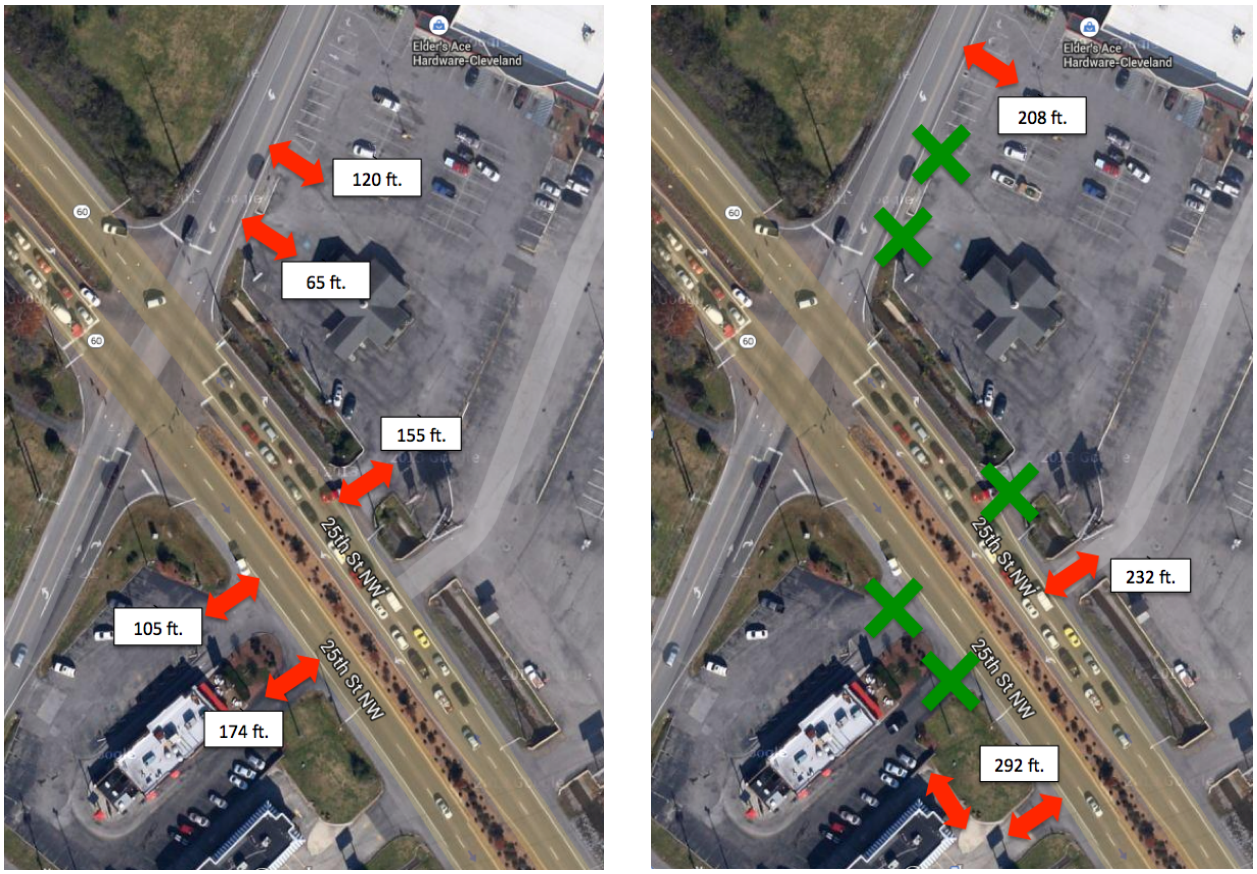



Figure 69: Corner Clearance Issues at the Intersection of SR 60 and Peerless Road

### → *Intersection with Georgetown Road/ Westside Drive:*

Georgetown Road and Westside Drive are minor arterials. The corner clearance is supposed to be 200 ft. At the intersection of these roads are two businesses that have four and three driveways each. It is recommended to eliminate those driveways that do not meet the corner clearance standards.

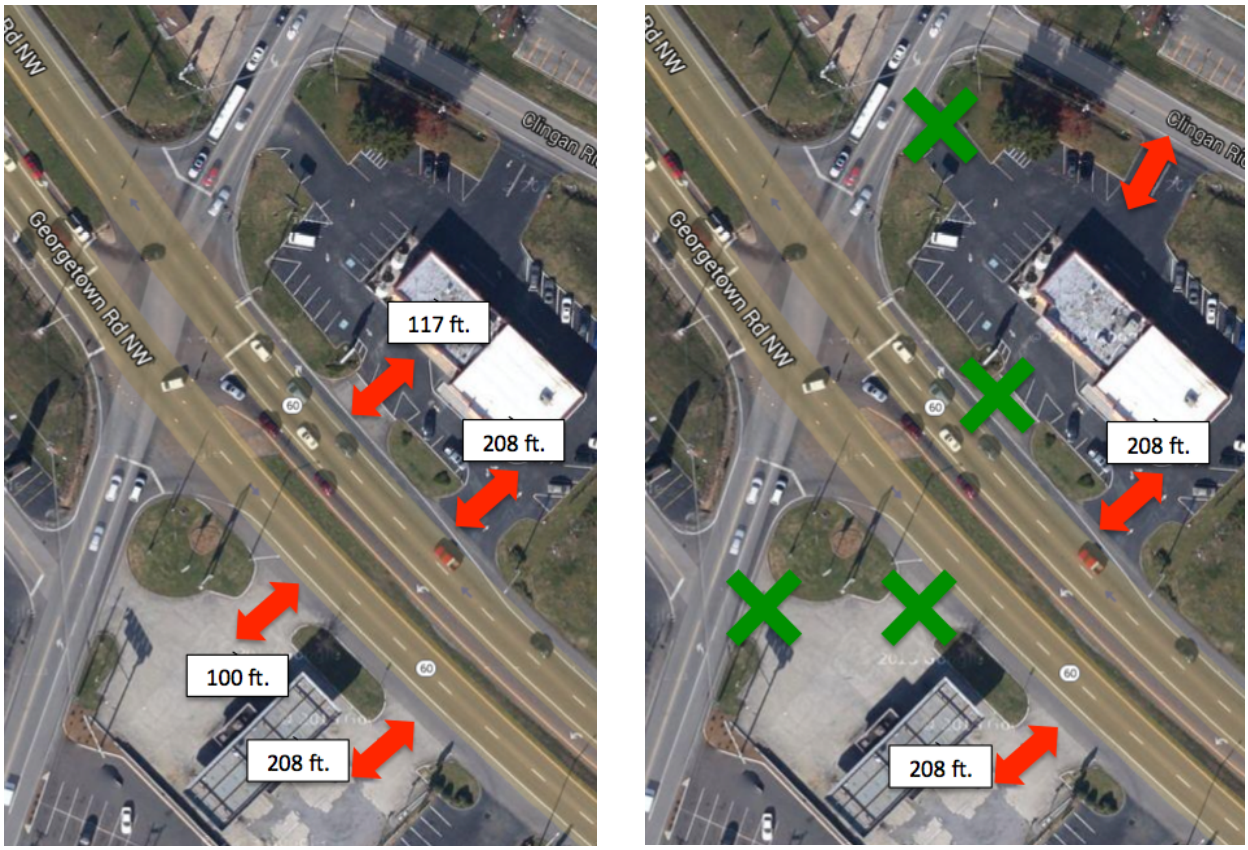



**Figure 70: Corner Clearance Issues at the Intersection of SR 60 with Georgetown Road/ Westside Drive and Recommended Solutions to Minimize Driveways**

- The speed limit on Section IV should be reduced. It is currently 45 mph and should be reduced to 35 mph as suggested for urban areas with lots of access points. This will reduce the speed differential of vehicles traveling at 45 mph that have to slow down or stop to turn.
- At intersections, sufficient deceleration length for turn lanes to prevent congestion in through lanes should be provided. This also helps reduce the speed differential on through lanes. It is recommended that the length of the deceleration lane is at least 630 ft. at 45 mph speed (under current conditions) or 350 ft. at 35 mph on major arterials.

### 5.4.5 Recommendations for Section V

- **Functional Class: Principal Arterial**
- **Setting: Suburban Area**
- **Accessibility: Less restrictive access control**
- ***Access Management "Transect" Category: Class III [see Ch. 5.2]***

- This section will change significantly once the widening project has been undertaken.
- Access spacing standards for a principal arterial should be followed as the project is implemented.
- Since there are several residential neighborhoods along this section, it is advised that houses don't access SR 60 with individual driveways but feed into a local collector road that provides access to SR 60.

***→ Section of SR 60 between Villa Drive and Lennox Drive:***

Currently, there are some sections with residential houses and individual driveways accessing the highway. Since this section of SR 60 is a principal arterial in a suburban/ rural setting, driveways should be spaced at 660 ft. The photo shows driveways that are spaced 28 to 177 ft. apart and thus do not meet the spacing standards. It is recommended to limit individual driveway access to SR 60 and instead encourage local access roads that serve residential neighborhoods.

**Figure 71: Narrow Residential Driveway Spacing along Section V**

***→ Section of SR 60 between Weston Hills Drive and Villa Drive:***

Another section with driveway spacing that is too close together is between Weston Hills Drive and Villa Drive. Commercial development is on the west side and residential development on the east side. The commercial development consists of medical offices, a bank, etc. and has four driveways that are spaced between 47 and 125 ft. apart and therefore do not meet the recommended 660 ft. spacing. It would be a simple solution for this commercial complex to combine driveways into one entrance/exit driveway. The bank is also accessed from Villa Drive, which would be sufficient. The right-out exit from the bank onto SR 60 is not advisable since traffic has to cross a left-turn lane.

The residential houses on the opposite side of the street have individual driveways that access SR 60, which are spaced only between 31ft. and 183 ft. Access to a local road such as Weston Hills Drive or Kimberly Drive is advisable.

**Figure 72: Narrow Commercial and Residential Driveway Spacing along Section V**

### 5.4.6 Recommendations for Section VI

- **Functional Class: Principal Arterial**
- **Setting: Rural Area**
- **Accessibility: Less restrictive access control**
- ***Access Management "Transect" Category: Class III [see Ch. 5.2]***

- Maintain and implement the access management standards for spacing of driveways and streets for a principal arterial in a rural setting.
- Driveways should be spaced at 660 ft. and streets at one quarter mile spacing. Any traffic signals should be spaced at one half mile. If this section is widened to four lanes, any median openings should be spaced at one quarter mile.
- This section of SR 60 is in a rural setting with adjacent, sparse, and is a mostly residential development. There are minimum access conflicts at this time. However, as growth is expected over the next years, it is important to comply with access control standards.

***→ Section of SR 60 north of SR 306:***

Though most of the development is residential along this section, above the intersection with SR 306 are a few commercial establishments (e.g. car wash, veterinary hospital, a marine shop). Those businesses have more than one driveway each accessing SR 60. The marine shop is at the corner of the intersection and has driveways within the corner clearance zone.

It is advisable to consolidate driveways and share access. Since SR 306 is a minor arterial and SR 60 a principal arterial, the corner clearance should be at least 200 ft.

**Figure 73: Narrow Driveway Spacing along Section VI**

### → *Section of SR 60 in a rural setting:*

This illustration (Figure 74) shows a typical stretch of SR 60 on Section VI consisting of farmland, forest and low-density residential development with no access conflicts at present. As growth continues, individual driveways onto SR 60 from houses and commercial establishments should be limited and should be spaced at least at 660 ft. distance apart.

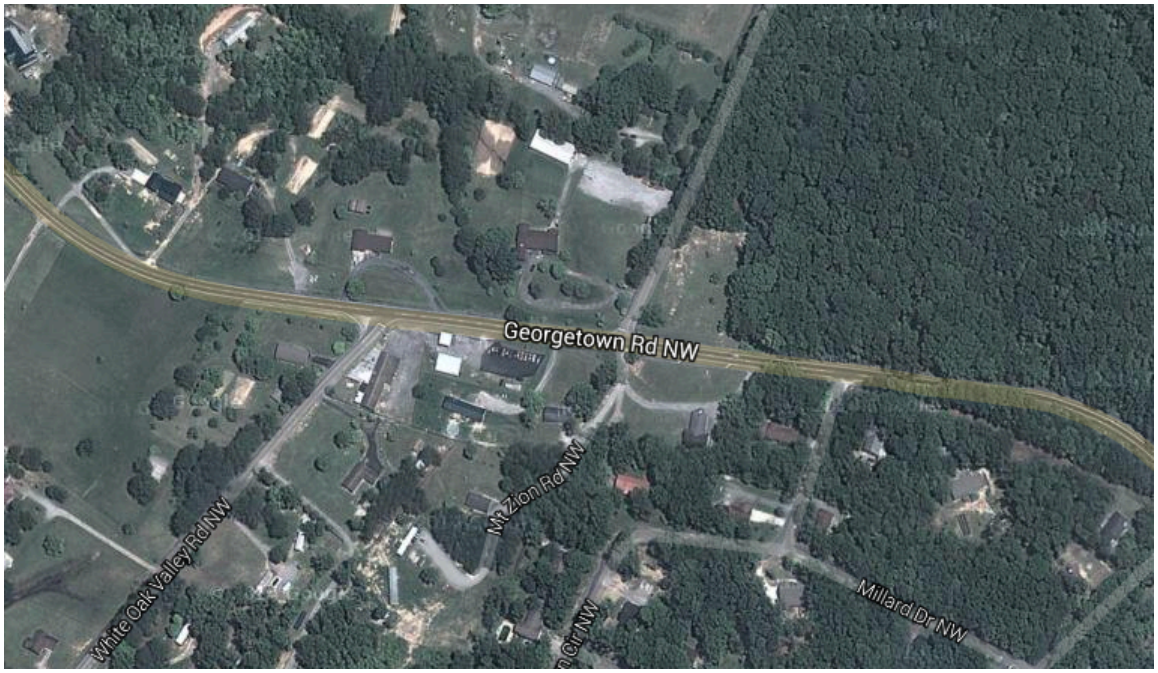



**Figure 74: Typical Stretch of SR 60 in a Rural Setting**

## 5.5. Final Conclusion

This access management planning study provides the basis for the decision-making process for adopting specific access management standards.

Access management is achieved through the systematic application of planning, regulatory, and design strategies. It involves:

- Adopting plans and policies that govern roadway and development access,
- Linking these policies to roadway and site design, and
- Instituting codes and procedures to enforce agency decisions and coordinate access management actions among land use and transportation agencies.

In the next steps following this study, the CMA committee should discuss adopting access management standards and guidance. Suggestions and recommendations from this study should serve as a reference point.

As indicated in this study, the "Transect Access Management" concept, developed by a consultant team for CMA SR 109, could be used as a starting point by taking the access categories and developing standards based on those.

It is also important at this time to follow TDOT's efforts in the adoption of the 2015 *Manual for Constructing Driveways on State Highways*. Any standards included in that manual should be included in the local policies.

Access management standards can be adopted as part of the local subdivision and zoning regulations, or the comprehensive plans. Nevertheless, it is recommended to develop a separate "Access Management Manual" that includes parts from this study, and references TDOT's driveway regulations, as well as any of the standards that are adopted by the City of Cleveland and Bradley County.

The findings in this study show the challenges that arise without implementing proper access management. Along SR 60 are sections that are characterized by capacity problems and safety issues, potentially linked to inadequate access management. Narrowly spaced access points, improper median and intersection design, and high speed differentials create major conflicts on the roadway system, in particular in combination with increasing traffic volumes. Those issues have been illustrated on SR 60's busy road sections, such as 25th Street. Most of SR 60 is characterized by adjacent low-density development. As development continues there is an urgency to have a set of access management standards guiding the permit process for driveways, new streets, as well as for the design of medians, turning lanes, and intersections. With access management standards in place, existing designs should be evaluated and new designs considered, especially where safety and capacity pose issues.

As a coordinated planning approach, access management will lead to more efficient and safe movement of traffic by reducing conflicts on the roadway system.

# Appendix

## A. Glossary

**Access Point** – A location on a property frontage at which access to a highway is allowed.

**Annual Average Daily Traffic (AADT)** – Average daily traffic on a roadway link for all days of the week during a period of one year, expressed in vehicles per day (VPD).

**Auxiliary Lane –** A lane along the roadway that is used for the purpose of acceleration, deceleration, or storage of vehicles for turning movements.

**Corner Clearance** – At an intersecting street or highway, the distance measured along the edge of traveled way between the intersection of right-of-way lines and the tangent projection of the nearest edge of the driveway.

**Driveway Angle** – The angle of 90° or less between the driveway centerline and the edge of the traveled way.

**Driveway Width** – The perpendicular distance between the parallel edges of a driveway.

**Edge Clearance** – The distance measured parallel to the edge of the traveled way, between the frontage boundary line and tangent projection of the nearest edge of the driveway. In the case of driveways at an angle less than 90° to the traveled way, the edge clearance shall be measured between the frontage boundary line and the point where the tangent edge of the driveway is closest to the traveled way.

**Frontage** – The length along the highway right-of-way line of a single property tract or roadside development area between the edges of the property. Corner property at a highway intersection has a separate frontage along each highway.

**Frontage Boundary Line** – A line, normal to the highway centerline, at each of the frontage, which extends from the right-of-way line to the edge of through traffic lane.

**Functional Classification** – The grouping of streets and highways into classes or systems according to the character of service they are intended to provide.

**Level of service (LOS)** – LOS is a qualitative measure used to relate the quality of traffic service. LOS is used to analyze highways by categorizing traffic flow and assigning quality levels of traffic based on performance measure like speed, density, etc. Six LOS are defined for each type of facility that has analysis procedures available.

Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst.

**Multi Unit (MU) Trucks** – Vehicles consisting of three or more units, one of which is a tractor or straight truck power unit.

**Right-of-Way (ROW)** – Lands conveyed or dedicated to the public for use as a street, alley, walkway, or other public purpose related to the provision of transportation services.

**Setback** – The lateral distance between right-of-way line and the roadside business building, gasoline pump curb base, display stand, or other object, the use of which will result in space for vehicles to stop or park between such facilities and the right-of-way line.

**Sight Distance** – The distance at which a driver can see or be seen by an approaching vehicle.

**Single Unit (SU) Trucks** – Vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc.

**Tennessee Roadway Information Management System (TRIMS)** – An ORACLE relational database, which contains information on over 80,000 miles of public roads in Tennessee. The interface allows users to query data in the form of inventory data, digital photographs, road mileage, documents, digital plans, and scanned documents. TRIMS also offers a graphical interface, which offers map-based queries, and displays information on maps.

## B. Literature

**American Association of State Highway and Transportation Officials (AASHTO).** A Policy on Geometric Design of Highways and Streets. 2004.

**Bradley County, Tennessee.** Bradley County Comprehensive Plan. Draft for Steering Committee Review. Draft Date: August 20, 2013.

**Center for Transportation Research and Education.** Iowa State University. Access Management Toolkit. 2007. URL*:* *http://www.ctre.iastate.edu/research/access/toolkit/index.htm* [Accessed: 2015].

**City of Cleveland, Tennessee.** Cleveland Comprehensive Plan and Central City Area Plan. Prepared by consultants: McBride Dale Clarion with Brown Pearman Russell, RPM Transportation Consultants, and Arcadis. 2013.

**City of Cleveland, Tennessee.** Subdivision Regulations. Recommendation of the Land Use Implementation Committee and the Cleveland Planning Commission to the Cleveland City Council. 1997. Draft Updated August 23, 2009.

**City of Cleveland, Tennessee.** Zoning Ordinance. Zoning and Land Use Control. Recommendations of the Land Use Select Implementation Committee and the Cleveland Municipal Planning Commission to the Cleveland City Council. May 1996. Revisions: 2008.

**Cleveland Area Metropolitan Planning Organization (MPO).** Cleveland Area MPO Bicycle and Pedestrian Plan. Final Report. Prepared by RPM Transportation Consultants. December 2008.

**Cleveland Urban Area Transit System.** Homepage: Rideclevelandtransit.org. Accessed: May 2015.

**Nashville Metropolitan Planning Organization (MPO).** State Route 109 Corridor Management Committee. Presentation. January 23, 2015.

**Tennessee Department of Transportation (TDOT).** Tennessee Roadway Information Management System (TRIMS). Traffic database. Traffic data continuously updated. Accessed: 2014-2015.

**Tennessee Department of Transportation (TDOT).** Evaluation of Roadway Efficiency (EVE) Program. Roadway Performance Management system. Traffic data updated 2014. Accessed: 2014-2015.

**Tennessee Department of Transportation (TDOT).** Project Planning and Resource Management (PPRM) Program. Project Data continuously updated. Accessed: 2014-2015.

**Tennessee Department of Transportation (TDOT).** Technical Report: State Route 60, Westside Drive to Candies Lane. 2013.

**Tennessee Department of Transportation (TDOT).** Road Safety Audit Report. SR 60 Interchange at Benton Pike, LM 13.25 to LM 13.28. PIN 118674.00. 2013.

**Tennessee Department of Transportation (TDOT).** Manual for Constructing Driveway Entrances on State Highways. Draft. 2015 Edition.

**The State of Tennessee.** Tennessee Code Annotated. URL: *http://www.lexisnexis.com/hottopics/tncode/* [Accessed: May 2015].

**Transportation Research Board (TRB).** Access Management Manual. Second Edition. 2014.

**Transportation Research Board (TRB).** National Cooperative Highway Research Program (NCHRP) Report 420. Impacts of Access Management Techniques. 1999.

**Transportation Research Board (TRB).** Circular E-C019: Urban Street Symposium. Urbitran Associates: Access Spacing and Traffic Safety. 1999.

**Transportation Research Board (TRB).** National Cooperative Highway Research Program (NCHRP) Report 672. Roundabouts: An Informational Guide. Second Edition. 2010.

**United States Census Bureau.** Quick Facts: Cleveland, Tennessee. URL: *http://quickfacts.census.gov/qfd/states/47/4715400.html* [Accessed: February 2015].

**United States Department of Transportation, Federal Highway Administration (FHWA).** Flexibility in Highway Design. URL (PDF): *http://www.fhwa.dot.gov/environment/publications/flexibility/flexibility.pdf* [Accessed: December 2014].

**Virginia Department of Transportation (VDOT)**. Road Design Manual: Appendix G. Access Management Design Standards for Entrances and Intersections: Minor Arterials, Collectors, Local Street. October 14, 2009. URL: *http://virginiadot.org/projects/resources/AppendixG.pdf* [Accessed: December 2015]

**Virginia Department of Transportation (VDOT)**. Background on the Revisions of VDOT's Access Management Spacing Standards. Spacing Standards for Commercial Entrances, Signals, Intersections, and Crossovers. December 2011. URL: *http://www.virginiadot.org/projects/resources/access_management/12.27.11/Overview_of_Revised_Appendix_F_Spacing_Standards_12.2011.pdf* [Accessed: December 2015]