ISLE OF WIGHT COUNTY
BREWER'S NECK CORRIDOR STUDY











PREPARED FOR:

ISLE of WIGHT COUNTY IN VIRGINIA

VDOT

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Brewer's Neck Corridor Study
Isle of Wight County, Virginia

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Prepared for:

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Chapter 1.0 Executive Summary

The Isle of Wight County *Brewer's Neck Corridor Study* provides a comprehensive understanding of the operational and capacity improvements necessary along Brewer's Neck Boulevard, Carrollton Boulevard, and Nike Park Road to accommodate anticipated growth and economic vitality within the study area and identifies a preferred alignment for the extension of Nike Park Road from its terminus with Reynolds Drive in the west to its terminus with Carrollton Boulevard in the east. The implementation of system-wide improvements will occur through local policies, programs, and funding as well as state contributions and private investment. The study provides a blueprint for a coordinated approach to defining a transportation network capable of supporting the County's vision of land development, economic vitality, and quality of life.

The report will serve as a beneficial tool to both Isle of Wight County and VDOT in their discussions with developers as they convey future plans and projects for the Brewer's Neck Boulevard and Carrollton Boulevard corridors as well as Nike Park Road. This strategic vision will provide the opportunity to obtain right-of-way, as well as realize implementation of both specific and regional improvements through the development review process. On a much broader scale, the study will ultimately be used as a planning tool by the County and VDOT to manage growth and assess the transportation network impacts created by regional influences internally and externally to the study area.

The study examined existing and future conditions for the horizon year of 2034, with the intent of gaining a better understanding of the more immediate needs along Nike Park Road, Smith's Neck Road, and Battery Park Road as well as coordinated signal system needs along Carrollton Boulevard. Growth within and adjacent to the study area corridor is very dynamic in terms of anticipated residential and commercial/retail development, as well as increases in traffic volumes stemming from the corridor's role in the regional transportation network. This study considered a robust list of planned and approved growth opportunities within the study area (e.g., Benn's Grant, The Crossings, St. Luke's Village, Norsworthy, Bridge Point Commons, etc). The comprehensive approach to the development of future traffic projections was necessary due to regional travel pattern behavior, the anticipated cumulative impact on the Brewer's Neck Boulevard/Carrollton Boulevard intersection operations, as well as the need to capture the operational benefit of the proposed extension of Nike Park Road. This will assist the County in making informed land use and economic development decisions as they relate to roadway and utility infrastructure improvements/investments necessary to support development.

As a result of the field reviews, traffic analyses, policy review, and discussions with the County, project stakeholders, and VDOT, recommendations for improvements have been identified within the study area to include; operational and capacity improvements as well as bike and pedestrian improvements along the corridor, and the extension of Nike Park Road to Carrollton Boulevard to relieve corridor congestion through the enhancement of network connectivity. The recommendations were based on the desire to safely and efficiently address future internal and external traffic growth associated with the key study area components (i.e., operational and capacity enhancements along the corridor, network connectivity, and overall traffic safety). A key short-term recommendation of the study is the proposed extension of Nike Park Road approximately 1.0 mile from its current intersection with Reynolds Drive in the west to a proposed intersection with Carrollton Boulevard in the east. This will address a missing link in the local street network and provide local travelers and/or local residents with a more direct and safe alternate route to the Smith's Neck Road to Titus Creek Drive to Nike Park Road route used by many today. Thus this new connection is expected to reduce traffic volumes through the Smith's Neck Road/Reynolds Drive, Smith's Neck Road/Titus Creek Drive, and Carrollton Boulevard/Brewer's Neck Boulevard intersections. The major recommendations of the study involve the widening of Brewer's Neck Boulevard, Carrollton Boulevard, and ultimately Nike Park Road. These projects are economically significant in nature and therefore it is not practical under current economic conditions to expect that the construction of these improvements would all occur within a relatively short period of one another. Rather, projects are grouped and/or categorized into short, mid, and long-term based on the magnitude of the project (i.e., cost), timing/schedule of when the particular project could be constructed, as well as the scale of the issue a particular project is intended to address. This approach allows communities to prioritize larger scale projects over time while also being able to implement "quick hitter" projects that mitigate immediate needs.

Short-term recommendations are those that are intended to be implemented within six months to five years. These improvements typically cost less than longer term improvements. Due to the cost associated with some of the following improvements (e.g., roadway widening, raised/landscaped median, new roadway, etc.), they would typically be considered/grouped as long-term recommendations. However, for this case they can be constructed within the existing right-of-way and are intended to quickly mitigate existing congestion problems. The short-term improvements include, but are not limited to the following:

- Traffic signal timing phasing and timing/coordination improvements (Carrollton Boulevard)
- New traffic signal (Northgate Drive at Carrollton Boulevard)
- Widening of Battery Park Road from S. Church Street to Nike Park Road to include; multi-use path
- Access management improvements with Battery Park Road widening
- Extension of Nike Park Road from Reynolds Drive to Carrollton Boulevard
- Construction of roundabout at the intersection of Battery Park Road and Nike Park Road
- Turn-lane improvements at the intersections of Nike Park Road/Reynolds Drive, Smith's Neck Road/Titus Creek Drive, and Nike Park Road/Titus Creek Drive

Mid-term recommendations are those that are intended to be implemented within five to fifteen years, which will range from relatively low cost to several million dollars. Mid-term improvements have been identified that include, but are not limited to the following:

- Widening of the Carrollton Boulevard from a 4-lane to a 6-lane roadway between Brewer's Neck Boulevard to the south to a location approximately 2,200 feet north of the Carrollton Boulevard/Harbor Pointe Lane/Whippingham Parkway
- Install Signal System Wireless Interconnection along Carrollton Boulevard corridor
- Widening of the Brewer's Neck Boulevard Corridor from a 4-lane to a 6-lane roadway between Benn's Church Boulevard and Carrollton Boulevard
- Construct/install access management improvements along both Carrollton Boulevard and Brewer's Neck Boulevard
- Traffic signal improvements and signal equipment upgrades

To capture a longer term need of the corridor, 2034 projected traffic volumes were analyzed which suggested the need for additional larger scale projects that involve the widening of Nike Park Road from a 2-lane to a 4-lane roadway, capacity and operational improvements along Nike Park Road at Battery Park Road, Titus Creek Drive, and Reynolds Drive, as well as related access management improvements. Long-term recommendations are those that are intended to be implemented within fifteen to twenty-plus years. These long-term recommendations can range in cost and magnitude, but are typically higher in cost and larger in scale, involving major construction and right-of-way acquisition. The long-term improvements have been identified that include, but are not limited to the following:

- Widening of the Nike Park Road from a 2-lane to a 4-lane roadway between Reynolds Drive and Carrollton Boulevard
- Nike Park Road at Battery Park Drive intersection improvements
  - Upgrade roundabout from single lane to double lane roundabout
  - Install appropriate signage and pavement markings
- Nike Park Road at Titus Creek Drive intersection improvements
  - Install exclusive left and right turn-lane improvements
  - Monitor for potential signalization
- Nike Park Road at Reynolds Drive intersection improvements
  - Install traffic signal
  - Install exclusive left and right turn-lane improvements

Additionally there are recommendations that consist of recommended ongoing/cyclic activities, policies, and procedures. These ongoing recommendations include the following:

- Closing/modifying access points and consolidating commercial and residential driveways as site plan approval, rezoning approval, and conditional use permits are given.
- Routinely clearing vegetation that blocks sign visibility, especially on minor street approaches.
- Retiming all traffic signals along the corridor on a regular schedule at 3 to 5 year intervals once all signals along the Carrollton Boulevard and ultimately the Brewer's Neck Boulevard corridor are interconnected.
- Installation of pedestrian displays and pedestrian crosswalk push buttons at signalized intersections
- Construction of a multi-use path and/or sidewalks as a part of any roadway improvement project and/or new development along the identified corridors (Brewer's Neck Boulevard, Carrollton Boulevard, Smith's Neck Road, and Nike Park Road)

Project specific recommendations focus on operational, capacity, and safety improvements within the study area. Planning-level cost estimates, expressed in year 2013 dollars, have been included for all recommendations. These planning-level cost estimates have been based on VDOT's statewide four-year cost averages for 2009, the VDOT Transportation & Mobility Planning Division's (TMPD) "Statewide Planning Level Cost Estimates" worksheet from 2006, as well as familiarity with similar project and improvement costs throughout Virginia. Due to fluctuations in the costs of labor, materials, and equipment, variability in the market and the outcome of competitive bidding, and the general planning-level nature of the recommendations, these estimated costs are neither exact nor guaranteed.

Variation between actual and estimated costs will change as time passes, and the time value of money has not been taken into account. Cost estimations performed using the "Statewide Planning Level Cost Estimates" worksheet include right-of-way acquisition cost estimates developed with the sheet's methodology. The cost breakdown per scenario includes engineering costs, landscaping costs, pavement marking costs, urban roadway costs, rigid material costs (milling, overlay, sidewalks, channelization, etc.), signal costs (timing and construction), signing costs, and miscellaneous costs which includes, mobilization, sediment and erosion control, traffic control (i.e., maintenance of traffic (MOT) during construction), right-of-way (ROW) and utility costs, and stormwater management. **Chapter 7.0** reflects the cost estimates for those all projects that fall within a particular time frame (i.e., short term, mid-term, long term). **Table 7-1** through **Table 7-3** provides recommendations and action times for improvements to include general project description, overall cost estimate, general timeframe for implementation, and likely responsible parties.

The study outlines the long-term vision for the corridor and its associated transportation network needs. The intent is to now use the vision as projects emerge, whether small or large, public or private, to ensure that the ultimate overarching desires and needs of the corridor study area are achieved. Each project should be evaluated against the overall *Isle of Wight County Brewer's Neck Boulevard Corridor Study* to determine specifically how it can best contribute towards realizing the vision.

The next key step in the planning process is to determine how the recommended improvements will be implemented. Both the County and VDOT officials will need to determine implementation strategies as well as establish project priorities. Implementation strategies to consider include seeking and identifying funding streams, both public and private, to construct improvements. There are several potential public programs that may assist with funding projects. At the federal level there are earmarks, National Highway System funds, bridge funds, and Highway Safety Improvement Program (HSIP) funds to name a few. At the state level there is the VDOT six-year improvement program (SYIP), multimodal planning grants, and enhancement funds. At the local level Isle of Wight County is a member of the Hampton Roads Transportation Planning Organization (HRTPO) which can assist local planning efforts by providing services and guidance on funding strategies/coordination with VDOT. Private funds may be realized through rezoning action and proffer contributions, as well as dedication of right-of-way. All these programs must be considered for each recommended improvement as outlined in the report. The recommended improvements should be prioritized into projects with both County and VDOT input. Each project should be thoroughly evaluated then identified for priority order, time frame from implementation and potential funding sources.

Chapter 2.0 Introduction

Section 2.1 Background

Isle of Wight County, Virginia is located in the southeastern corner of the state and a part of the Hampton Roads region. Within Isle of Wight County and surrounding municipalities, development opportunities continue and growth in retail, commercial, and residential development has resulted in operational impacts along the Brewer's Neck Boulevard (U.S. Route 258/State Route 32) corridor. This vibrant economic activity adds to the intensity of traffic throughout the County along Brewer's Neck Boulevard, Benn's Church Boulevard (U.S. Route 258/State Route 10/32), and Carrollton Boulevard (U.S. Route 17/258/State Route 32). Additionally, developments will alter the traffic's character as they increase the demand for access points and add to the number of vehicles entering and exiting the County's roadway network.

Kimley-Horn and Associates, Inc. (KHA) was retained by the Virginia Department of Transportation (VDOT) to work directly with Isle Wight County staff in an effort help define a vision for the County's transportation network, to assess and evaluate current and future conditions, and to make recommendations for mitigating near- and long-term improvements. The result of this effort is a corridor study that will serve as a technical document which identifies future conditions, potential projects, and implementation strategies. The project team included VDOT Transportation Mobility & Planning Division (TMPD) staff, VDOT Hampton Roads District staff, Isle of Wight County staff, and Kimley-Horn.

Section 2.2 Purpose and Need

The key objective of the study is to serve as a planning level document that includes a technical review and analysis of the study area corridor, as well as the proposed alternative route/connector road alignments. The study will be used for four (4) purposes: 1) as a planning tool by Isle of Wight County and VDOT to identify operational and capacity improvements necessary to accommodate anticipated growth and economic vitality along the study area corridor (i.e., Brewer's Neck Boulevard, Carrollton Boulevard, Nike Park Road); 2) identification of a preferred alignment for an alternate route/connector road between a location/terminus along Benns Church Boulevard/S. Church Street in the west and a location/terminus along Carrollton Boulevard in the east; 3) use by Isle of Wight to manage growth and periodically assess the transportation network impacts created by regional influences internal and external to the study corridor; 4) determine future planning activities, corridor transportation policies (e.g., Transportation Overlay District and/or access management strategies), and levels of funding needed to support the proposed improvements. The project was prepared in coordination with VDOT, Isle of Wight County, and appropriate Project Team/Stakeholder members.

Section 2.3 Study Area

The study area for the Brewer's Neck Boulevard Corridor and Alignment Study is in the immediate vicinity (i.e., 0.25 miles north and south) of the Brewer's Neck Boulevard (U.S. Route 258/State Route 32)/Benn's Church Boulevard (U.S. Route 258/State Route 10/32) signalized intersection, continuing east along Brewer's Neck Boulevard, then north along Carrollton Boulevard (U.S. Route 17/258/State Route 32) to the southern base of the James River Bridge a distance of approximately 5.5 miles. The alignment study area component will include segments of Smith's Neck Road, Reynolds Drive, Nike Park Road, and Battery Park Road, which currently provides a northern alternate route to Brewer's Neck Boulevard. The alternative route/connector road study area to the north also covers a distance of approximately 5.5 miles. This study area covers a distance of approximately 2.5 miles. The study area is illustrated in **Figure 2-1.**

Within the study area, the key intersections include the following:

A. Battery Park Road at South Church Street (signalized)
B. Battery Park Road at Nike Park Road (signalized)
C. Brewer's Neck Boulevard at Benns Church Boulevard (signalized)
D. Brewer's Neck Boulevard at Queen Anne's Court (unsignalized)
E. Brewer's Neck Boulevard at Sentara St. Luke's (unsignalized)
F. Brewer's Neck Boulevard at Reynolds Drive/Campbells Chapel Drive (unsignalized)
G. Brewer's Neck Boulevard at Norsworthy Drive/New Towne Haven Lane (signalized)
H. Norsworthy Drive at Reynolds Drive (unsignalized)
I. Reynolds Drive at Nike Park Road (unsignalized)
J. Nike Park Road at Titus Creek Drive (unsignalized)
K. Smith's Neck Road at Titus Creek Drive (unsignalized)
L. Smith's Neck Road at Reynolds Drive (unsignalized)
M. Brewer's Neck Boulevard at Deep Bottom Drive (unsignalized)
N. Brewer's Neck Boulevard at Carrollton Boulevard (signalized)
O. Carrollton Boulevard at Deep Bottom Drive (unsignalized)
P. Carrollton Boulevard at Northgate Drive (unsignalized)
Q. Carrollton Boulevard at Smith's Neck Road (signalized)
R. Carrollton Boulevard at Eagle Harbor Parkway (signalized)
S. Carrollton Boulevard at Harbor Point Lane/Whippingham Parkway (signalized)
T. Carrollton Boulevard at Omera Drive/Ashby Way (signalized)

Study area roadways and intersections were identified during conversations with VDOT and Isle of Wight County staff. The study area is illustrated in **Figure 2-1**. In addition to these intersections, there are numerous paved and unpaved public and private driveways along the study corridor.

Section 2.4 Study Process

The process to develop the traffic study and implementation strategy for the corridor consisted of the following major efforts:

- **Stakeholder and Public Involvement.** At the onset of the study, the project Team or key stakeholders were identified and the initiative for public involvement/public participation was established. The stakeholders attended project status meetings and working sessions, provided valuable input on key future developments, as well as participation in the alternatives improvements selection process. In addition to the involvement of the project stakeholders, a public hearing/public information meeting was held to present the corridor and connector road alignment alternatives. The public involvement component was emphasized in an effort to solicit input and comments as well as share information regarding the project.

- **Data Collection and Baselining.** This involved collecting and assimilating background information including previous transportation and land use plans, traffic impact studies, future development plans, mapping, traffic volumes, crash data, and other information to firmly establish a starting point for the study.

- **Development of Improvement Concepts.** To address current and anticipated future transportation deficiencies, challenges, and opportunities in the County, several corridor typical section alternatives, intersection improvement options, and connector road alignment concepts were developed for consideration.

- **Traffic Study Recommendations.** Following input from the public, project stakeholders, and County staff, traffic study recommendations were developed focusing on sustaining or improving traffic operations via level-of-service conditions, network connectivity, and the proposed timing of strategic improvements.

- **Implementation.** The first step in implementing the proposed transportation improvements involves the approval and support of the study by the project stakeholders, the Planning Commission members, and final adoption by the Board of Supervisors. Once the study is "adopted" it will serve as a tool for the County to use in prioritizing projects, pursuing funding sources as they become available, and getting them programmed into the VDOT system/Six-Year Improvement Program (SYIP).

Section 2.5 Study Assumptions

At the onset of this project the following key assumptions were identified:

- The study is a technical review and planning level analysis of the corridor;
- A planning horizon is a future year milestone used to evaluate level of service (LOS) along the study corridor. For consistency with the soon to be updated 2034 Regional Long Range Transportation Plan, the planning horizon year for this study is 2034;
- Analysis scenarios consider the weekday AM (6:30 AM to 8:30 AM) and PM (4:00 PM to 6:00 PM) peaks;
- Historical traffic data provided by VDOT was used to develop background annual growth rates for the analysis of future conditions. Trip generation estimates for potential development sites (e.g., Benn's Grant, Norsworthy, St. Luke's, Bridge Point Commons, The Crossings, etc.) were added in addition to annual background growth obtained from the historical data. For detailed intersection and arterial analyses, a Synchro (Version 7.0) model was developed by Kimley-Horn for Existing, Unimproved, Improved, and Improved with Connector conditions during the AM and PM peak hours;
- The study assesses the benefits of a connector road between Benns Church Boulevard and Carrollton Boulevard via Nike Park Road and Battery Park Road;
- The study identifies short-, mid-, and long-term recommendations to mitigate anticipated future traffic demand; and
- VDOT Hampton Roads District staff and Isle of Wight County staff were involved throughout the planning process.

Section 2.6 Public Involvement

Public outreach and public involvement can add a very valuable component in the evaluation and decision making process. A community's citizens typically have a detailed first-hand knowledge of the places where they live and travel and of the transportation problems they encounter on a daily basis. To make sure the corridor and connector road traffic study considered citizen concerns and interests, input was requested from the general public, as well as through project stakeholders, County staff, elected officials, and VDOT. A summary of the public involvement is noted below.

Project Team Work Session

Two project team work sessions were conducted to present future conditions, findings, typical section alternatives, connector road alignment and typical section options, and to solicit input (i.e., support – do not support, like-dislike, etc.) from the key project team members regarding the transportation issues and possible solutions. These team meetings were held on **October 30, 2012** and **December 20, 2012.**

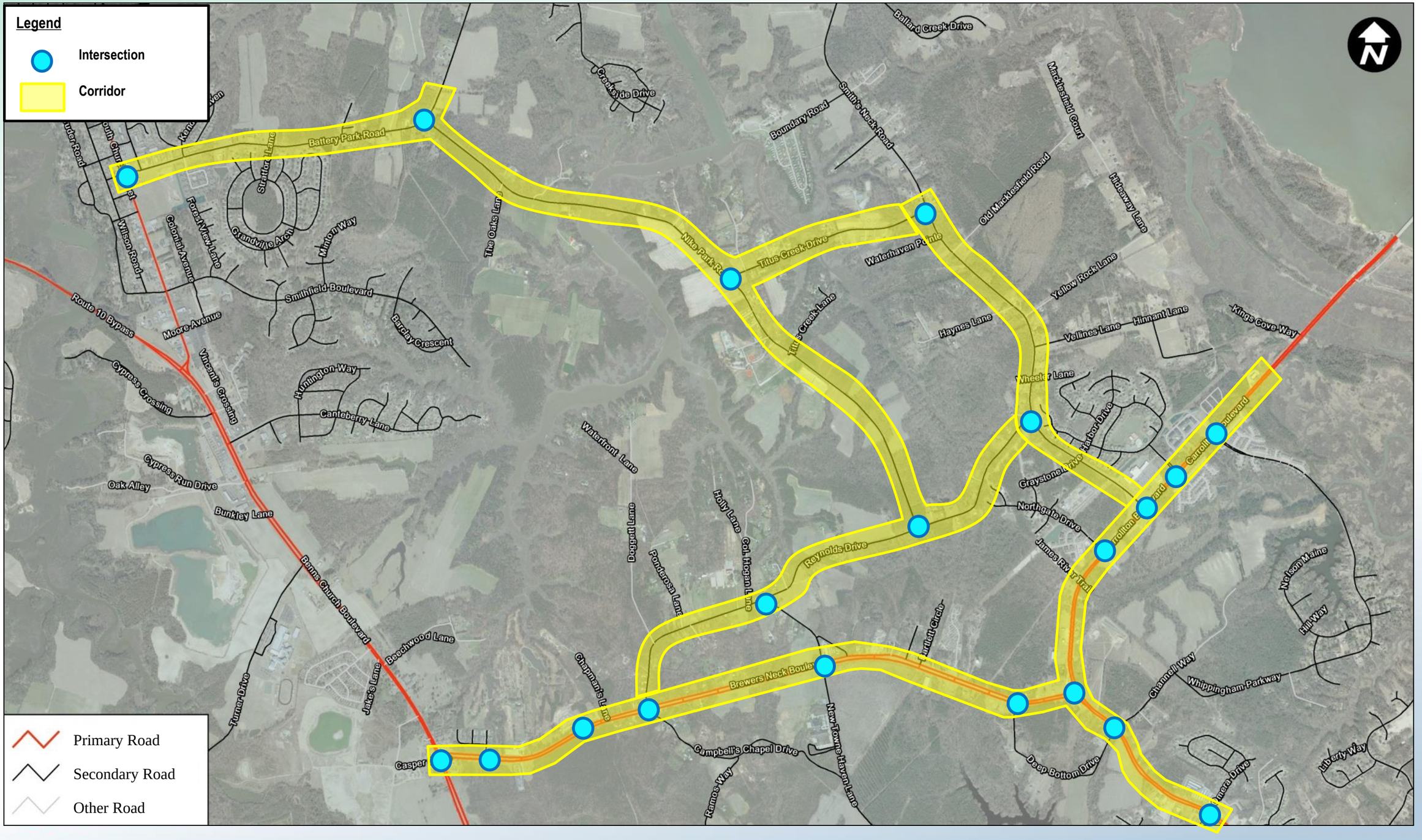
Public Information Meeting # 1

A public information meeting was held on January 10, 2013 at the Mary Wells Senior Center, located along Nike Park Road near Carrollton, Virginia. The public meeting focused on the goals and objectives of the corridor study along with the various improvement alternatives being considered as solutions to existing and future traffic concerns. Citizens were informed about the intent of the evening's meeting, asked to review the various concepts under consideration, and asked to identify the alternative concepts they preferred or liked versus those they did not by marking them with green or red dots. Citizens were also asked to fill out and turn in a public input survey regarding the project and alternatives discussed. Attendees were reminded that their input was needed and valued in helping to determine a preferred alternative consistent with the community's objectives and character. The summary of comments from Public Information Meeting # 1 is included in **Appendix A**.

Carrollton Civic League Discussion

Members of the project team were invited to attend the Carrollton Civic League monthly meeting to discuss the Brewer's Neck Corridor Study. The project team reviewed the goals and objectives of the corridor study and discussed the conceptual improvement alternatives under consideration for the various roadway segments in the study area. The meeting was held on February 4, 2013 in the Conference Room of Sentara St. Luke's Medical Center on Brewer's Neck Boulevard near Benns Church, Virginia. During the conversation with the group, citizens were asked to consider and identify the alternative concepts they preferred or liked versus those they did not like as a part of the need for public input and feedback to establish the community's preferred alternatives. As a part of this meeting it was noted that just the widening of Brewer's Neck Boulevard and Carrollton Boulevard or the extension and widening of Nike Park Road would not meet the needs of the community based on anticipated future growth and related traffic volumes. From this conversation, input during Pubic Information #1, discussions among project team members, traffic volumes projections for both corridors, and the long range significance of these corridors at the local and regional level, it was determined that both projects should be included as future roadway network improvements.

Figure 2-1: Brewer's Neck Boulevard Corridor Study Area



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Chapter 3.0 Existing Conditions Analysis

Section 3.1 Existing Land Use and Zoning

Land use in the study area is regulated by the Comprehensive Plan, the County's zoning ordinances, and existing land uses pre-dating zoning. The Comprehensive Plan designates much of the land in the study area as being in the Newport Development Service District (DSD) because of the location of the major County transportation corridors that traverse the district and existing or planned future sewer and water service areas. **Figure 3-1** shows the extent of the Newport DSD boundary within the project study area.

Within the DSD, lands are broken into five land use planning areas:

- Mixed Use Activity Center
- Business and Employment
- Suburban Residential
- Suburban Estate
- Resource Conservation

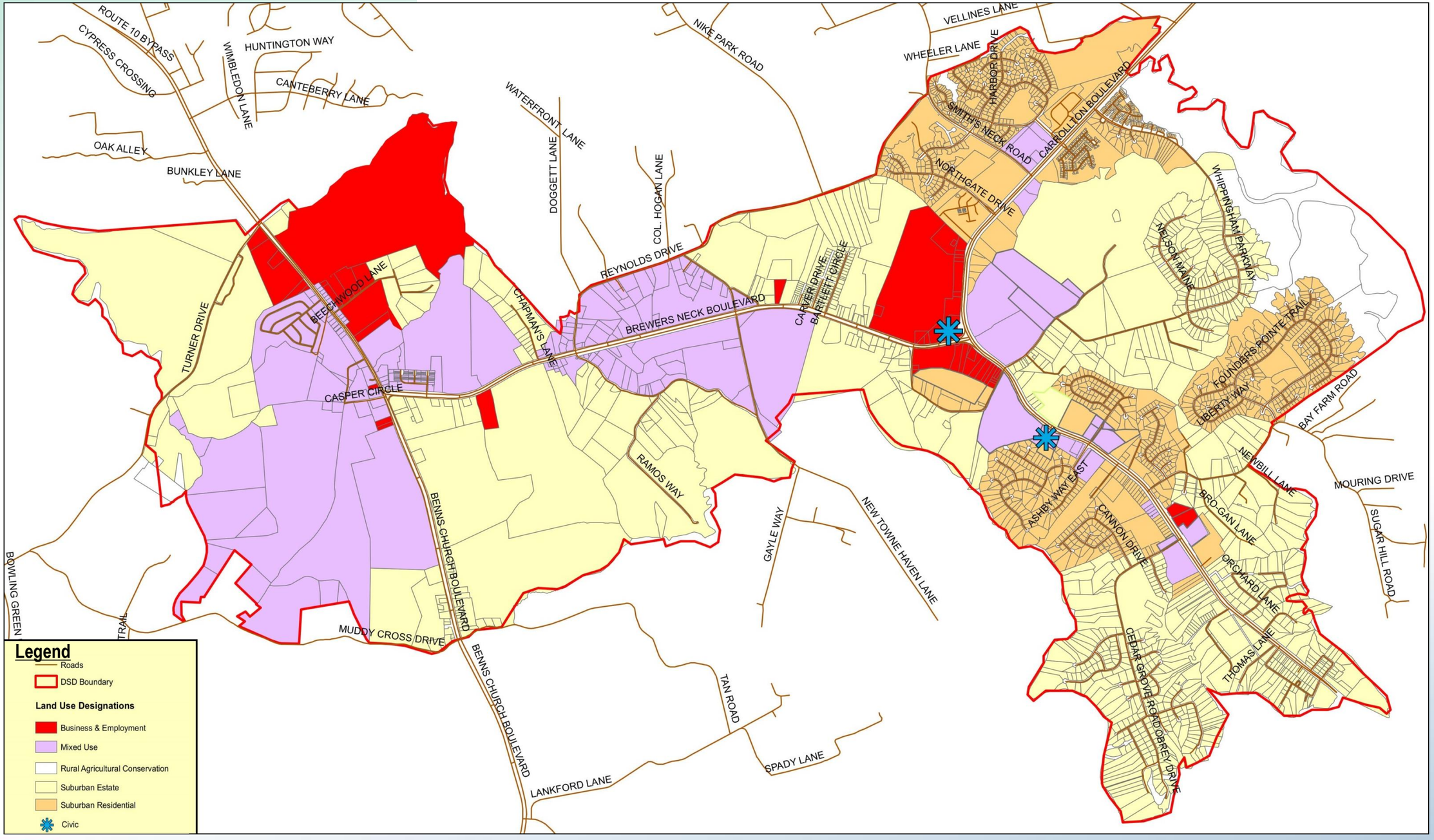
Isle of Wight County identifies six general land use area types with individual land-use policies:

- Rural Districts
- Residential Districts
- Commercial Districts
- Industrial Districts
- Planned Development Zoning Districts
- Special Overlay Districts

Of the six main land uses, the majority of Isle of Wight County is zoned as Rural Agricultural Conservation District (RAC), which includes all types of agricultural uses and single family homes. Within the study area of the Brewer's Neck Corridor Study, adjacent zoning is comprised of a combination of RAC (Rural Agricultural Conservation), PD-MX (Planned Development Mixed Use), PD-MH (Planned Development Manufactured Home Park), PD-R (Planned Development Residential), SR (Suburban Residential), UR (Urban Residential), RR (Rural Residential), NC (Neighborhood Conservation), SE (Suburban Estate), GC (General Commercial), and LI (Limited Industrial) as shown in **Figure 3-2**. Although there has been growth along the corridors within the study area, it is anticipated that remaining undeveloped parcels will continue to undergo rezoning in the future to accommodate land uses more consistent with the vision for this area.

The vision for this area is to provide a mix of land uses that meet the needs and desires of the public by managing and developing vacant land along major transportation corridors. It is expected that the impact of development on major transportation corridors will be minimized within the Newport DSD since residents will have the opportunity to be located physically close to jobs and the services they will require. This allows residents to maximize the function and capacity of the major transportation corridors traversing the district.

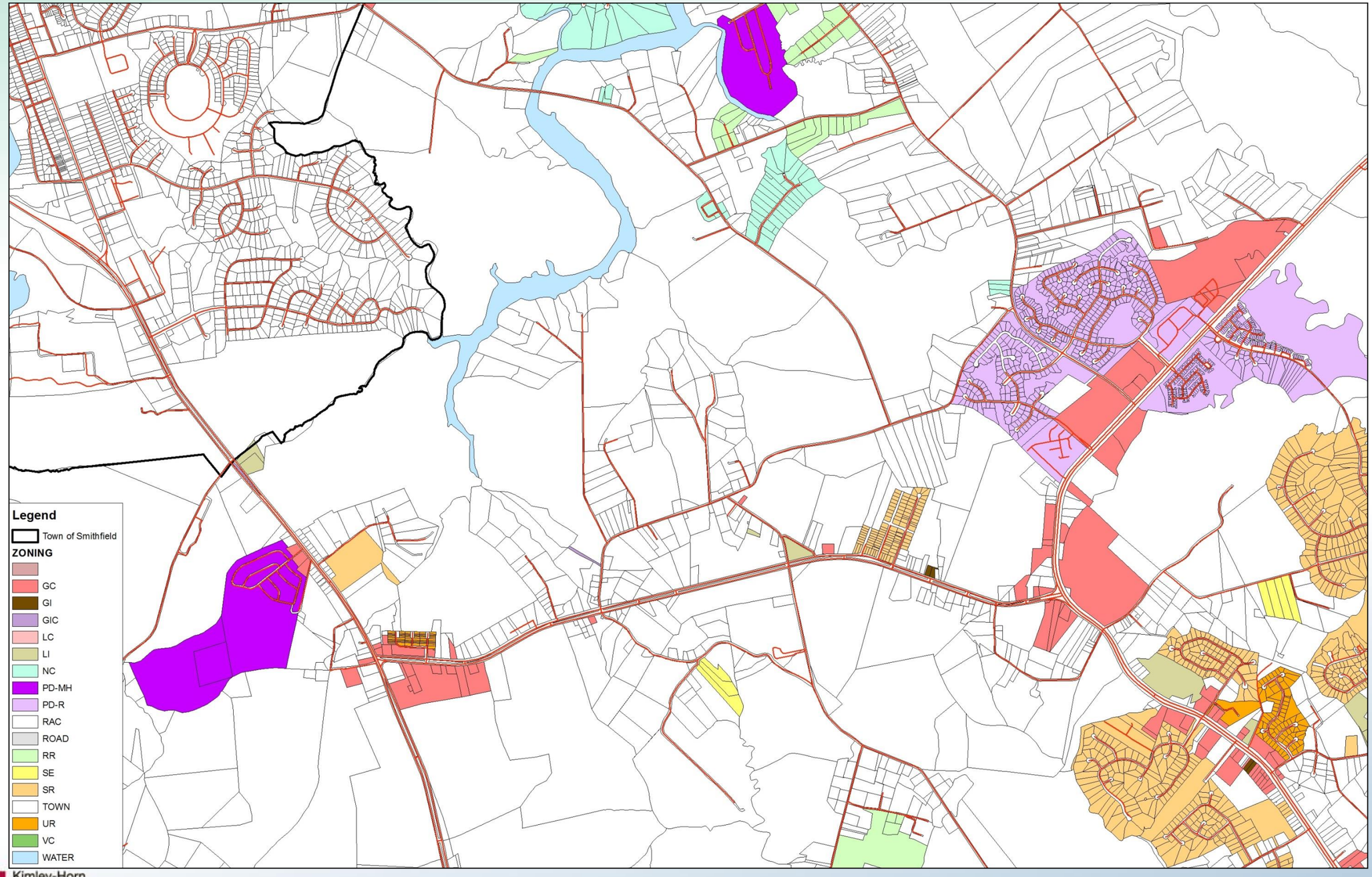
Figure 3-1 Newport Development Service District Land Use Plan



Kimley-Horn and Associates, Inc.

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Figure 3-2 Isle of Wight County, Virginia Zoning Map for Project Study Area



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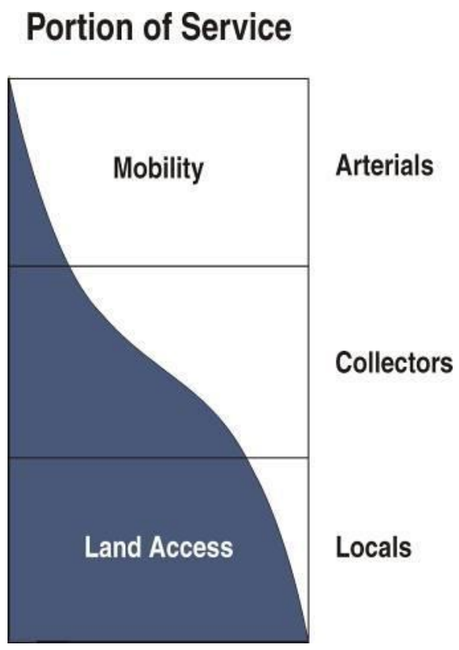
Section 3.2 Key Transportation Corridors

The transportation network is comprised of a collection of roadways with different functional classifications. Functional classification refers to a hierarchy of street types used to describe the purposes of different streets in a network. In the study area, there are four classes of streets represented, as shown in **Figure 3-3.** These roadways form a network that seeks to provide a balance between access and mobility. A main focus of the transportation network are the corridors linking activity centers such as home, school, work, shopping, social, and recreational destinations to one another. Furthermore, a transportation network lays the groundwork to encourage development on and around these linked roadways.

In Isle of Wight County, transportation corridors need to support diverse travel purposes including regional travel, such as the work trips of Isle of Wight residents who are employed outside of the county (e.g., Newport News), the commuter traffic destined to and from major regional employers like Huntington Ingalls Industries (formerly Northrop Grumman Shipbuilding) and Smithfield foods, and local travel between activity centers in Isle of Wight. In addition to supporting a combination of regional and local trip purposes, key corridors need to serve vehicular and other (i.e. bicyclists) users as well as pedestrians. The following briefly describes characteristic of each functional class of roads in the study area:

- **Interstates and Arterials.** These roadways provide a high level of mobility; however, they offer little opportunity for access (driveways and intersections). This classification includes limited access roadways such as freeways and expressways. Typically, arterials have higher operating speeds and significant vehicular capacity. They are also largely focused on serving longer distance travel. Most arterials and interstates in Virginia are maintained by the Virginia Department of Transportation (VDOT). Carrollton Boulevard, Brewer's Neck Boulevard, and Benns Church Boulevard are the principal arterials within the study area. South Church Street is a minor arterial within the study area.

- **Collectors.** These roadways balance mobility and access. Depending upon their purpose, they are further classified as major and minor collectors. Major collectors typically provide service to roadways on an arterial system, link nearby towns and counties, and serve the intra-county corridors. Minor collectors are typically spaced depending upon population density, serve as an intermediate route between local roads and bring traffic within a reasonable distance of a major collector and/or arterial, and provide service to smaller communities. Reynolds Drive, Smith's Neck Road, and Battery Park Road are the collectors within the study area.



- **Locals.** This classification of streets provides the least mobility, but the highest level of access to property. Similar to collectors, local streets are stratified into major and minor streets. Local streets typically connect to one another and to collectors. Less often, local streets connect to arterials. However, this is the case for much of the study area. Typical characteristics of local streets include low posted speeds, narrow lane widths, on-street parking, frequent driveways, and low traffic volumes.

Functional classification information for the study roadways was obtained through the VDOT Functional Classification link for Isle of Wight County on VDOT's website (Hampton Roads Construction District – County/City/Town: Isle of Wight).

Brewer's Neck Boulevard

Brewer's Neck Boulevard (U.S. Route 258/State Route 32) is oriented east/west and extends from Benns Church Boulevard (U.S. Route 258/State Route 10/32) to the west to Carrollton Boulevard (U.S. Route 17/258/State Route 32) to the east. The corridor is a significant through-traffic facility as it serves as the main connector between two of the most heavily traveled principal arterials in the county and subsequently a major river crossing in the Hampton Roads Region, the James River Bridge.



Brewer's Neck Boulevard Typical Section looking east



Brewer's Neck Boulevard Typical Section looking west

Brewer's Neck Boulevard is configured as a four-lane, divided facility with a posted speed limit of 55 mph from Benns Church to Carrollton Boulevard. It has signalized intersections at Benns Church Boulevard, Norsworthy Drive/New Towne Haven Lane, and Carrollton Boulevard. There are also several unsignalized median crossovers located along the roadway. Pedestrian facilities are relatively limited to non-existent along this section of roadway.

Carrollton Boulevard

Carrollton Boulevard (U.S. Route 17/258/State Route 32) is a primary north/south route within the study area. The corridor extends from the James River to the north to the City of Suffolk in the south. To the north, it provides direct access to the James River Bridge and the City of Newport News. The corridor provides access to several residential and commercial properties. Within the study area, it is configured as a four-lane, divided facility with a posted speed limit of 55 mph to the south and 45 mph to the north of its intersection with Brewer's Neck Boulevard. It has signalized intersections at Omera Drive/Ashby Way, Brewer's Neck Boulevard, Smith's Neck Road, Eagle Harbor Parkway/King's Crossing, and Harbor Point Lane/Whippingham Parkway. There are several unsignalized median crossovers located along the roadway. Pedestrian facilities are relatively limited to non-existent along this section of roadway. A multi-use path is located on the east side of Carrollton Boulevard across the frontage of the shopping center/Bojangles' near Smith's Neck Road as well as between King's Crossing and Whippingham Parkway.



Carrollton Boulevard Typical Section looking north



Carrollton Boulevard Typical Section looking south

Smith's Neck Road

Smith's Neck Road (State Route 665) is an urban collector generally oriented in a north/south direction within the study area. Smith's Neck Road extends from Carrollton Boulevard in the south to the community of Rescue in the north, a distance of approximately 3.7 miles. Rescue Road, Titus Creek Drive, and Reynolds Drive are all provided access to Carrollton Boulevard via Smith's Neck Road. The roadway provides access to several residential and commercial properties and serves as an important link for access between the James River Bridge and the Town of Smithfield. Within the study area, it is primarily configured as a two-lane, undivided facility with a posted speed limit of 45 mph. It is a four-lane undivided facility only for a distance of approximately 1,800 feet between Graystone Drive/Harbor Drive and its intersection with Carrollton Boulevard to the south. The three key intersecting streets along Smith's Neck Road (i.e., Rescue Road, Titus Creek Drive, and Reynolds Drive) are all unsignalized intersections along the roadway. Pedestrian facilities are non-existent along this section of roadway.



Smith's Neck Rd Two-Lane Typical Section looking north



Smith's Neck Rd Four-Lane Typical Section looking north

Nike Park Road

Nike Park Road (State Route 669) is also listed as an urban collector generally oriented in a northwest/southeast direction within the study area. Nike Park Road extends from Reynolds Drive in the south to Battery Park Road in the north, a distance of approximately 2.8 miles. The roadway provides access to numerous residential properties, Nike Park, and serves as the key alternative link for access between the James River Bridge and the Town of Smithfield. Within the study area, it is primarily configured as a two-lane, undivided facility with a posted speed limit of 45 mph beginning in the area along Titus Creek Drive and continuing north to Battery Park Road. To the south of this location, down to Reynolds Drive the roadway is assumed to have a statutory speed limit of 55 miles per hour since the speed limit is otherwise not posted. Pedestrian facilities are non-existent along this section of roadway.



Nike Park Road Typical Section looking north



Nike Park Road Typical Section looking south

Battery Park Road

Battery Park Road (State Route 704) is an urban collector serving as a secondary east/west route within the study area. Battery Park Road extends from South Church Street in the west to Todd Avenue and the community of Battery Park in the east/north, a distance of approximately 2.5 miles. The roadway provides access to numerous individual residential properties as well as several neighborhoods, and serves as a key link for access between the Town of Smithfield and Carrollton Boulevard via Nike Park Road and Smith's Neck Road. Within the study area, the roadway is primarily configured as a two-lane, undivided facility with a posted speed limit of 45 mph. Some pedestrian facilities (i.e., sidewalk) are present along the south side of the roadway in the Town of Smithfield for a distance of approximately 1,800 feet. Beyond this section of roadway pedestrian facilities are essentially non-existent.

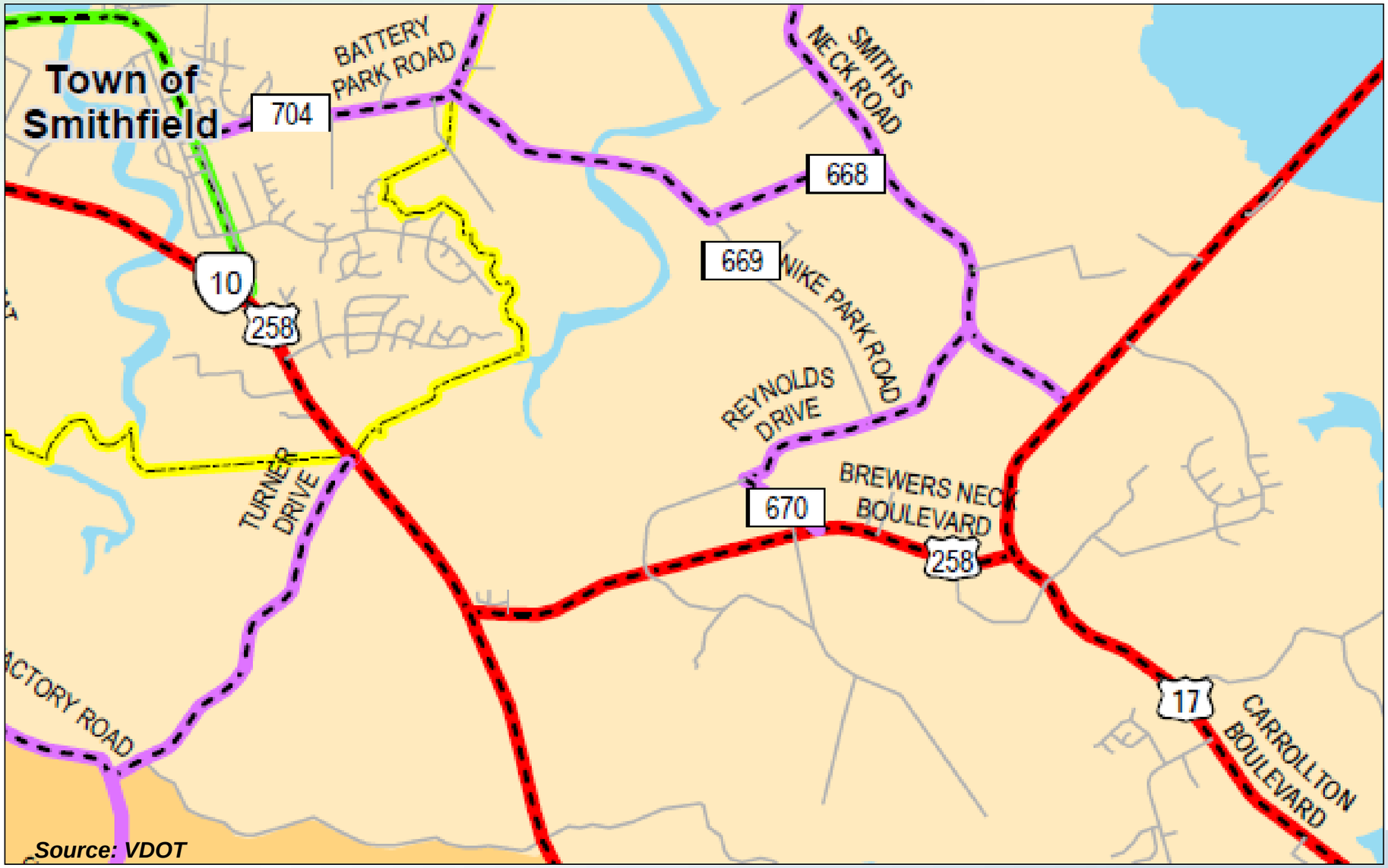


Battery Park Road Typical Section looking west



Battery Park Road Typical Section looking east

Figure 3-3: VDOT Roadway Functional Classification Map



Source: VDOT

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Section 3.3 Access Characteristics

Within the study area, access is relatively uncontrolled with modestly spaced driveways located along both Brewer's Neck Boulevard and Carrollton Boulevard. These entrances access both residential and commercial land uses with varying access configurations including single business driveways, strip center development driveways, signalized intersections, unsignalized intersections, and unsignalized private roadways. **Figure 3-4A through Figure 3-4C: Brewer's Neck Boulevard Existing Corridor Access** and **Figure 3-5A through 3-5C: Carrollton Boulevard Existing Access** illustrate field observed access configurations along the corridors.

Figure 3-4A: Brewer's Neck Boulevard Existing Corridor Access



Brewer's Neck Boulevard Typical Section looking east



Brewer's Neck Boulevard Typical Section looking west

Figure 3-4B: Brewer's Neck Boulevard Existing Corridor Access



New Towne Haven Lane approach looking north



Brewer's Neck Boulevard at Norsworthy Drive looking west

Figure 3-4C: Brewer's Neck Boulevard Existing Corridor Access



Sentara Way approach at Brewer's Neck Boulevard



Reynolds Drive approach looking south

Figure 3-5A: Carrollton Boulevard Existing Corridor Access



Carrollton Boulevard Typical Section looking south



Carrollton Boulevard Typical Section looking north

Figure 3-5B: Carrollton Boulevard Existing Corridor Access



Northgate Drive approach looking east



Smith's Neck Road approach looking east

Figure 3-5C: Carrollton Boulevard Existing Corridor Access



Eagle Harbor Parkway approach looking east



Whippingham Parkway approach looking west

Section 3.4 Existing Traffic Volumes and Characteristics

Existing traffic volumes along a highway corridor are determined by stationing people or automated counting equipment at selected points on the corridor and counting the number of vehicles that pass through that point during a given timeframe. Both automated and human counters can collect data on vehicle classification to distinguish passenger cars, small trucks, and SUVs from heavy vehicles while counting volumes. Automated counters can also collect speed data while counting volumes. The existing geometry of the study intersections is shown in **Figures 3-6A** and **3-6B**.

Weekday turning movement counts (TMCs) were conducted manually by Kimley-Horn and Associates, Inc. sub-consultant Peggy Malone & Associates, Inc., (PMA) at twelve intersections within the study area from March 13 through March 15, 2012:

A) S. Church Street and Holt Road/Battery Park Road
B) Nike Park Road and Battery Park Road
C) Benns Church Boulevard and Brewer's Neck Boulevard
F) Brewer's Neck Boulevard and Campbells Chapel Drive/Reynolds Drive
H) Norsworthy Drive and Reynolds Drive
I) Nike Park Road and Reynolds Drive
L) Smith's Neck Road and Reynolds Drive
M) Brewer's Neck Boulevard and Deep Bottom Drive
O) Carrollton Boulevard and Channell Way/Deep Bottom Drive
Q) Carrollton Boulevard and Smith's Neck Road
R) Carrollton Boulevard and Eagle Harbor Parkway/King's Crossing
S) Carrollton Boulevard and Harbor Point Lane/Whippingham Parkway

The intersections were observed for two hours each during typical weekday AM (6:30 to 8:30) and PM (4:00 to 6:00) peak periods.

In addition to those intersections, counts were conducted manually by Data Collection Group from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM, May 24 through May 26, 2011 for the following intersections:

G) Brewer's Neck Boulevard and Norsworthy Drive/New Towne Haven Lane
D) Brewer's Neck Boulevard and Queen Anne's Court
E) Brewer's Neck Boulevard and Sentara Way

The intersection of Carrollton Boulevard and Northgate Drive was manually counted by Peggy Malone & Associates, Inc. (PMA) from 6:00 AM until 6:00 PM on June 7, 2011.

Counts for the intersections of Brewer's Neck Boulevard and Carrollton Boulevard and Carrollton Boulevard and Omera Drive/Ashby Way were obtained from a Traffic Impact Analysis for The Crossings completed by DRW Consultants, LLC dated December 28, 2010.

The AM and PM peak period TMCs for each intersection are shown in **Figures 3-7A and 3-7B.** The detailed counts are provided in the **Appendix A**.

Kimley-Horn also collected average weekday daily traffic (AWDT) counts using automated counting tubes at twelve locations from March 13 through March 15, 2012:.

1) Battery Park Road north of Nike Park Road
2) Battery Park Road west of Nike Park Road
3) Benns Church Boulevard between Brewer's Neck Boulevard and Turner Drive
4) Benns Church Boulevard north of Turner Drive
5) Brewer's Neck Boulevard west of Campbells Chapel Drive
6) Brewer's Neck Boulevard west of Deep Bottom Drive
7) Carrollton Boulevard north of Brewer's Neck Boulevard
8) Carrollton Boulevard south of Deep Bottom Drive
9) Nike Park Road east of Battery Park Road
10) Nike Park Road north of Reynolds Drive
11) Reynolds Road west of Smith's Neck Road
12) Route 258 west of Benns Church
13) Smith's Neck Road north of Harbor Drive

Average weekday daily traffic volumes are shown in **Figures 3-7A and 3-7B** along with the TMCs for each intersection.

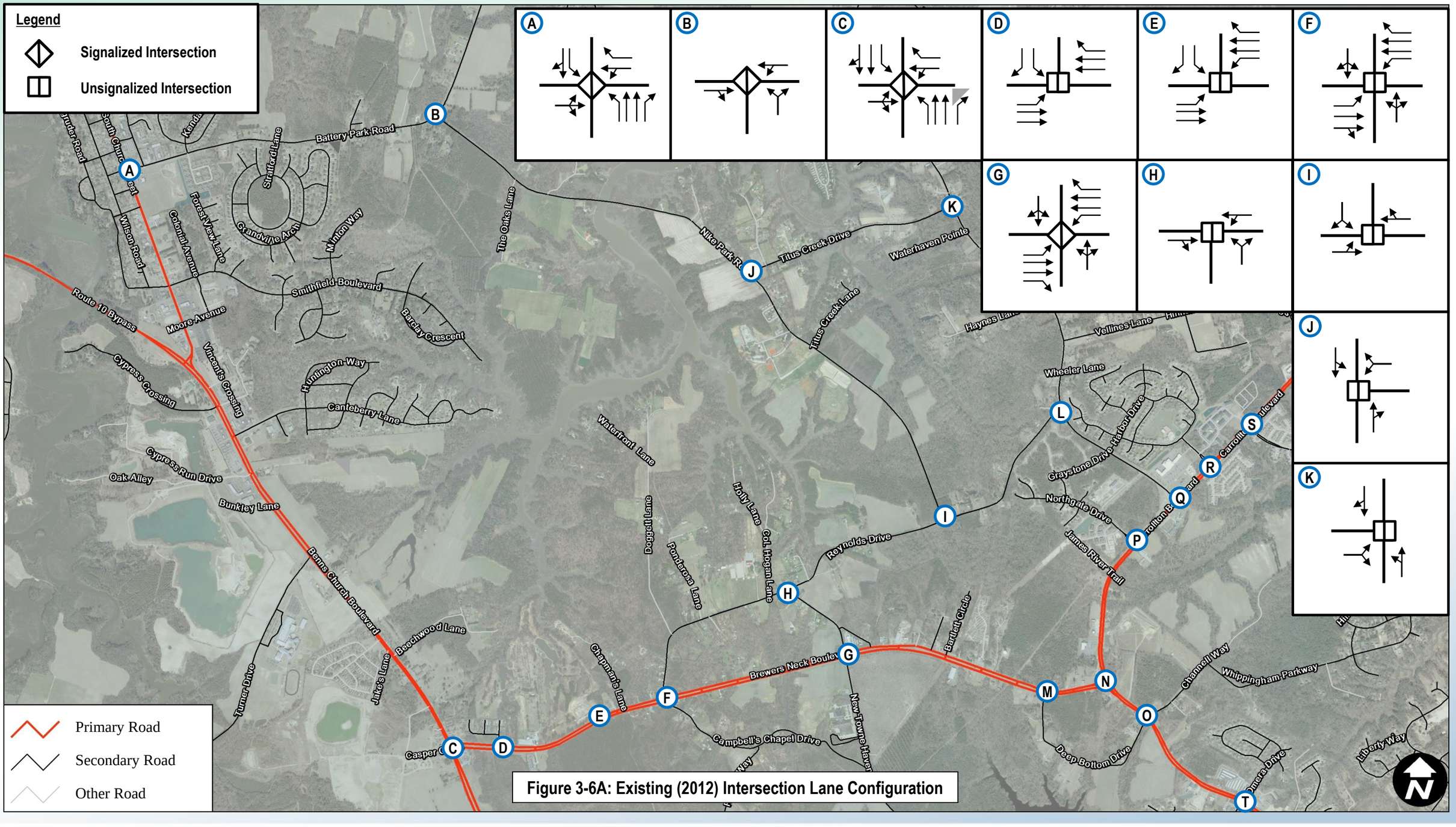


Figure 3-6A: Existing (2012) Intersection Lane Configuration

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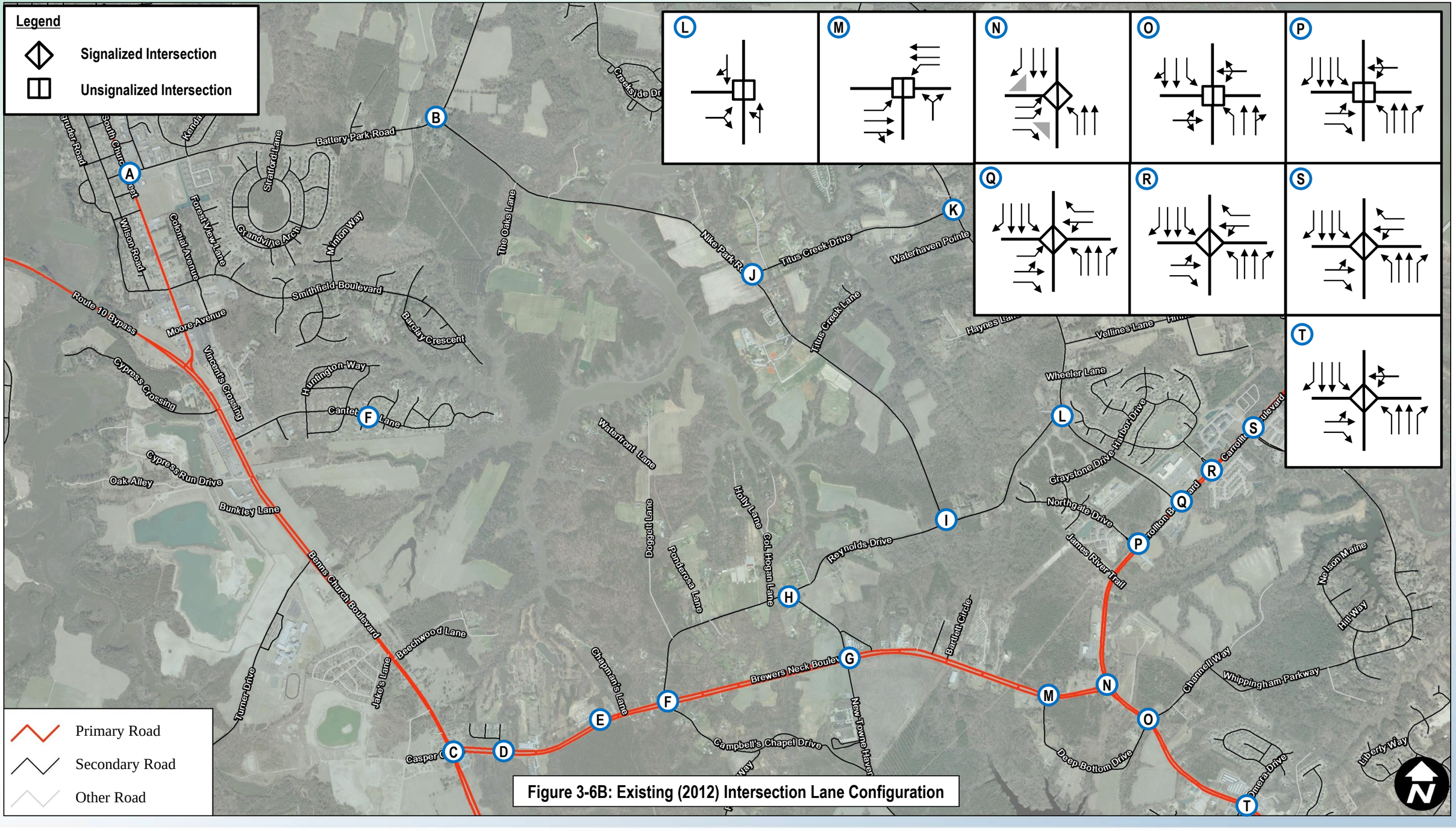


Figure 3-6B: Existing (2012) Intersection Lane Configuration

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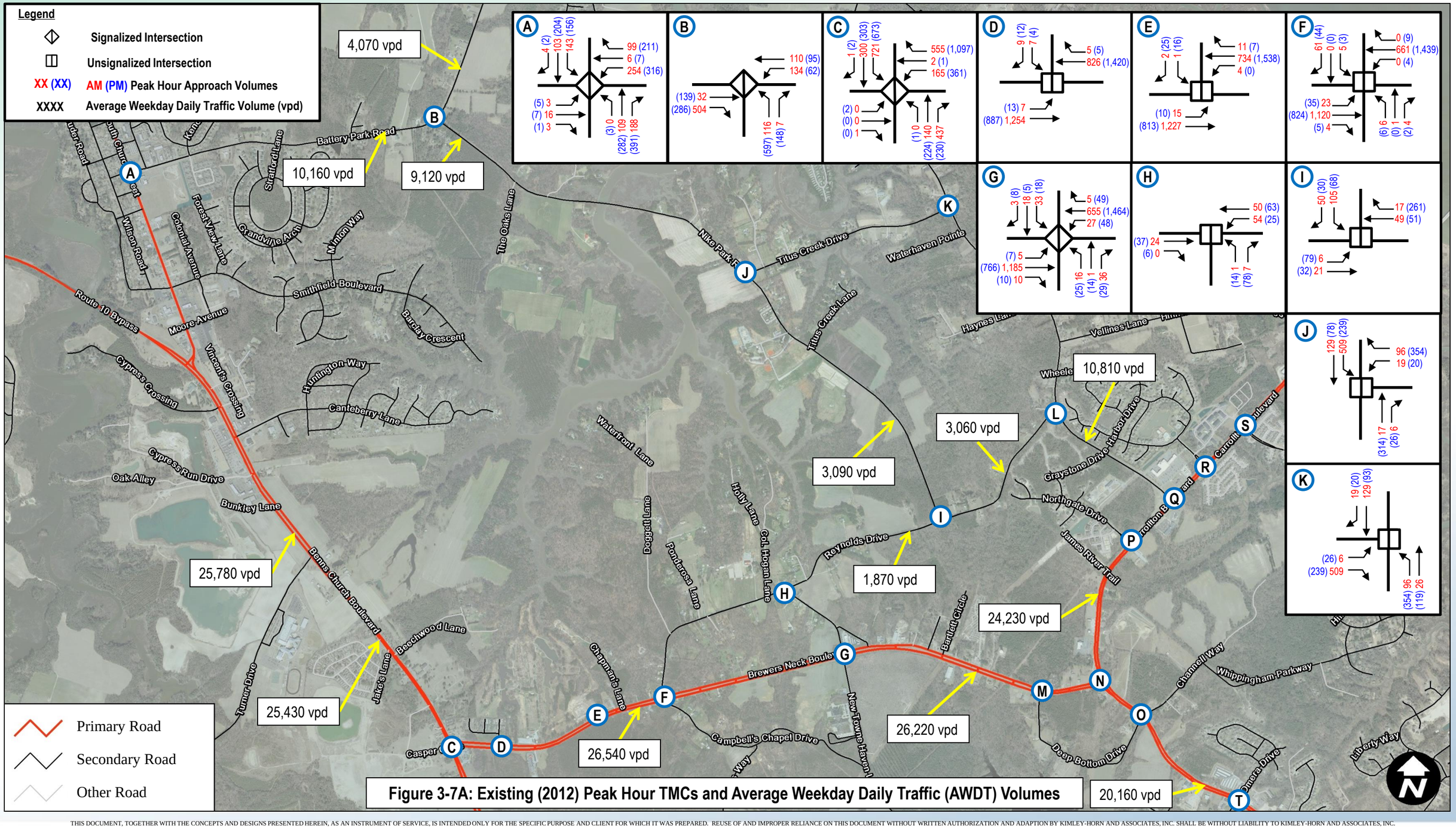


Figure 3-7A: Existing (2012) Peak Hour TMCs and Average Weekday Daily Traffic (AWDT) Volumes

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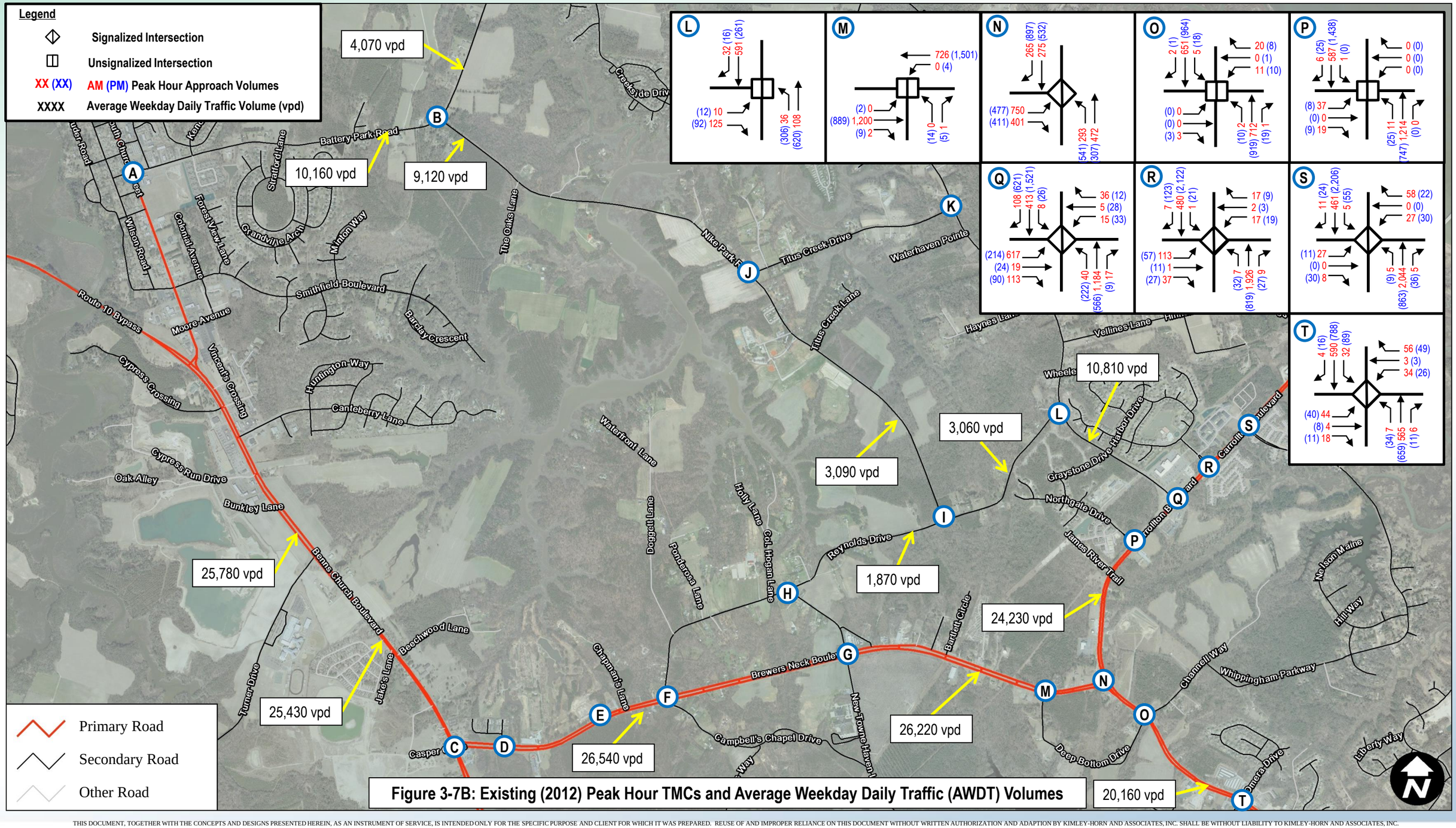


Figure 3-7B: Existing (2012) Peak Hour TMCs and Average Weekday Daily Traffic (AWDT) Volumes

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Based on the turning movement counts, an imbalance was discovered between Battery Park Road and Reynolds Drive along Nike Park Road. Previous assumptions had suggested a possible cut-through route existed from Battery Park Road to Smith's Neck Road via Nike Park Road and Reynolds Drive. However, after further evaluation of the traffic counts and subsequent field observations it was confirmed that cut-through traffic is actually using Titus Creek Drive as a part of the route to access Smith's Neck Road.



Smith's Neck Road north of Reynolds Drive



Eastbound Traffic on Titus Creek Drive

The turning movement counts performed by KHA also included classification counts. The percent of heavy vehicles on each approach for the intersections during the two-hour AM and PM counts are shown in **Table 3-1**.

For existing conditions analysis, actual heavy vehicle percentages per movement were applied. Since no heavy vehicle percentages are available for the future 2034 analysis, it was assumed for all movements that heavy vehicle percentages would remain the same under future conditions. If truck percentages were not available, the default 2% was used.

Table 3-1: Intersection Heavy Vehicle Percentages

ID	Intersecting Street	Peak Hour	Northbound %HV	Southbound %HV	Eastbound %HV	Westbound %HV
A	S. Church Street & Battery Park Road	AM	5%	2%	9%	3%
		PM	1%	1%	4%	1%
B	Battery Park Road & Nike Park Road	AM	1%	-	1%	2%
		PM	0%	-	1%	2%
C	Brewer's Neck Boulevard & Benns Church Boulevard	AM	5%	4%	0%	7%
		PM	4%	4%	10%	3%
D	Brewer's Neck Boulevard & Queen Anne's Court	AM	-	11%	5%	8%
		PM	-	9%	4%	3%
E	Brewer's Neck Boulevard & Sentara Way	AM	-	0%	3%	2%
		PM	-	0%	5%	6%
F	Brewer's Neck Boulevard & Campbells Chapel Drive/Reynolds Drive	AM	0%	3%	5%	6%
		PM	15%	1%	4%	3%

Table 3-2: Intersection Heavy Vehicle Percentages (continued)

ID	Intersecting Street	Peak Hour	Northbound % HV	Southbound % HV	Eastbound % HV	Westbound % HV
G	Brewer's Neck Boulevard & Norsworthy Drive/New Towne Haven Lane	AM	8%	0%	5%	6%
		PM	0%	7%	3%	2%
H	Norsworthy Drive & Reynolds Drive	AM	6%	-	11%	2%
		PM	2%	-	1%	2%
I	Nike Park Road & Reynolds Drive	AM	--	2%	11%	1%
		PM	--	1%	3%	0%
J	Nike Park Road & Titus Creek Drive	AM	2%*	2%*	2%*	2%*
		PM	2%*	2%*	2%*	2%*
K	Smith's Neck Road &Titus Creek Drive	AM	2%*	2%*	2%*	2%*
		PM	2%*	2%*	2%*	2%*
L	Smith's Neck Road & Reynolds Drive	AM	2%	1%	3%	-
		PM	1%	1%	2%	-
M	Brewer's Neck Boulevard & Deep Bottom Drive	AM	0%	-	4%	8%
		PM	7%	-	4%	3%
N	Brewer's Neck Boulevard & Carrollton Boulevard	AM	2%*	2%*	2%*	2%*
		PM	2%*	2%*	2%*	2%*
O	Carrollton Boulevard & Deep Bottom Drive/Channell Way	AM	6%	4%	33%	9%
		PM	3%	3%	10%	9%
P	Carrollton Boulevard & Northgate Drive	AM	3%	5%	2%	0%
		PM	2%	2%	0%	0%
Q	Carrollton Boulevard & Smith's Neck Road	AM	3%	4%	1%	0%
		PM	3%	1%	2%	0%
R	Carrollton Boulevard & Eagle Harbor Parkway/King's Crossing	AM	3%	6%	3%	6%
		PM	3%	2%	3%	4%
S	Carrollton Boulevard & Harbor Point Lane/Whippingham Parkway	AM	3%	6%	0%	1%
		PM	3%	2%	4%	2%
T	Carrollton Boulevard & Omera Drive/Ashby Way	AM	2%*	2%*	2%*	2%*
		PM	2%*	2%*	2%*	2%*

Source: Kimley-Horn and Associates, Inc.

- *Indicates **default value of 2%** used since data were not available*

Section 3.5 Existing Level of Service

Through methodology outlined by the Transportation Research Board's *Highway Capacity Manual* (*HCM*), turning movement and ADT counts were used in conjunction with *Synchro Professional* 7.0 and HCS+ software to determine levels of service for the intersections and arterial segments. Level of service (LOS) describes the quality of the driving experience using six levels designated A through F. Each LOS is defined by a range of quantitative measurements appropriate to the described facility, such as the density and speed of traffic for a highway LOS or the number of vehicles stopped and average stop duration for a traffic signal LOS. The ranges of delay (seconds per vehicle) for each intersection LOS are shown in **Table 3-2.**

Table 3-3: Signalized and Unsignalized Intersection HCM LOS Criteria

LOS	Intersection Delay per Vehicle(s)	
	Signalized	Unsignalized
A	0.0 - 10	0.0 - 10
B	>10 - 20	>10 - 15
C	>20 - 35	>15 - 25
D	>35 - 55	>25 - 35
E	>55 - 80	>35 - 50
F	>80	>50

Source: Transportation Research Board, Highway Capacity Manual 2000

3.5.1 Intersection LOS Analysis

Capacity analyses for signalized and unsignalized intersections in the weekday AM and PM peak hours were performed using *Synchro Professional 7.0*. This software uses methodologies contained in the *2000 Highway Capacity Manual (HCM)* [TRB Special Report 209, 2000].

Intersection turning movement counts were used in conjunction with geometric data including number of lanes and traffic control (signalization) to determine existing levels of service (LOS). For intersections, LOS is based on the average delay experienced by all traffic using the intersection during the busiest 15-minute peak period. LOS A through D is considered acceptable.

Existing peak hour LOS throughout the study area are shown in **Figure 3-8A** and **Figure 3-8B**. Overall intersection LOS operations are summarized as well as per approach LOS for signalized intersections and per lane LOS for unsignalized intersections. For lanes serving only through and right-turn movements on uncontrolled approaches of unsignalized intersections, no LOS results were calculated as the *HCM* does not provide LOS criteria for the major street's through and right-turn movements at a two-way stop. LOS for all intersections are based on average per-vehicle seconds of delay calculated from the intersection laneage and geometry, traffic volumes and characteristics, and the traffic signal timing (for signalized intersections). **Table 3-3** through **Table 3-22** report the LOS for the studied intersections both signalized and unsignalized. The tables depict the LOS for each approach and the overall intersection LOS.

Table 3-4: S. Church Street and Battery Park Road Signalized Intersection LOS (Intersection A)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	D (36.5)	E (59.1)	C (24.9)	C (28.1)	D (39.3)
PM Peak Hour					
Existing (2012)	D (40.8)	D (39.8)	C (23.9)	C (28.4)	C (30.4)
Source: Kimley-Horn and Associates, Inc.					

Table 3-5: Battery Park Road and Nike Park Road Signalized Intersection LOS (Intersection B)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	C (26.1)	B (16.9)	C (24.8)	-	C (23.2)
PM Peak Hour					
Existing (2012)	F (98.3)	C (23.1)	F (>300)	-	F (212.9)
Source: Kimley-Horn and Associates, Inc.					

Table 3-6: Brewer's Neck Boulevard and Benns Church Boulevard Signalized Intersection LOS (Intersection C)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	D (51.6)	C (21.0)	A (8.1)	D (47.9)	C (29.2)
PM Peak Hour					
Existing (2012)	E (59.8)	E (70.1)	B (19.7)	F (85.4)	E (66.5)
Source: Kimley-Horn and Associates, Inc.					

Table 3-7: Brewer's Neck Boulevard and Queen Anne's Court Unsignalized Intersection LOS (Intersection D)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	A (9.9)	A (0.0)	-	C (16.0)	A (0.2)
PM Peak Hour					
Existing (2012)	B (13.8)	A (0.0)	-	C (22.3)	A (0.3)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-8: Brewer's Neck Boulevard and Sentara Way Unsignalized Intersection LOS (Intersection E)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	A (10.0)	A (0.0)	-	C (21.6)	A (0.2)
PM Peak Hour					
Existing (2012)	B (14.4)	A (0.0)	-	E (43.4)	A (0.8)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-9: Brewer's Neck Blvd and Campbells Chapel Drive/Reynolds Drive Unsignalized Intersection LOS (Intersection F)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	A (9.5)	A (0.0)	E (35.2)	B (13.1)	A (1.2)
PM Peak Hour					
Existing (2012)	C (15.5)	A (10.0)	E (36.1)	D (29.3)	A (1.3)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-10: Brewer's Neck Blvd and Norsworthy Drive/New Towne Haven Lane Signalized Intersection LOS (Intersection G)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	C (20.9)	B (15.3)	D (37.1)	D (37.9)	C (20.1)
PM Peak Hour					
Existing (2012)	B (17.9)	C (26.5)	D (35.7)	D (38.7)	C (24.1)
Source: Kimley-Horn and Associates, Inc.					

Table 3-11: Norsworthy Drive and Reynolds Drive Unsignalized Intersection LOS (Intersection H)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	A (0.0)	A (3.9)	A (8.9)	-	A (3.7)
PM Peak Hour					
Existing (2012)	A (0.0)	A (2.6)	A (9.2)	-	A (4.8)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-12: Nike Park Road and Reynolds Drive Unsignalized Intersection LOS (Intersection I)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	A (2.6)	A (0.0)	-	B (10.3)	A (6.1)
PM Peak Hour					
Existing (2012)	A (6.1)	A (0.0)	-	B (13.9)	A (4.4)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-13: Nike Park Road and Titus Creek Drive Unsignalized Intersection LOS (Intersection J)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	-	C (15.6)	A (0.0)	A (7.4)	A (8.4)
PM Peak Hour					
Existing (2012)	-	C (21.2)	A (0.0)	A (7.2)	A (9.9)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-14: Titus Creek Drive and Smith's Neck Road Unsignalized Intersection LOS (Intersection K)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	C (15.6)	-	A (6.2)	A (0.0)	B (11.2)
PM Peak Hour					
Existing (2012)	B (14.0)	-	A (6.8)	A (0.0)	A (8.2)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-15: Smith's Neck Road and Reynolds Drive Unsignalized Intersection LOS (Intersection L)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	C (19.8)	-	A (3.3)	A (0.0)	A (3.5)
PM Peak Hour					
Existing (2012)	C (21.7)	-	A (5.6)	A (0.0)	A (6.2)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-16: Brewer's Neck Boulevard and Deep Bottom Drive Unsignalized Intersection LOS (Intersection M)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	A (0.0)	A (0.0)	B (14.1)	--	A (0.0)
PM Peak Hour					
Existing (2012)	A (0.0)	B (10.8)	C (23.1)	--	A (0.3)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-17: Brewer's Neck Boulevard and Carrollton Boulevard Signalized Intersection LOS (Intersection N)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	B (18.7)	-	B (19.3)	B (12.2)	B (17.3)
PM Peak Hour					
Existing (2012)	B (17.6)	-	E (71.4)	B (12.2)	C (29.6)
Source: Kimley-Horn and Associates, Inc.					

Table 3-18: Carrollton Boulevard and Deep Bottom Drive/Channell Way Unsignalized Intersection LOS (Intersection O)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	B (11.2)	C (16.9)	A (9.2)	A (9.2)	A (0.6)
PM Peak Hour					
Existing (2012)	A (9.9)	F (51.3)	A (10.0)	B (10.3)	A (1.2)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-19: Carrollton Boulevard and Northgate Drive Unsignalized Intersection LOS (Intersection P)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	F (53.7)	A (0.0)	A (8.9)	B (11.9)	A (1.2)
PM Peak Hour					
Existing (2012)	F (154.1)	A (0.0)	B (14.4)	A (0.0)	A (0.8)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 3-20: Carrollton Boulevard and Smith's Neck Road Signalized Intersection LOS (Intersection Q)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	E (57.2)	D (52.5)	C (31.7)	C (22.4)	D (37.7)
PM Peak Hour					
Existing (2012)	E (57.4)	E (62.5)	C (33.2)	D (35.6)	D (38.1)
Source: Kimley-Horn and Associates, Inc.					

Table 3-21: Carrollton Boulevard and Eagle Harbor Parkway/King's Crossing Signalized Intersection LOS (Intersection R)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	D (51.5)	D (52.7)	E (62.1)	B (17.3)	D (52.9)
PM Peak Hour					
Existing (2012)	E (59.0)	E (60.5)	B (11.5)	C (26.1)	C (23.5)
Source: Kimley-Horn and Associates, Inc.					

Table 3-22: Carrollton Boulevard and Harbor Point Lane/Whippingham Parkway Signalized Intersection LOS (Intersection S)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	E (56.4)	D (52.1)	C (22.5)	A (8.8)	C (21.7)
PM Peak Hour					
Existing (2012)	C (27.4)	C (29.5)	C (22.3)	F (229.6)	F (157.3)
Source: Kimley-Horn and Associates, Inc.					

Table 3-23: Carrollton Boulevard and Omera Drive/Ashby Way Signalized Intersection LOS (Intersection T)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Existing (2012)	C (28.8)	C (25.8)	B (15.4)	B (15.2)	B (16.7)
PM Peak Hour					
Existing (2012)	D (37.6)	C (33.8)	B (18.7)	B (16.5)	B (18.9)
Source: Kimley-Horn and Associates, Inc.					

3.5.2 Roadway Capacity Analysis

Roadway capacity analyses were performed for both the weekday AM and PM peak hours using *Synchro Professional 7.0*. This software uses methodologies contained in the *2000 Highway Capacity Manual (HCM)* [*TRB Special Report 209, 2000*]. The ranges of delay for arterial LOS are shown in **Table 3-23** through **Table 3-25: HCM Arterial Classification – LOS Criteria**. Arterial analysis includes analysis of the roadway capacity in terms of average travel speed on the arterial. The LOS ranges are based on the roadway classification types: Class I, Class II, and Class III. Within the study area, Brewer's Neck Boulevard is currently classified as Class I while the majority of Carrollton Boulevard, Nike Park Road, Smith's Neck Road, and Battery Park Road are Class II arterial facilities. **Tables 3-21** and **3-23** display the typical LOS ranges for Class I, Class II and Class III arterial segments based on average travel speed (miles per hour).

Table 3-24: HCM Arterial Classification I – LOS Criteria

Arterial Street Classification – I (Range of Free Flow Speed 50-45 MPH)	
LOS	**Average Travel Speed (MPH)**
A	> 55
B	> 50 – 55
C	> 45 – 50
D	> 40 – 45
E	≤ 40
Source: Transportation Research Board, 2000 Highway Capacity Manual	

Table 3-25: HCM Arterial Classification II – LOS Criteria

Arterial Street Classification – II (Range of Free Flow Speed 35-45 MPH)	
LOS	**Average Travel Speed (MPH)**
A	> 35
B	> 28-35
C	> 22-28
D	> 17-22
E	> 13-17
F	≤ 13
Source: Transportation Research Board, Highway Capacity Manual 2000	

Table 3-26: HCM Arterial Classification III – LOS Criteria

Arterial Street Classification – III (Range of Free Flow Speed 35-30 MPH)	
LOS	**Average Travel Speed (MPH)**
A	> 30
B	> 24-30
C	> 18-24
D	> 14-18
E	> 10-14
F	≤ 10
Source: Transportation Research Board, Highway Capacity Manual 2000	

Using intersection turning movement county (TMC) and average weekday daily traffic (AWDT) counts conducted by KHA and data from VDOT, the arterial level of service was determined for Brewer's Neck Boulevard and Carrollton Boulevard. Level of service (LOS) describes traffic conditions at an intersection or on a roadway. LOS ranges from A to F—A indicating a condition of little or no congestion and F indicating a condition with severe congestion, unstable traffic flow, and stop-and-go conditions. For roadways, the arterial LOS is determined based on the arterial speed (i.e., average travel speed (ATS)) and distance between intersections. A LOS D or better is typically considered acceptable. **Table 3-26** through **Table 3-29** summarize the results of the arterial LOS analyses with detailed results provided in the **Appendix D**. It should be noted the class of each segment of the arterial may vary based on the posted speed limit and signal spacing. Therefore, LOS as reported by Synchro may not always match the above tables.

As shown in the level of service results, all arterial sections along Brewer's Neck Boulevard operate at an acceptable LOS D or better under existing peak hour conditions. Carrollton Boulevard operates acceptably except for the portion between the Eagle Harbor Parkway/King's Crossing and Smith's Neck Road intersections. It should be noted that the two segments that have poor arterial LOS are relatively short segments (i.e., ~ 1,000 feet between signalized intersections) with relatively high mainline volumes. These short distances combined with a lack of proper coordination between traffic signals at adjacent intersections results in very low travel speeds as traffic is forced to stop and queue at each signalized intersection.

Table 3-27: 2012 Existing Arterial Level of Service – Eastbound Brewer's Neck Boulevard

Cross Street	AM		PM	
	ATS (mph)	LOS	ATS (mph)	LOS
Benns Church Boulevard	34.7	B	34.7	B
New Towne Haven Lane/Norsworthy Drive	45.3	A	46.8	A
Carrollton Boulevard	33.2	C	32.3	C
Overall	**39.5**	**B**	**39.6**	**B**

Table 3-28: 2012 Existing Arterial Level of Service – Westbound Brewer's Neck Boulevard

Cross Street	AM		PM	
	ATS (mph)	LOS	ATS (mph)	LOS
New Towne Haven Lane/Norsworthy Drive	39.9	B	36.4	B
Benns Church Boulevard	38.3	B	36.7	B
Overall	**38.9**	**B**	**36.6**	**B**

Table 3-29: 2012 Existing Arterial Level of Service – Northbound Carrollton Boulevard

Cross Street	AM		PM	
	ATS (mph)	LOS	ATS (mph)	LOS
Omera Drive/Ashby Way	26.8	D	24.6	D
Brewer's Neck Boulevard	45.4	A	48.2	A
Smith's Neck Road	31.9	C	35.6	B
Eagle Harbor Parkway/King's Crossing	12.7	F	23.9	D
Harbor Point Lane/Whippingham Parkway	20.5	E	17.6	E
Overall	**28.7**	**C**	**31.8**	**C**

Table 3-30: 2012 Existing Arterial Level of Service – Southbound Carrollton Boulevard

Cross Street	AM		PM	
	ATS (mph)	LOS	ATS (mph)	LOS
Harbor Point Lane/Whippingham Parkway	41.0	B	16.5	E
Eagle Harbor Parkway/King's Crossing	20.4	E	17.1	E
Smith's Neck Road	17.106	E	12.3	F
Brewer's Neck Boulevard	31.802	C	30.7	C
Omera Drive/Ashby Way	42.8	A	41.2	B
Overall	**31.9**	**C**	**23.9**	**D**

Legend

AM PM

AM/PM Peak Hour LOS

Signalized Intersection

Unsignalized Intersection

Intersection LOS A or B

Intersection LOS C or D

Intersection LOS E or F

X (X) AM (PM) Approach LOS

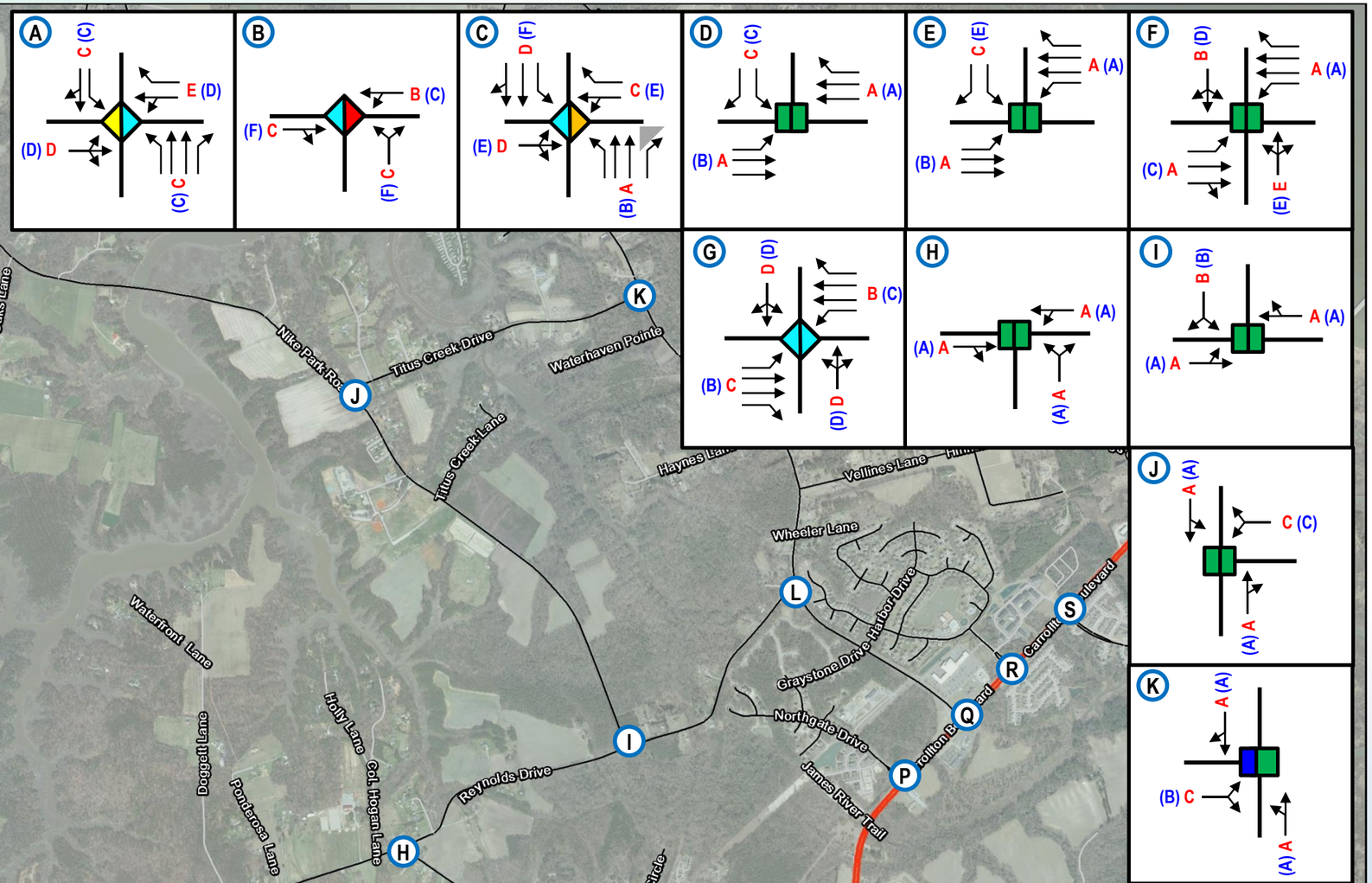


Figure 3-8A: Existing (2012) Peak Hour Level of Service

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Legend

AM PM — AM/PM Peak Hour LOS

Signalized Intersection

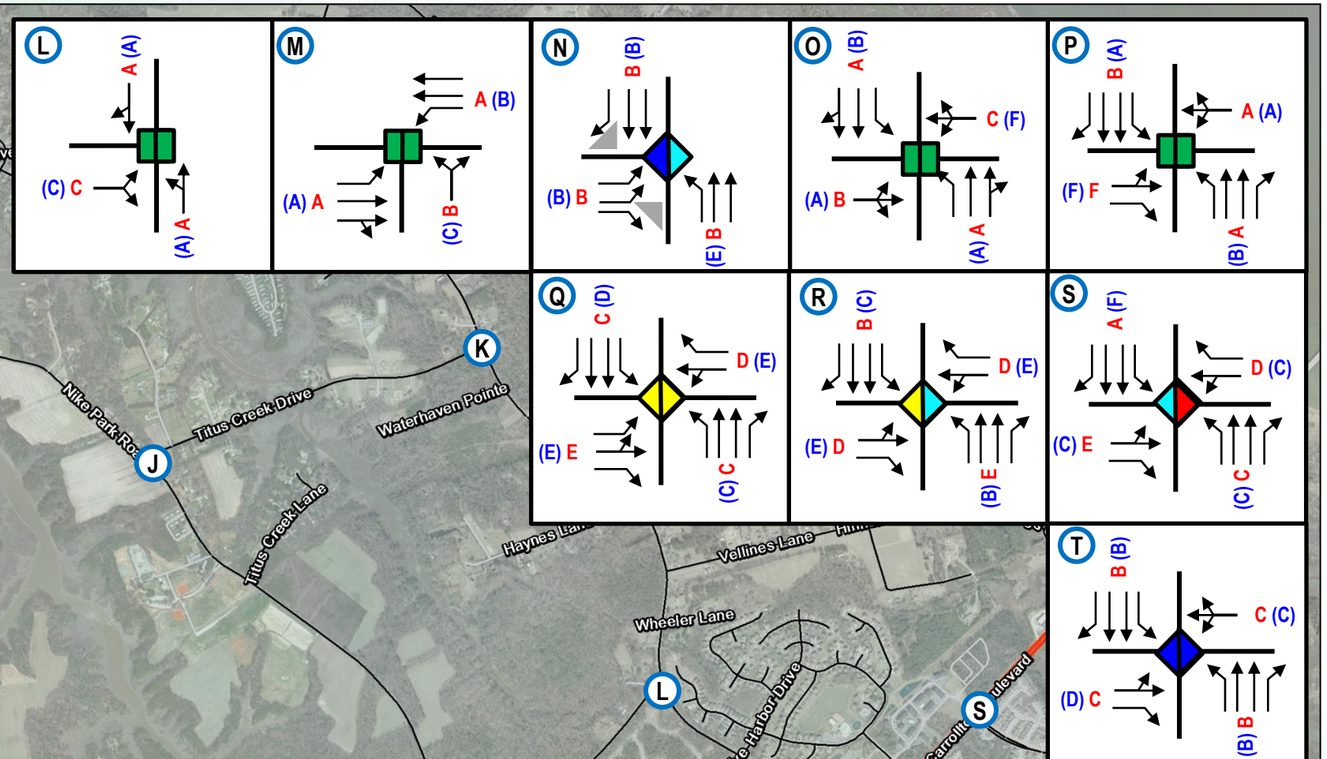
Unsignalized Intersection

Intersection LOS A or B

Intersection LOS C or D

Intersection LOS E or F

X (X) — AM (PM) Approach LOS



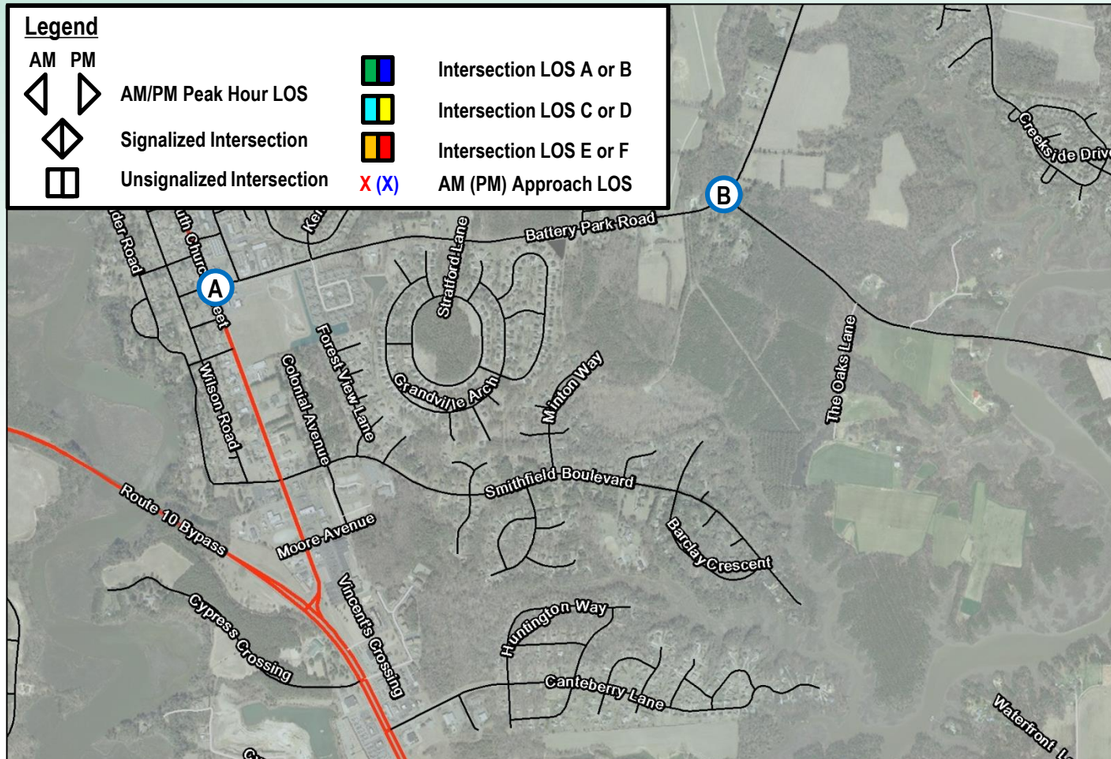


Figure 3-8B: Existing (2012) Peak Hour Level of Service

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Section 3.6 Existing Traffic Deficiencies

Within the LOS framework, operating conditions that achieve a LOS of A to D are generally considered acceptable while LOS E and F are regarded as unacceptable. At an intersection, a LOS E or F indicates lengthy queuing with vehicles experiencing prolonged waits. On a street or highway segment, a LOS E or F indicates dense, slow-moving, or stop-and-go traffic. Typically, LOS E indicates unstable conditions and an imminent need for improvements while LOS F indicates a failed element of the transportation network and a strong, current need for improvements. In general, the overall intersection and approach LOS throughout the study area are acceptable under existing conditions. Some stop-controlled minor street approaches like the southbound approach at Brewer's Neck Boulevard and Sentara Way, the northbound approach at Brewer's Neck Boulevard and Campbells Chapel Drive/Reynolds Drive, the westbound approach at Carrollton Boulevard and Deep Bottom Drive/Channell Way and the eastbound approach at Carrollton Boulevard and Northgate Drive experience long delays due to heavy mainline volumes and lack of gaps to enter the roadway. Poor coordination, heavy mainline volumes, and left-turn phasing impact the levels of delay on several approaches including approaches at the signalized intersections of S. Church Street and Battery Park Road/Holt Street, Battery Park Road and Nike Park Road, Brewer's Neck Boulevard and Benns Church Boulevard, Carrollton Boulevard and Smith's Neck Road, Carrollton Boulevard and Eagle Harbor Parkway/King's Crossing, and Carrollton Boulevard and Harbor Point Lane/Whippingham Parkway.



Carrollton Boulevard at Eagle Harbor Parkway



Carrollton Boulevard looking south at Eagle Harbor Parkway

The primary operational issue observed during field investigations resulted from a lack of coordination between traffic signals that was causing poor progression along Carrollton Boulevard. The traffic signals lacking coordination are from Smith's Neck Road to Whippingham Parkway/Harbor Point Lane on Carrollton Boulevard. The relatively high volume of traffic combined with the close spacing of these signals results in significant backups and delays when the signals are poorly coordinated. Of particular concern is the progression of the eastbound left-turn off of Brewer's Neck Boulevard that proceeds north along Carrollton Boulevard during the AM peak hour. Under the current timings, vehicles turning left off of Brewer's Neck Boulevard have the potential to be stopped again at Smith's Neck Road, Eagle Harbor Parkway/King's Crossing, and Whippingham Parkway/Harbor Point Lane. Coordination of these traffic signals will be an important improvement necessary to enhance traffic operations along these particular segments of the corridor.

Field observations generally confirm the results of the existing conditions analyses. Periods of congestion was observed at the Brewer's Neck and Benns Church Boulevard intersection during the AM peak which supports a LOS D on this approach of the intersection. Whereas severe periods of congestion and queuing were observed/documented during the PM peak hour as the southbound and westbound approaches to the intersection experienced LOS F and LOS E respectively.



Benns Church Boulevard looking north



Southbound Left-Turn Queue along Benns Church Boulevard

Section 3.7 Crash Analysis

An analysis of existing crash data was conducted within the study area in order to identify existing safety concerns and potential countermeasures. VDOT provided crash data from the Highway Traffic Records Information System (HTRIS) for a three-year period between January 2008 and December 2010. Crash data were examined along Carrollton Boulevard, Brewer's Neck Boulevard, Benns Church Boulevard, Battery Park Road, Nike Park Road, Reynolds Drive, and Smith's Neck Road.

Review of the available crash data indicated that a total of 268 crashes occurred on the above mentioned roadways within the study area during the three year study period as summarized in **Table 3-30** below.

Table 3-31: Crash Summary By Roadway

Roadway	No. of Crashes over 3 Years	Crash Rate (Per 100 Million Vehicle-miles)
Brewer's Neck Boulevard	57	66.0
Benns Church Boulevard	37	66.3
Carrollton Boulevard	73	109.7
Battery Park Road	9	62.0
Nike Park Road	43	155.8
Reynolds Drive	17	676.8
Smith's Neck Road	32	451.0
Titus Creek Road	13	209.4
Total	**268**	**102.9**

Note: statewide average crash rate for similar facilities which is approximately 125

When examining the overall crash rate, it can be observed that the study area crash rate of 102.9 is lower than the statewide average crash rate for similar facilities which is approximately 125. It should be noted, however, that a handful of roadways within the study area experience much higher crash rates, especially Reynolds Drive and Smith's Neck Road. The study area segments of both of these high crash rate roadways are two-lane, undivided typical sections with substantial curvature and essentially no shoulder area on either side of the roadway. Several portions of these roadways also feature relatively deep drainage ditches and trees within close proximity to the edge of the traveled way. This would essentially suggest that the poor geometric conditions of roadways potentially combined with speed and/or driver error are leading contributors to the high crash rates documented along these secondary facilities. These factors all combine to contribute to the relatively high crash rate along these two segments. The 268 crashes were broken down by severity and type as listed in **Figure 3-8** through **Figure 3-15**.

Figure 3-8: Distribution of Crashes by Severity – Major Corridors

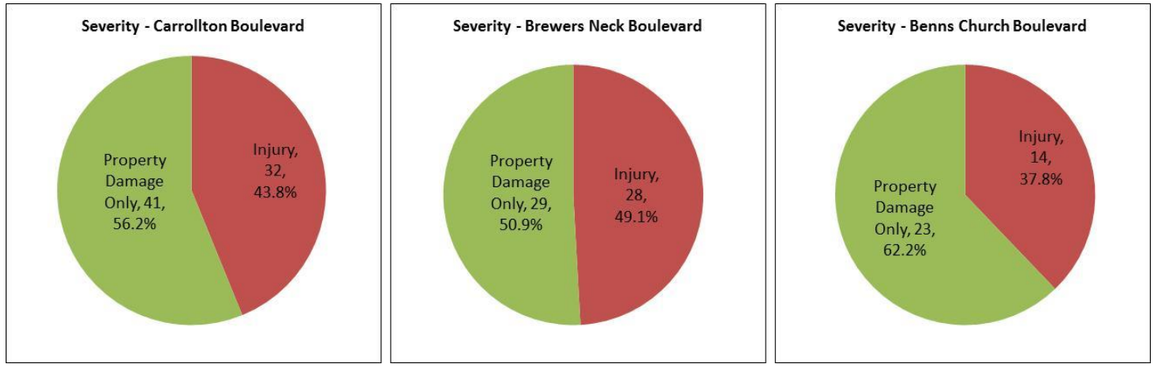
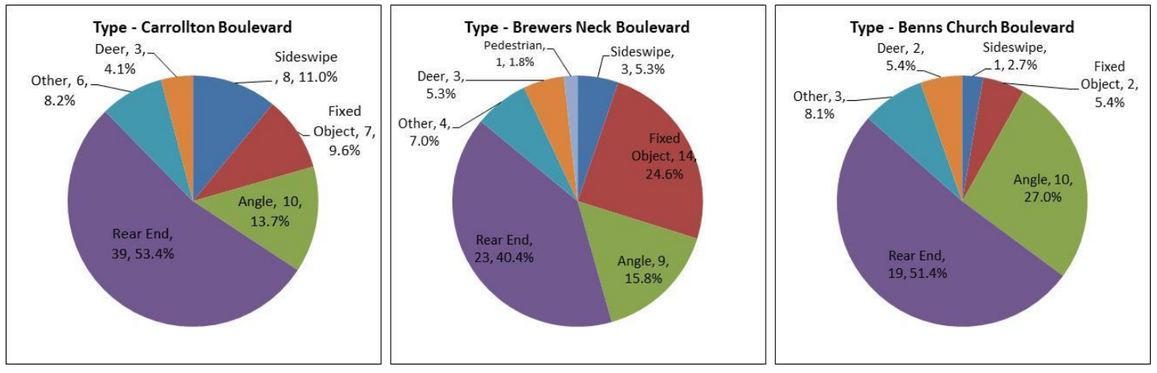


Figure 3-9: Distribution of Crashes by Type – Major Corridors



As shown in **Figure 3-8** and **Figure 3-9**, between a half and two thirds of all crashes on major roadways resulted in property damage only. Property damage crashes are only reported if the damage is equal to or more than $1,000; therefore, it should be noted that crashes with property damage resulting in less than $1,000 of damage may not be captured. There are no crashes in the three year period that resulted in a fatality along major roadways. With respect to type of crash, rear end crashes accounted for nearly half of all crashes during the study period. Fixed object, angle, and sideswipe crashes accounted for nearly a third of all crashes.

The number of crashes varied little from year to year, with 59 during the first year, 65 during the second year, and 43 during the third year. The weekly distribution of crashes was fairly evenly distributed throughout the week as shown in **Figure 3-10**. Over three fourths of all crashes occurred during clear weather conditions. A detailed distribution of crashes by weather conditions is provided in **Figure 3-11**.

Figure 3-10: Distribution of Crashes by Day of Week – Major Corridors

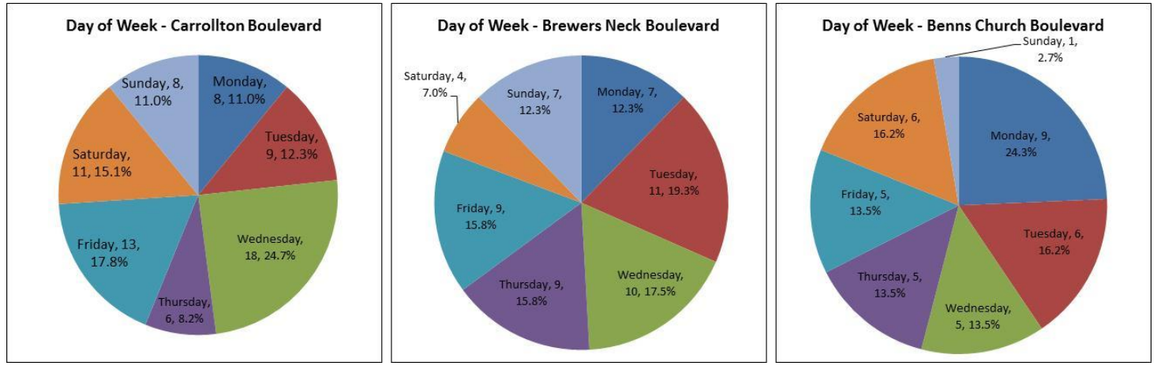
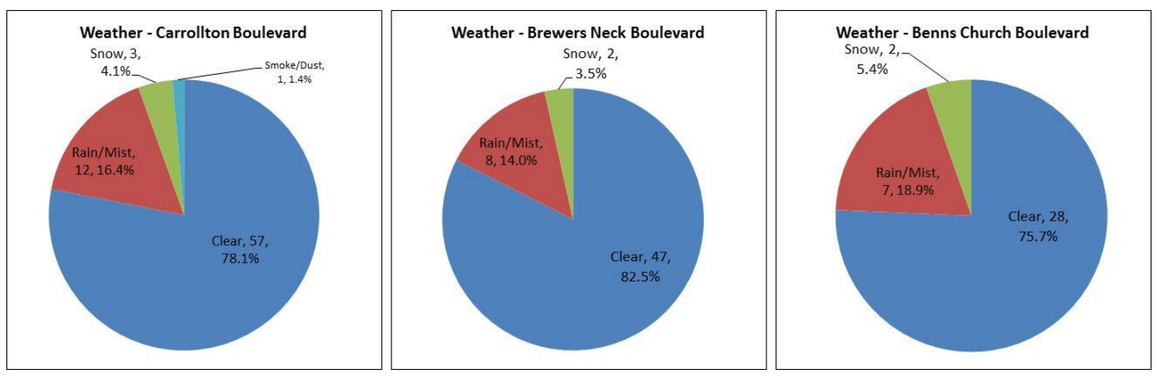


Figure 3-11: Distribution of Crashes by Weather Conditions – Major Corridors



Overall the primary roadways within corridor study area have crash rates near or well below the statewide average, particularly Battery Park Road, Brewer's Neck Boulevard, Benns Church Boulevard, and Carrollton Boulevard.



Skid Marks on westbound Brewer's Neck Boulevard



Skid Marks on westbound Brewer's Neck Boulevard

In addition to the major corridors, existing traffic counts indicate a cut through route via Nike Park Road and either Titus Creek Drive or Reynolds Drive to Smith's Neck Road. Because of the relatively high traffic volumes and the potential cut through routes, crash analyses were also conducted for the Battery Park Road, Nike Park Road, Reynolds Drive, Titus Creek Drive, and Smith's Neck Road corridors. **Figure 3-12** illustrates the distribution of crashes by severity along these cut through routes while **Figure 3-13** shows the distribution of crashes by type. Between January 1, 2008 and December 31, 2010, there were 9 reported crashes along Battery Park Road, 42 reported crashes along Nike Park Road, 17 reported crashes along Reynolds Drive between Nike Park Road and Smith's Neck Road, 13 reported crashes along Titus Creek Drive and 31 reported crashes along Smith's Neck Road between Carrollton Boulevard (Route 17) and Titus Creek Drive.

Figure 3-12: Distribution of Crashes by Severity – Cut Through Routes

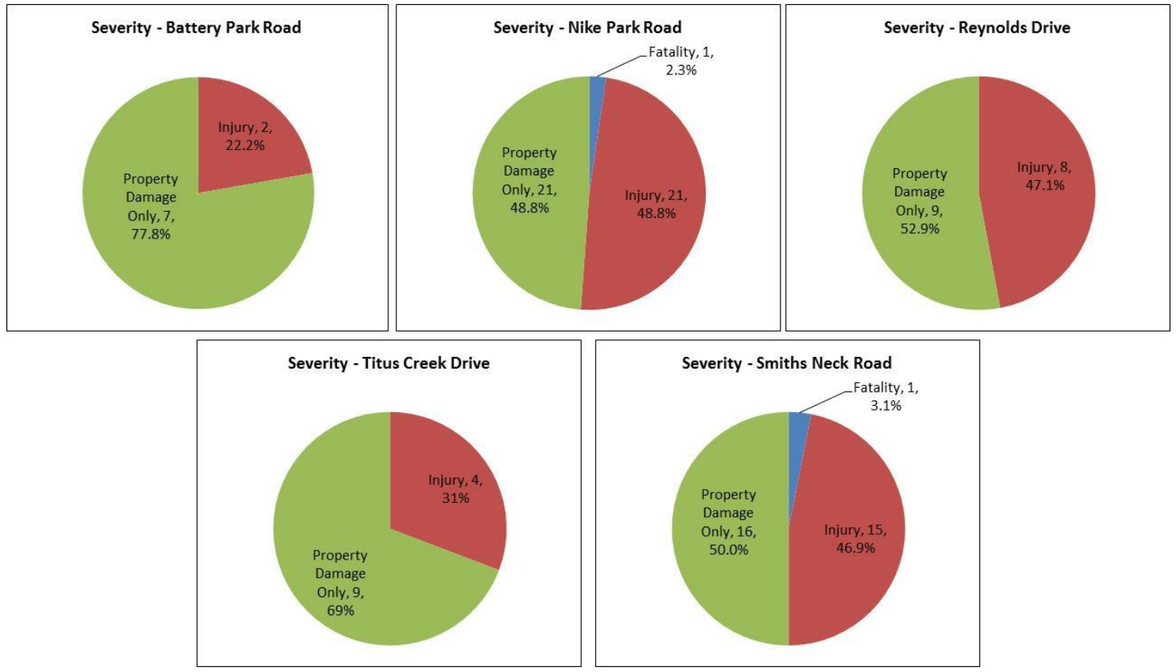


Figure 3-13: Distribution of Crashes by Type – Cut Through Routes

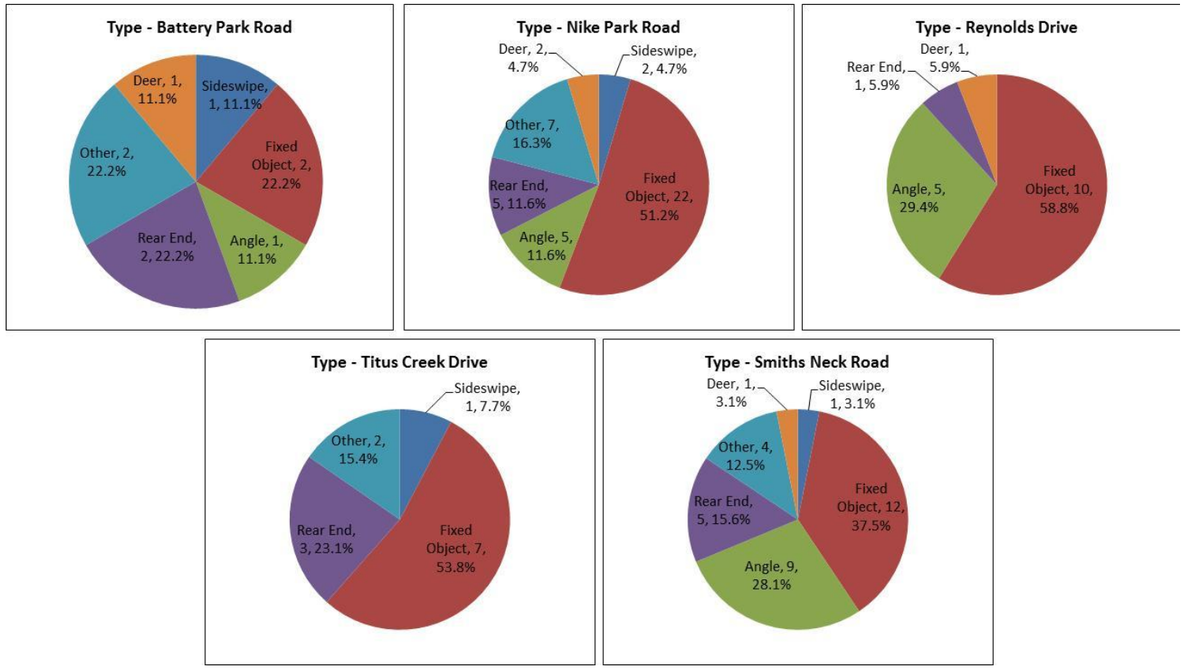
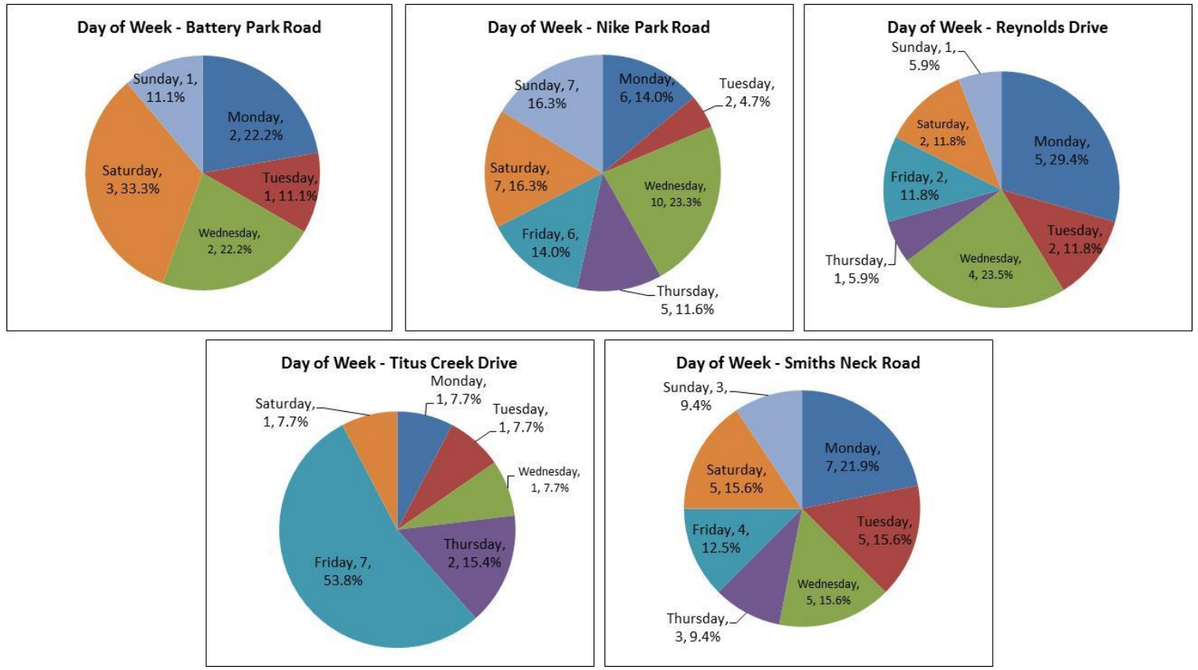


Figure 3-14: Distribution of Crashes by Day of Week – Cut Through Routes

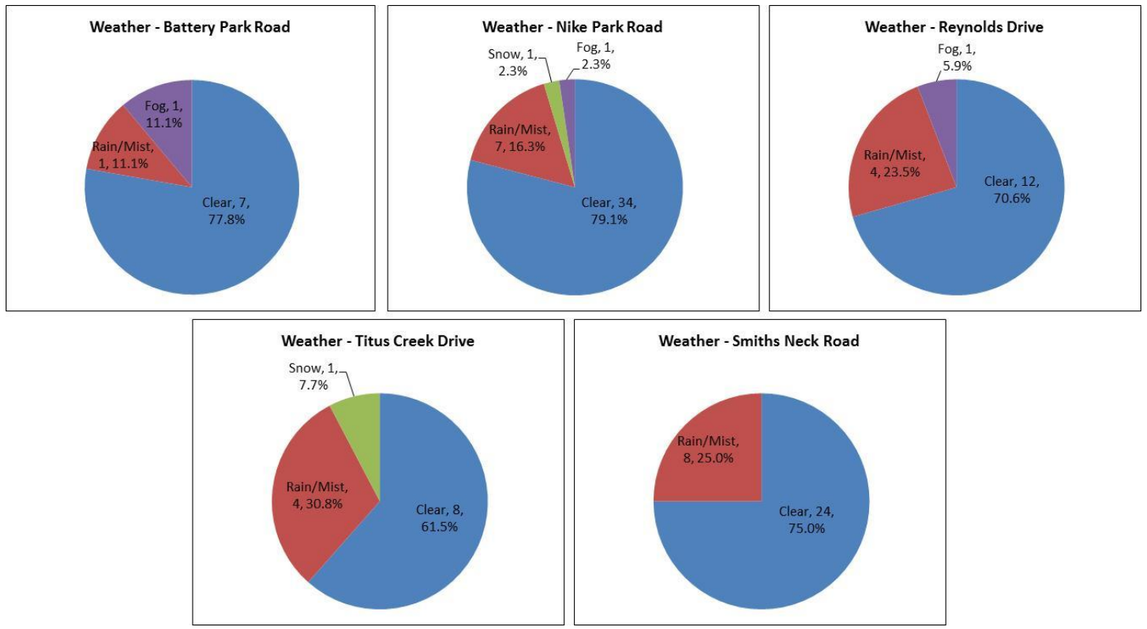


As can be seen from the above charts, of the 114 crashes analyzed for the cut through routes, roughly 45% had injuries or at least one fatality. The majority of crashes involved a fixed object off of the roadway. Additional information provided in the crash reports indicate several crashes were caused by vehicles leaving the roadway. Of the two crashes resulting in fatalities, the crash along Smith's Neck Road was a head-on collision while the fatal crash along Nike Park Road was caused by a fixed object (off the road) collision.

As noted previously, Smith's Neck Road and Reynolds Drive both experience relatively high crash rates. The cause of many of these crashes can be attributed to the relatively narrow travel way, sharp curves, and lack of significant shoulder area for errant vehicles to recover and return to the roadway which results in vehicles striking a fixed object off the roadway. Recommendations to help mitigate these types of crashes along Smith's Neck Road and Reynolds Drive will be included with recommended future capacity improvements.

Figure 3-14 illustrates the distribution of crashes by day of week and **Figure 3-15** shows the distribution of crashes by weather.

Figure 3-15: Distribution of Crashes by Weather – Cut Through Routes



As **Figure 3-14** indicates, there is no distinguishable pattern for a particular day of the week crashes occur on the cut through routes. **Figure 3-15** shows that the majority of crashes occur during clear conditions with no adverse weather effects.

Section 3.8 Bicycle, Pedestrian, and Transit Activity

The Brewer's Neck Boulevard and Carrollton Boulevard corridors currently have very limited bicycle and pedestrian facilities. There are no dedicated bicycle lanes in the roadway and only limited segments of sidewalks/multi-use paths along the corridors. None of the unsignalized and signalized intersections along the corridors have marked crosswalks or additional pedestrian features such as pedestrian signage, pedestrian signal heads, and/or crosswalk push buttons.

Bicycle and pedestrian safety and awareness is an issue within the project area due to the higher travel speeds observed throughout the corridor as well as the general lack of pavement markings, signage, and accommodations. Recommendations considering bicycle and pedestrian accommodation improvements will potentially be made where deemed necessary or applicable. Bicycle and pedestrian recommendations should be consistent with the *Isle of Wight County Pedestrian and Bicycle Facilities Master Plan* updated in August 2009.

There are currently no active transit operations/Hampton Roads Transit (HRT) services within the study area. The County in coordination with HRT should consider conducting a survey of County residents to assess potential ridership demand if public transportation services were offered. To address congestion along Carrollton Boulevard and/or the James River Bridge in the near term, Isle of Wight County in cooperation with VDOT should also consider the construction and designation of a Park-N-Ride lot along the Carrollton Boulevard corridor.



Pedestrian Facilities along Brewer's Neck Boulevard



Unmaintained Pedestrian Facilities along Carrollton Boulevard



Pedestrian Facilities along Carrollton Boulevard



Pedestrian Facilities along Carrollton Boulevard

Chapter 4.0 Environmental Screening

Kimley-Horn conducted a preliminary environmental screening of the study corridor in order to provide a cursory assessment of potential environmental constraints that may be relevant to the project. The specific portions of the project area reviewed in the field are shown on **Figure 1** in **Appendix B** and include:

- Carrollton Boulevard (U.S. Route 17) starting at Brewer's Neck Boulevard (U.S. Route 258) to the James River Bridge
- Brewer's Neck Boulevard from Carrollton Boulevard to Benns Church Boulevard (U.S. Route 258)
- Benns Church Boulevard from Brewer's Neck Boulevard to South Church Street (U.S. Route 258)
- South Church Street from Benns Church Boulevard to Battery Park Road (State Route 704)
- Battery Park Road from South Church Street to Nike Park Road (State Route 669)
- Nike Park Road from Battery Park Road to Reynolds Drive (State Route 665)
- Titus Creek Drive from Nike Park Road to Smith's Neck Road (State Route 668)
- Reynolds Drive from Nike Park Road to Smith's Neck Road (State Route 669)
- Smith's Neck Road from Titus Creek Drive to Carrollton Boulevard

The screening consisted of a desktop review of data obtained from various standard environmental data sources related to wetlands and other surface waters, threatened and endangered species, cultural and historic resources, and hazardous materials. Staff from Kimley-Horn then visually inspected the project area to review local topographic and hydrographic conditions and review the results of the hazardous materials and cultural resources databases against actual field conditions.

The data sources consulted to perform the review were:

- U.S. Fish and Wildlife Service National Wetlands Inventory
- U.S. Environmental Protection Agency Facility Registration System
- Federal Emergency Management Agency – Flood Insurance Rate Maps
- Virginia Department of Historic Resources – Data Sharing System
- Virginia Department of Game and Inland Fisheries – Fish and Wildlife Information System
- Virginia Department of Conservation and Recreation – Natural Heritage Explorer
- Army Corps of Engineers – Regulatory In-Lieu Fee Bank Information Tracking System

Section 4.1 Wetlands and Surface Waters

Surface waters within the study area are shown on **Figure 1** in **Appendix B** and include Titus Creek, a tributary to Jones Creek as well as Jones Creek, a tributary to the Pagan River which flows into the James River. Nike Park Road crosses Jones Creek as it flows northeast to its confluence with the Pagan River. The Nike Park Road crossing of Jones Creek is via an elevated bridge. Improvements along Nike Park Road could potentially impact Jones Creek and any associated wetlands within its floodplain. Carrollton Boulevard at the James River Bridge crosses an area called Ragged Island which includes Kings Creek, Coopers Creek and their associated wetlands.

Through research in the U.S. Fish and Wildlife Service National Wetlands Inventory, patches of wetlands were identified throughout the study area. When nearing the James River Bridge on Carrollton Boulevard, estuarine and marine deep water and wetland habitats can be found within an immediate vicinity of the road. These areas are associated with Kings Creek and Cooper Creek, tributaries of the James River. Reynolds Drive borders an area of freshwater forested/shrub wetlands. Along Smith's Neck Road, the study area borders areas of freshwater emergent wetlands, and freshwater forested/shrub wetlands.

Titus Creek Drive comes in contact with estuarine and marine deep water and wetland areas that are associated with Titus Creek, a tributary of Jones Creek. Nike Park Road has freshwater forested/shrub wetlands at numerous locations throughout the study area. Nike Park Road also crosses Jones Creek and its associated estuarine and marine deep water and wetland habitats. Brewer's Neck Boulevard has many areas of freshwater forested/shrub wetlands along the entire length of the study area. A map of these areas can be found as **Figure 1** in **Appendix B**.

A full wetland delineation with U.S. Army Corps of Engineers (USACE) confirmation will be necessary to determine the extent of potential impacts from any enhancements to roadways within the study area. Permits from the USACE, Virginia Department of Environmental Quality and possibly the Virginia Marine Resources Commission would be required for the roadway improvements depending upon the final selected design, quantity of impacts, and contributing drainage area upstream of the impact location.

Wetland impacts associated with roadway construction would likely require mitigation in the form of purchase of mitigation bank credits from a commercial bank serving the area (Hydrologic Unit Code (HUC) 02080206). The U.S. Army Corps of Engineers' online Regulatory and In-Lieu Fee and Bank Information Tracking System (RIBITS) (Accessed May 14, 2012 at: http://geo.usace.army.mil/ribits/index.html) shows that there are three wetland mitigation banks in HUC 02080206 with available wetland credits for purchase: East Henrico, Scandia, and Chickahominy. The East Henrico mitigation bank also offers stream credits for purchase by the linear foot to offset any impacts made to streams.

Section 4.2 Floodplain

Locations where the project corridor crosses the 100-year floodplain were determined by reviewing Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel numbers 51093C0155D, and 51093C00160D dated September 4, 2002 (included in **Appendix B**). FIRM mapping shows that the project elements cross the 100-year floodplain in five areas:

- Nike Park Road crossing Jones Creek (Zone AE; base flood elevation (BFE) of 8.5 feet above mean sea level);
- A portion of Brewer's Neck Boulevard between Norsworthy Slant Drive and Campbells Church Drive (Zone AE; BFE of 8.5 feet);
- Carrollton Boulevard between Brewer's Neck Boulevard and Smith Neck Road(Zone AE; BFE of 8.5 feet);
- Carrollton Boulevard East towards the James River (Zone AE; BFE between 9 and 10 feet; Zone VE; BFE of 12 feet)
- Titus Creek Road crossing Titus Creek (Zone AE; BFE 8.5 feet)

Flood zone AE denotes the 100-year flood plain where base flood elevations have been established or areas with a 1 percent annual chance of water levels exceeding the base flood elevation. Zone VE denotes the areas where base flood elevations have been established or areas with a 1 percent annual chance of water levels exceeding the base flood elevation with additional hazards due to storm surges. Zone X denotes areas with an elevation higher than a 0.2 percent chance of annual flooding.

It is the professional opinion of KHA that potential enhancements to the roads in the study area would not be greatly impacted by the flood plain. Special considerations should be made while planning any impacts to the areas crossing the 100-year flood plain as listed above to reduce adverse effects by the 1 percent annual chance of waters exceeding the base flood elevation.

Section 4.3 Threatened and Endangered Species

The Virginia Department of Game and Inland Fisheries (VDGIF) Virginia Fish and Wildlife Information Service (VAFWIS) database was consulted on May 4, 2012 for the presence of federal and state threatened or endangered species within a two-mile radius of the project area. Although several databases are represented in the VAFWIS, the Collections database is the only one of interest due to the requirement for coordination with federal and/or state agencies when it identifies a species of legally protected status. Other databases in the VAFWIS do not require coordination with federal or state agencies and are, therefore, of no concern to this investigation.

The Collections database found only two threatened or endangered species of concern within the researched area. The bald eagle (Haliaeetus leucocephalus) is a federal species of concern as well as a state threatened animal. A bald eagle's nest was observed twice in March and April, 2011 within a quarter mile of Nike Park Road (ObsIDs 20112822 and 20112821). It is in the opinion of KHA that improvements to the roads in the study area would not impact the bald eagles in the area as long as the regulations outlined by VDGIF in "Bald Eagle Protection Guidelines for Virginia" are abided by. These guidelines state that construction activities must be at least 750 feet from the active nest at all times. Occupied nests require up to a 1,320 foot buffer zone. The specific distance is dependent on the eagles' tolerance for human activity. The Atlantic sturgeon (Acipenser oxyrinchus) is federally endangered, and was observed twice in March 1997 (ObsIDs 62961 and62960). These sightings were over a half mile away from the study area but considering the sturgeons are anadromous, meaning they spend the first period of their lives in fresh water, then move to salt water, and return to fresh water to spawn, any impacts to fresh and brackish water habitats such as Jones Creek could impact this species. Special considerations would need to be made when planning improvements to Nike Park Road over Jones Creek as well as Carrollton Boulevard at the mouth of the James River Bridge. Coordination with the National Marine Fisheries Service (NMFS) is recommended if changes to the Jones Creek Bridge are planned. Additional information on locations and observation information can be found in **Appendix B**.

The Virginia Department of Conservation and Recreation (VDCR) Natural Heritage Explorer was reviewed on May 3, 2012 for the presence of protected natural areas, conservation lands or known rare plant communities within the project area. In their report dated June 1, 2012, VDCR mentions the Bartlett Conservation site for the bald eagle. This conservation site has been given a ranking of B5, indicating a site of significant conservation importance. Details on this site can be found in **Appendix B**. As stated above, it is in KHA's professional opinion that improvements to the roads in the study area will not have a negative impact to the bald eagles' nest as long as the necessary precautions, as outlined in the VDGIF document "Bald Eagle Protection Guidelines for Virginia," are taken.

Section 4.4 Cultural and Historic Resources

The Virginia Department of Historic Resources (VDHR) Data Sharing System was searched on April 12, 2012. The archaeological and architectural sites that were found within the study area are detailed in **Table 4-1.**

It is Kimley-Horn's opinion that impacts to these sites can be avoided by careful planning of improvements to the roads in the study area and prior to acquisition of right-of-way from the parcels, a determination of the eligibility of these properties being included on the national Register of Historic Places should be undertaken. Potential impacts to listed or eligible resources should be coordinated with the State Historic Preservation Office (SHPO) and Advisory Council on Historic Preservation (ACHP). The James River Bridge is a continuation of Carrollton Boulevard and any impacts to it would need to be approved by DHR. The Archeological sites found near the study area are not close enough to the roads to be impacted by road improvements. Additional information on these archaeological and architectural sites is located in **Appendix B** and reflected graphically on **Figure 1** in the same section of the Appendices.

Table 4-1: VDHR Identified Sites

VDH ID #	Site Description	Status
046-0024	St. Luke's Church and Grounds, ca. 1632, at 14477 Benns Church Boulevard	Recommended Eligible
44IW0271	St. Luke's Church and Grounds: Euro-American from 4th Quarter 17th Century	
046-5002	James River Bridge	Not Evaluated
046-5052	The ARADCOM NDA Nike-Ajax Missile Launch Site located off of Nike Park Road and was the site of ground to air missile construction and testing during the Cold War Era	Recommended Eligible
046-5246	Benns Church, at 17571 Benns Church Boulevard, ca. 1924	

Table 4-1: VDHR Identified Sites (continued)

VDH ID #	Site Description	Status
300-5029	House ca. 1910 on Battery Park Road	Not Evaluated
300-5027	House ca. 1910 on Battery Park Road	Not Evaluated
300-5028	Moonfield School ca. 1910	Not Evaluated
300-5030	Smithfield Livestock Market ca. 1930	Not Evaluated
300-5020 – 300-5024	Houses ca. 1930 to 1940 on S. Church Street	Not Evaluated
046-5282	House ca. 1970 at 12545 Vellines Lane	Not Evaluated
300-0112	House ca. 1830 on S. Church Street	Not Evaluated
300-5025	Tastee Treetz, ca. 1950, at the corner of S. Church Street and Mercer Street	Not Evaluated
44IW0216	EH-1: a prehistoric, Native American open-air site	
44IW0005/0007	a prehistoric, Native American open-air site	
44IW0230	EH-20: an indeterminate, 20th century open-air site	
44IW0225	EH-15: an indeterminate, 18th century, 4th Quarter, open-air site EH-15: an indeterminate, 19th century, 1st Half, open-air site	
44IW0132	Indeterminate, 19th century open air site along S. Church Street	
44IW0190	Euro-American, 18th Century, 4th Quarter, open air site	

Section 4.5 Hazardous Materials

The United States Environmental Protection Agency (EPA) Facility Registry System (FRS) database was accessed on May 14, 2012 in order to obtain information related to hazardous material generation within the project corridor. The FRS identifies facilities, sites or places subject to environmental regulations or of environmental interest and includes records from the following programs: Toxic Release Inventory submitters; Resource Conservation and Recovery Act Information (RCRAInfo); Risk Management Plans; Permit Compliance System; Biennial Reporting System; Aerometric Information Retrieval System (AIRS); and Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS).

A total of five sites were identified by the FRS within the project corridor, including one active conditionally exempt small quantity generator site, two small quantity generators, one potentially active minor air emissions site, and one site that discharges wastewater into a river (**Table 4-2**). Based on the information reviewed and visual inspection of the sites during field investigations, KHA does not feel that these sites have released hazardous substances that would be encountered during construction within the project area. **Appendix B** contains a reference map of the sites (**Figure 1**) as well as the EPA FRS results.

Table 4-2: Hazardous Materials Generators

Map Label	EPA FRS Registry ID	Facility Name	Facility Address	Environmental Interest Type	Compliance Status
FRS-1	110006454728	Knox Automotive Center Inc.	21301 Brewer's Neck Blvd Carrollton, VA 23314	SQG	In Compliance
FRS-2	110039135691	Southern Food Store #7	1229 Benns Church Blvd Smithfield, VA 23430	POTENTIAL UNCONTROLLED EMISSION	In Compliance
FRS-3	110010912977	Capehart Homes	Nike Park Rd Carrollton, VA 23314	NPDES (NON-MAJOR)	In Compliance
FRS-4	110006458528	Charlie's Body Shop Inc.	213 Battery Park Rd Smithfield, VA 23430	SQG (ACTIVE)	In Compliance
FRS-5	110006454979	Keen Auto Machine Shop Inc.	1802 S Church St Smithfield, VA 23430	CESQG (ACTIVE)	In Compliance

During site reconnaissance, other sites of interest were identified in the study area. It is in the professional opinion of Kimley-Horn that these sites will not pose a problem to improvements in the study area. Details on these sites can be found in **Table 4-3**. These sites are also identified on **Figure 1** in **Appendix B**.

Table 4-3: Sites of Interest

Facility Number	Facility Name	Facility Address	Environmental Interest
1	Joe's Auto Parts	22251 Brewer's Neck Boulevard Carrollton, VA 23314	Automobile Repair and Salvage
2	Carrollton Metals Recycling	22097 Brewer's Neck Boulevard Carrollton, VA 23314	Metal Recycling
3	US 258 Auto Parts	22073 Brewer's Neck Boulevard Carrollton, VA 23314	Automobile Salvage
4	Ken's Auto Parts	21401 Brewer's Neck Boulevard Carrollton, VA 23314	Automobile Retail
5	BP	19417 Brewer's Neck Boulevard Carrollton, VA 23314	Gas Station
6	Brown Brothers Inc.	101 Moore Avenue Smithfield, VA 23430	Gas Station
7	Colonial Rentals	219 Battery Park Road Smithfield, VA 23430	Tanks and Scrap Material

Section 4.6 Summary

A delineation of wetlands and surface waters with U.S. Army Corps of Engineers confirmation within the limits of the study area corridors is recommended to verify the presence of wetlands and the accuracy of the limits of surface waters observed during the field inspection of the project area. Coordination with the VDHR and SHPO is also recommended prior to the submission of a Joint Permit Application to identify concerns regarding potential impacts to archeological or architectural resources associated with the project. An evaluation of Jones Creek for the presence of the Atlantic Sturgeon and confirmation of the active bald eagle nest off Nike Park Road may be requested by the VDGIF. Whenever possible, measures should be taken to avoid and minimize impacts to wetlands and cultural resource sites to the maximum extent practicable in order to facilitate the acquisition of environmental permits and minimize mitigation costs.

In addition, a Corridor Hazardous Materials Reconnaissance Survey is recommended to identify known or suspected areas of subsurface contamination within or immediately adjacent to the proposed limits of construction which may be encountered by the contractor and would require special handling or disposal of impacted soil or groundwater during the construction phase. Based on the results of the environmental screening, no critical flaws related to environmental considerations have been identified for the study.

Chapter 5.0 Future Conditions

In order to determine 2034 horizon year traffic volumes within the study area, numerous factors were taken into consideration. Anticipated future development within the study area was established through conversations with Isle of Wight County Planning staff and VDOT. For purposes of this study, existing traffic patterns were assumed to remain constant through 2034 if no improvements were made to the roadway network; however, with the improvements recommended as a part of this study it is anticipated that travel patterns would change as facilities offer improved operational conditions through additional capacity or alternative routes enhance the connectivity of surrounding area roadway network. Based on planned development future traffic volumes are expected to increase driving the need for roadway network improvements. The more direct factors that influenced the future volumes are discussed in detail in the following sections.

Section 5.1 Future Traffic Volumes

To determine 2034 horizon year traffic volumes, annual background growth rates were first established. Based on both historical data and projected future volumes from the Statewide Planning System (SPS) provided by VDOT, annual growth rates were determined for the study corridors that would be used to project future mainline traffic volumes.

In order to project future traffic volumes for the surface street network, background growth rates were applied to 2012 Existing volumes. VDOT provided growth rates for local streets derived from data within the Statewide Planning System. **Table 5-1: Surface Street Growth Rates** summarizes the growth rates used to develop future traffic projections.

Table 5-1: Surface Street Growth Rates

Route	Segment	Annual Growth Rate	
Benns Church Boulevard (Route 10/32)		All	1.50%
Brewer's Neck Boulevard (Route 32)		All	1.00%
Carrollton Boulevard (US Route 17)		Whippingham Parkway/Harbor Point Lane to Brewer's Neck Boulevard	1.50%
Carrollton Boulevard (US Route 17)		Brewer's Neck Boulevard to Omera Drive/Ashby Way	1.25%

The growth rates shown in **Table 5-1** were applied to only the mainline volumes. For those streets within the study area but not listed in **Table 5-1** above, a growth rate of 0.5% per year was applied to account for general background growth. Additionally, after growing 2012 Existing volumes, traffic was redistributed to/from Brewer's Neck Boulevard to Benn's Church Boulevard to reflect the impact of a proposed connector road. The proposed connector road location is part of the Brewer's Neck Extension project and provides an additional connection between Brewer's Neck Boulevard and Benn's Church Boulevard.

Section 5.2 Planned Development Sites

In addition to natural background growth, approved developments were also included to comprehensively project future traffic volumes. The following developments were added to the background growth to develop the 2034 Future volumes:

- St. Luke's Village
- Frank Property
- Riverside Medical Center
- The Crossings
- Red Oaks
- Bridge Point Commons
- Benn's Grant
- Norsworthy

Figure 5-1: Approved Developments

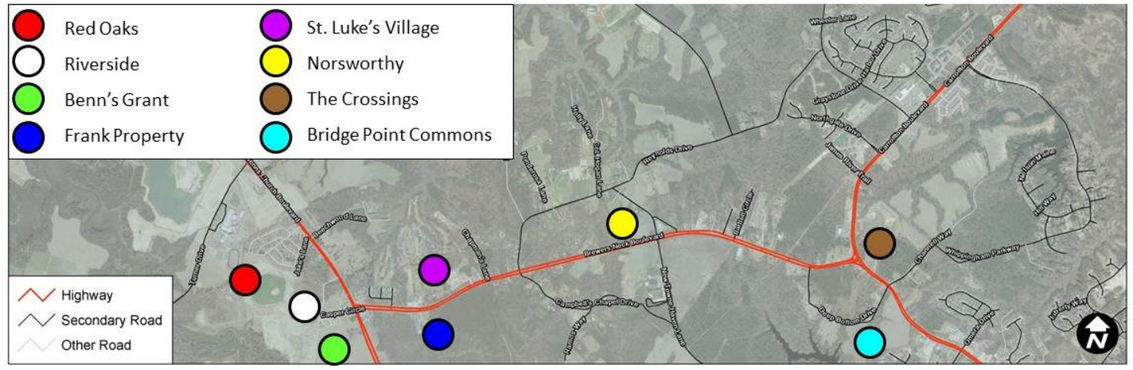


Figure 5-1 above shows the approximate locations of the parcels identified for future anticipated developments included with this study. Using the approved Traffic Impact Analysis (TIA) reports and working with VDOT and Isle of Wight County staff, anticipated trip distributions were determined for each of the developments. Detailed figures depicting the distribution percentages used for assigning site trips to the roadway network as well as the anticipated site trips for each specific development can be found in the **Appendix C**. By combining background growth with the anticipated development trips, the final 2034 traffic volumes were developed. These final 2034 traffic volumes on the unimproved study area network and operational conditions are summarized in **Figure 5-2A and Figure 5-2B**. The unimproved network reflects the existing state of the intersection geometry and/or planned or proffered improvements.

Section 5.3 Planned Roadway Improvements

After determining anticipated future traffic volumes and analyzing unimproved network conditions, planned roadway improvements were identified in order to more accurately analyze future conditions. Based on conversations with VDOT and Isle of Wight County, it was determined that the only planned roadway improvements located within the study area, are the proposed modifications/improvements to the Brewer's Neck Boulevard Extended intersection, the Brewer's Neck Boulevard/Queen Anne's Court/Brewer's Neck Boulevard Extended intersection, the Benn's Church Boulevard/Brewer's Neck Boulevard intersection. These intersections are anticipated as a part of the Benn's Grant development. Additionally as a part of recent land development rezoning cases and expected constructed planned improvements are also anticipated at the intersections of Brewer's Neck Boulevard and Carrollton Boulevard and Brewer's Neck Boulevard and Sentara Way. Since there are no significant changes to other study area intersections, initial future traffic conditions were analyzed using existing geometry to determine the 2034 Unimproved operational conditions. It should be noted that traffic signal timings were optimized for future volumes in order to more accurately model future conditions.

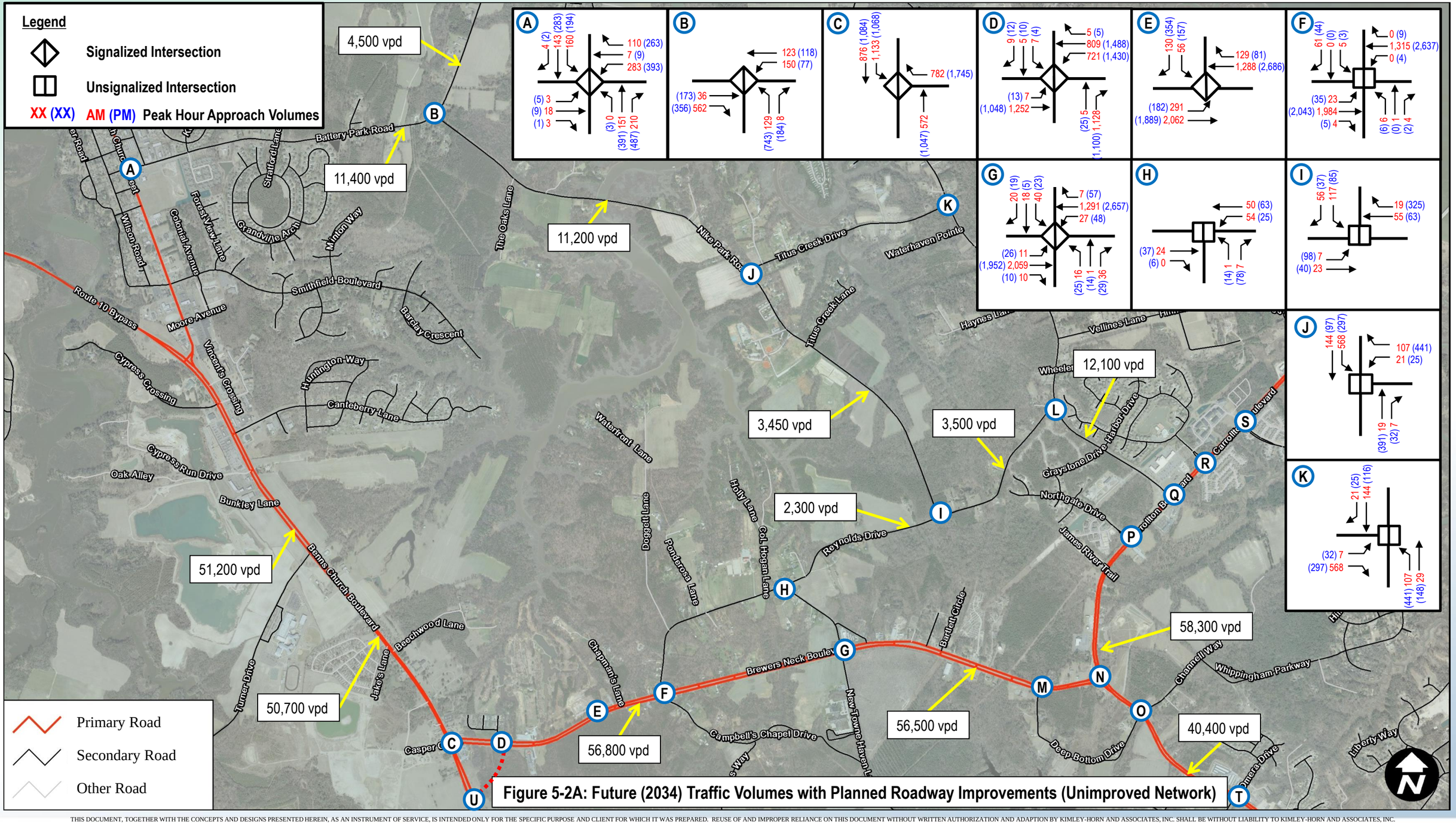


Figure 5-2A: Future (2034) Traffic Volumes with Planned Roadway Improvements (Unimproved Network)

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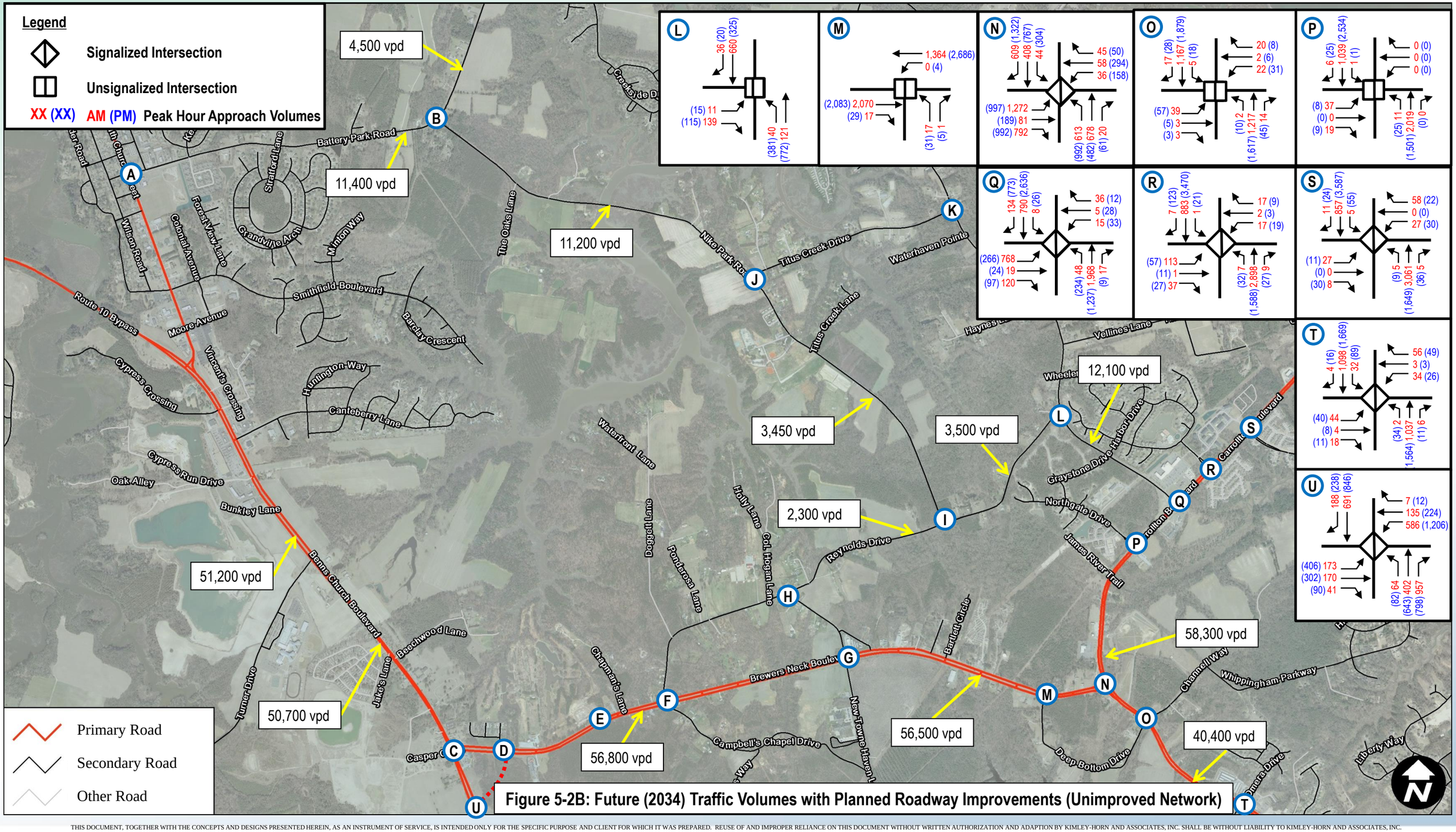


Figure 5-2B: Future (2034) Traffic Volumes with Planned Roadway Improvements (Unimproved Network)

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Section 5.4 Recommended Future Roadway Improvements

Based upon the results of both 2012 Existing conditions and 2034 Unimproved conditions analyses, roadway improvements are required to mitigate anticipated congestion which will occur as traffic volumes increase. The following intersection descriptions reflect the necessary lane configurations for the corridor to operate at acceptable levels of service under future conditions. The following improvements require modifications to traffic signal operations, lane striping, turn lanes, etc. Detailed descriptions of the modifications required to fully accommodate the recommended improvements are provided in **Chapter 7.0 Corridor Study Recommendations**. With the proposed intersection and corridor capacity improvements there are anticipated changes in travel patterns on the study area network. **Figure 5-3A** and **Figure 5-3B** reflect the future 2034 traffic volumes with the planned and proposed roadway improvements in place. It is noted that planned (i.e., planned configuration) roadway improvements reflect those that have been proffered as a part of an approved development or are currently listed in the VDOT six year improvement program (SYIP). Whereas proposed (i.e., recommended configuration) roadway improvements are those corridor or roadway infrastructure enhancements that have been identified as necessary based on existing operational deficiencies or future operational deficiencies stemming from anticipated future traffic volume projections.

5.4.1 Proffered Improvements

Several approved developments within the corridor study area have proffered intersection improvements to accommodate anticipated traffic demand. The construction or installation of these proffered improvements is contingent upon either the development going to construction or VDOT traffic volume thresholds and/or warrants being met before the improvement can be installed (e.g., traffic signal warrants being met).

Carrollton Boulevard/Northgate Drive

To support future traffic volumes, a traffic signal should be installed at this currently unsignalized intersection when warrants are met. Details regarding the modification to this intersection are discussed in further detail in **Chapter 7.0**.

Brewer's Neck Boulevard/Sentara Way

To support future traffic, a traffic signal should be installed at this currently unsignalized intersection as future development occurs and when warrants are met. Details regarding the modification to this intersection are discussed in further detail in **Chapter 7.0**.

Battery Park Road/Nike Park Road

To support existing and future traffic volume demand, a roundabout should be installed/constructed in conjunction with the planned development to the north of the existing intersection, and to replace/address the operational deficiencies associated with the existing traffic signal equipment and intersection configuration. Details regarding the replacement of traffic control at this intersection are discussed in further detail in **Chapter 7.0**.

5.4.2 Additional Major Roadway Improvements

Carrollton Boulevard/Nike Park Road Extension

To support future traffic volumes, enhance operational safety, and to maintain adequate level-of-service conditions it is proposed that Nike Park Road be extended from its current terminus with Reynolds Drive to the west, eastward approximately 1 mile creating a new intersection with Carrollton Boulevard. The initial phase of the extension would be a two-lane typical section with the option of going to an ultimate four-lane typical section at some point in the future. It is also anticipated that with this proposed extension of Nike Park Road that a traffic signal will be installed at the intersection with Carrollton Boulevard. Details regarding the proposed extension and associated intersection improvements are noted in the intersection diagrams reflected in this section, in **Section 5.5** Nike Park Road Extension, and **Chapter 7.0**.

Brewer's Neck Boulevard Widening

To support future traffic volumes, Brewer's Neck Boulevard should be widened to a 6-lane facility. Details regarding the preferred typical section for this corridor and the resulting intersection improvements are outlined in further detail in **Chapter 7.0**.

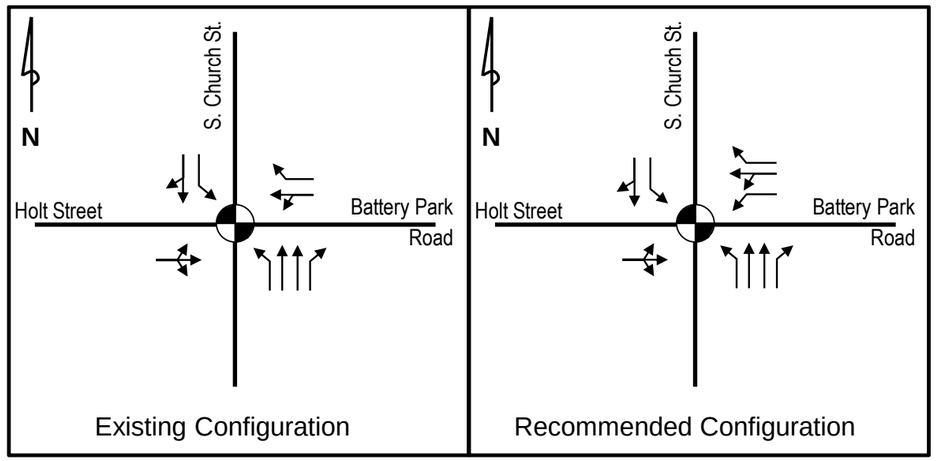
Carrollton Boulevard Widening

To support future traffic volumes, Carrollton Boulevard should be widened to a 6-lane facility. Details regarding the preferred typical section for this corridor and the resulting intersection improvements are outlined in further detail in **Chapter 7.0**.

S. Church Street at Battery Park Road (Intersection A)

To support future traffic volumes, this intersection should provide the following laneage:

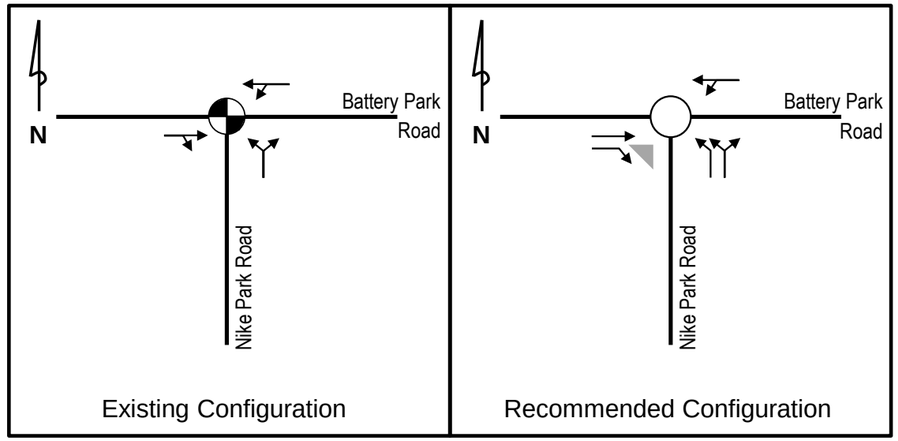
- S. Church Street (northbound) – one exclusive left-turn lane, two through lanes and one exclusive right-turn lane
- S. Church Street (southbound) – one exclusive left-turn lane and one shared through/right-turn lane
- Holt Street (eastbound) – one shared left/through/right-turn lane
- Battery Park Road (westbound) – one exclusive left-turn lane, one shared through/left-turn lane and one exclusive right-turn lane



Battery Park Road and Nike Park Road (Intersection B)

To support future traffic volumes, this intersection should provide the following traffic control improvement and laneage:

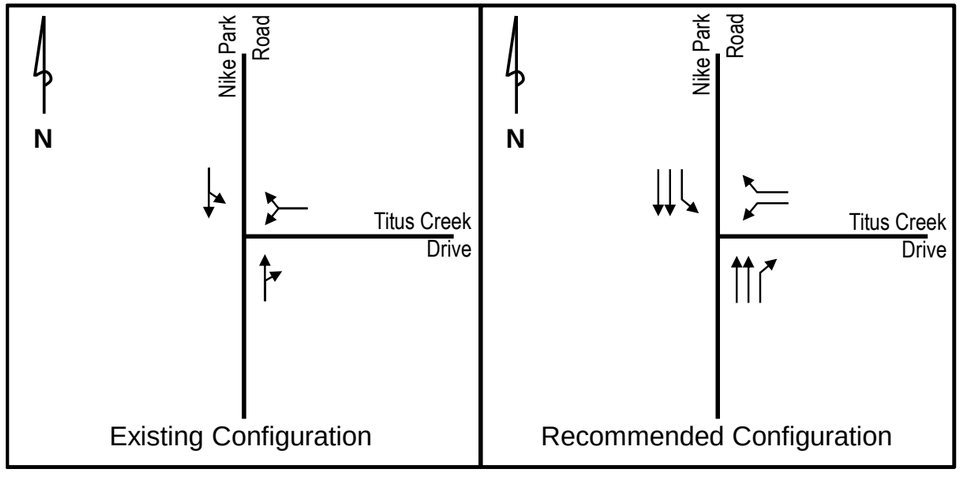
- Roundabout for traffic control
- Nike Park Road (northbound) – two approach lanes – one for left traffic and one for left/right traffic
- Battery Park Road (eastbound) – two approach lanes – one for through traffic and one free flow right slip-lane
- Battery Park Road (westbound) – one approach lane to accommodate through/left traffic



Nike Park Road and Titus Creek Drive (Intersection J)

To support future traffic volumes, this intersection should be improved to provide the following laneage:

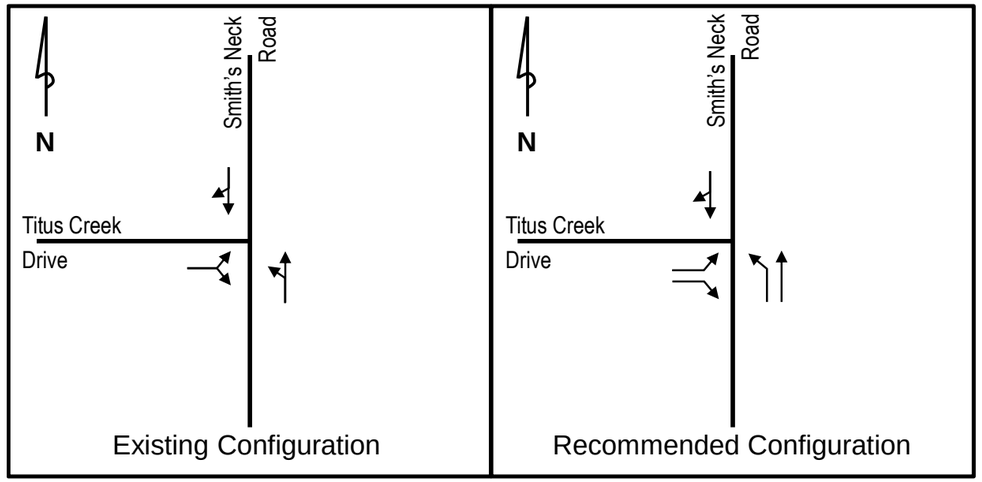
- Nike Park Road (northbound) – two through lanes and one exclusive right-turn lane
- Nike Park Road (southbound) – one exclusive left-turn lane and two through lanes
- Titus Creek Drive (westbound) – one exclusive left-turn lane and one exclusive right-turn lane



Smith's Neck Road and Titus Creek Drive (Intersection K)

To support future traffic volumes, this intersection should be improved to provide the following laneage:

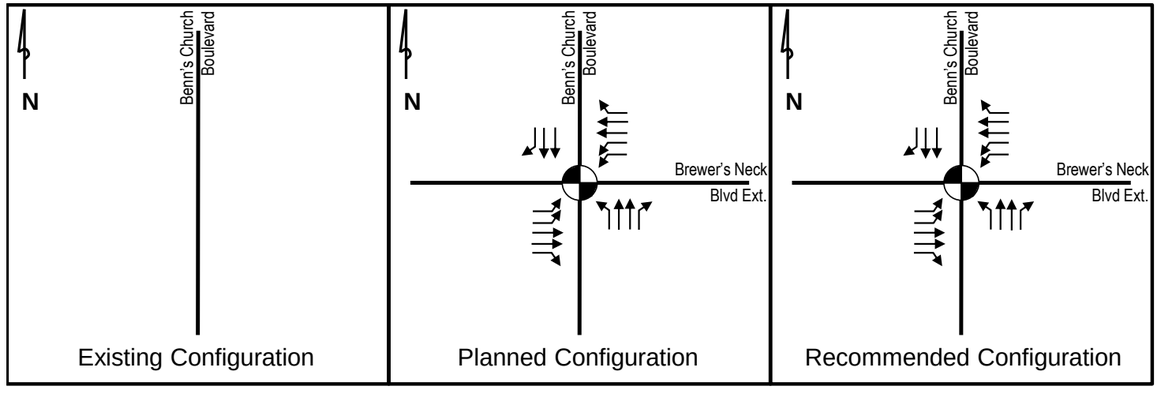
- Smith's Neck Road (northbound) – one exclusive left-turn lane and one through lane
- Smith's Neck Road (southbound) – one shared through/right-turn lane
- Titus Creek Drive (eastbound) – one exclusive left-turn lane and one exclusive right-turn lane



Benn's Church Boulevard and Brewer's Neck Boulevard Extended (Intersection U)

In anticipation of future development and related traffic volumes, this new intersection should provide the following laneage:

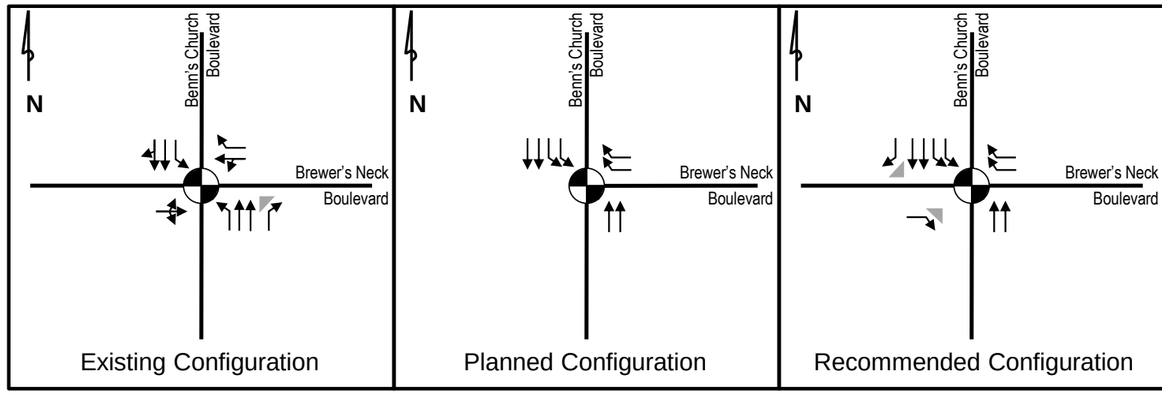
- Benn's Church Boulevard (northbound) – one exclusive left-turn lane, two through lanes, and one exclusive right-turn lane
- Benn's Church Boulevard (southbound) – two through lanes and one exclusive right-turn lane
- Brewer's Neck Boulevard Extended (eastbound) – two exclusive left-turn lanes, two through lanes, and one exclusive right-turn lane
- Brewer's Neck Boulevard Extended (westbound) – two exclusive left-turn lanes and two through lanes, and one exclusive right-turn lane



Brewer's Neck Boulevard and Benn's Church Boulevard (Intersection C)

To support future traffic volumes, this signalized intersection should be modified to provide the following laneage:

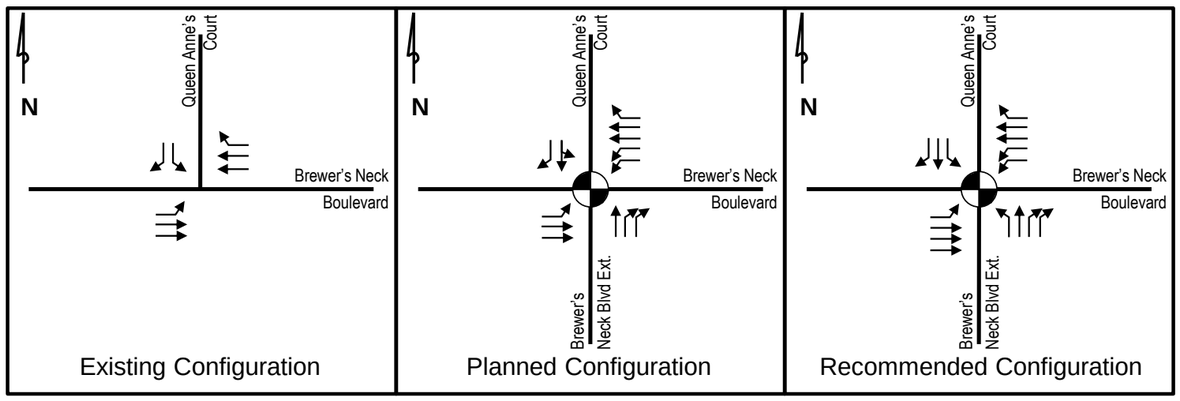
- Benn's Church Boulevard (northbound) – two through lanes
- Benn's Church Boulevard (southbound) – two exclusive left-turn lanes, two through lanes, and one channelized right-turn lane
- Brewer's Neck Boulevard (eastbound) – one exclusive right out only turn-lane
- Brewer's Neck Boulevard (westbound) – two exclusive right-turn lanes



Brewer's Neck Boulevard and Queen Anne's Court/Brewer's Neck Boulevard Extended (Intersection D)

To support future traffic volumes, this proposed future signalized intersection should be improved to provide the following laneage:

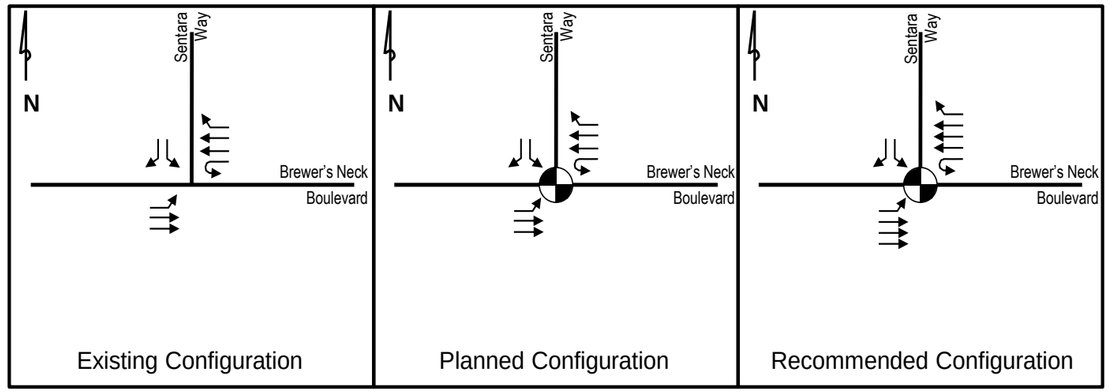
- Brewer's Neck Boulevard Extended (northbound) – one left-turn lane, one through lane, and two exclusive right-turn lanes
- Queen Anne's Court (southbound) – one exclusive left-turn lane, one through lane, and one exclusive right-turn lane
- Brewer's Neck Boulevard (eastbound) – one exclusive left-turn lane and three through lanes
- Brewer's Neck Boulevard (westbound) – two exclusive left-turn lanes, two through lanes, and one exclusive right turn lane



Brewer's Neck Boulevard and Sentara Way (Intersection E)

To support future traffic volumes, this proposed future signalized intersection should be improved to provide the following laneage:

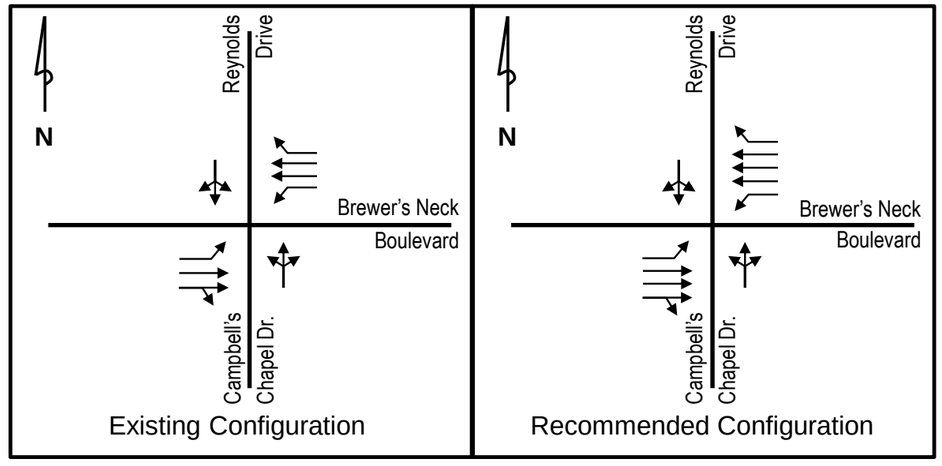
- Sentara Way (southbound) – one exclusive left-turn lane and one exclusive right-turn lane
- Brewer's Neck Boulevard (eastbound) – one exclusive left-turn lane and three through lanes
- Brewer's Neck Boulevard (westbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane



Brewer's Neck Boulevard and Reynolds Drive/Campbell's Chapel Drive (Intersection F)

To support future traffic volumes, this unsignalized intersection should provide the following laneage:

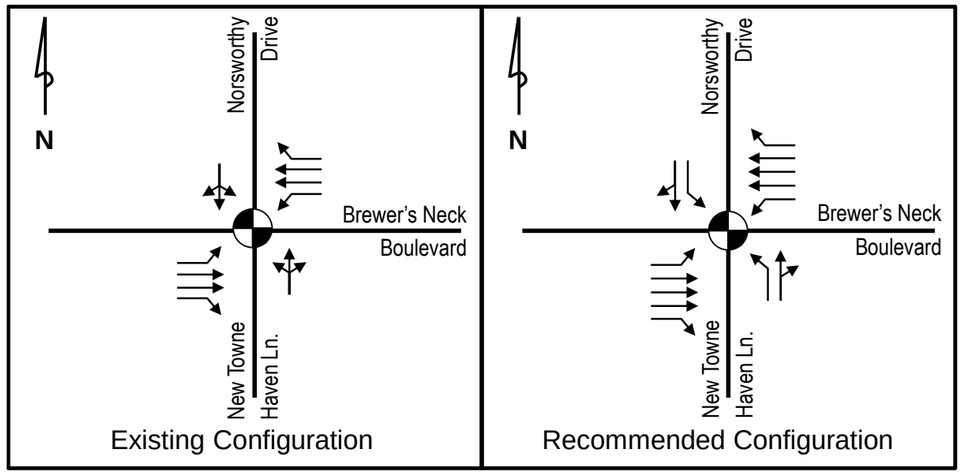
- Campbell's Chapel Drive (northbound) – one shared left/through/right-turn lane
- Reynolds Drive (southbound) – one shared left/through/right-turn lane
- Brewer's Neck Boulevard (eastbound) – one exclusive left-turn lane, two through lanes, and one shared through/right-turn lane
- Brewer's Neck Boulevard (westbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane



Brewer's Neck Boulevard and Norsworthy Drive/New Towne Haven Lane (Intersection G)

To support future traffic volumes, this signalized intersection should provide the following laneage:

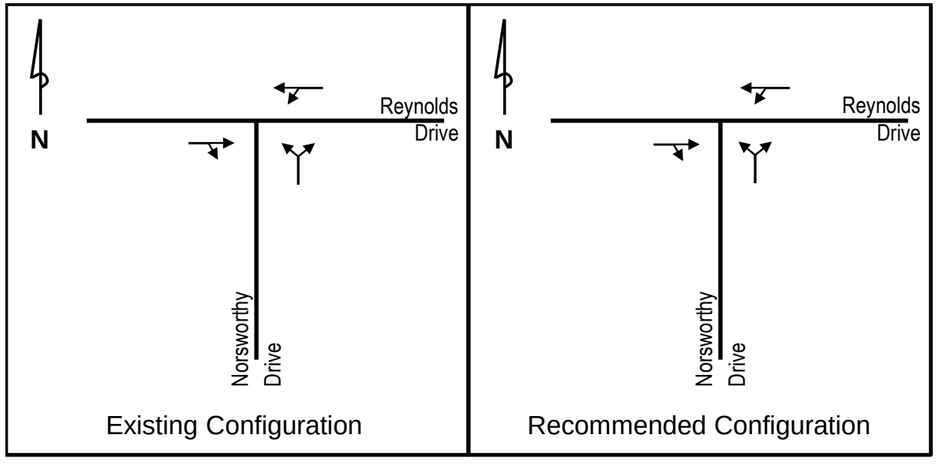
- New Towne Haven Lane (northbound) – one exclusive left-turn lane and one shared through/right-turn lane
- Norsworthy Drive (southbound) – one exclusive left-turn lane and one shared through/right-turn lane
- Brewer's Neck Boulevard (eastbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane
- Brewer's Neck Boulevard (westbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane



Norsworthy Drive and Reynolds Drive (Intersection H)

To support future traffic volumes, this unsignalized "T" intersection should provide the following laneage:

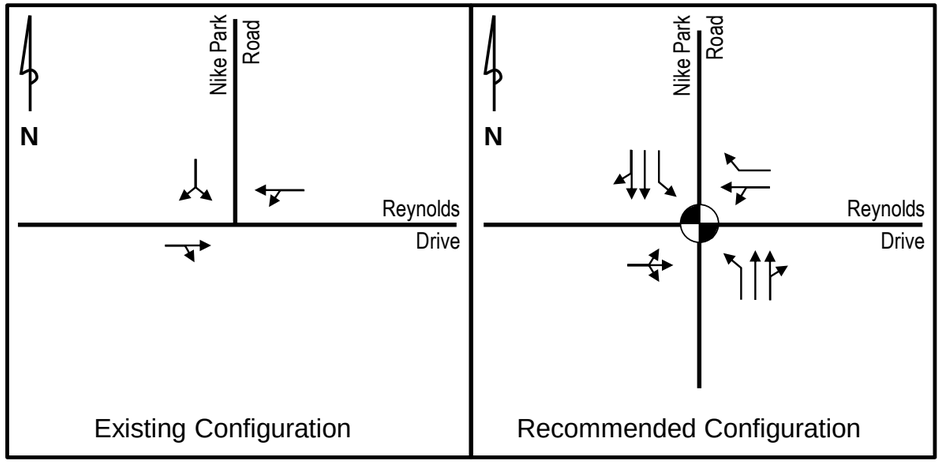
- Norsworthy Drive (northbound) – one shared left and right-turn lane
- Reynolds Drive (eastbound) – one shared through/right-turn lane
- Reynolds Drive (westbound) – one shared through/left-turn lane



Nike Park Road and Reynolds Drive (Intersection I)

To support future traffic volumes, this proposed future signalized intersection should provide the following laneage:

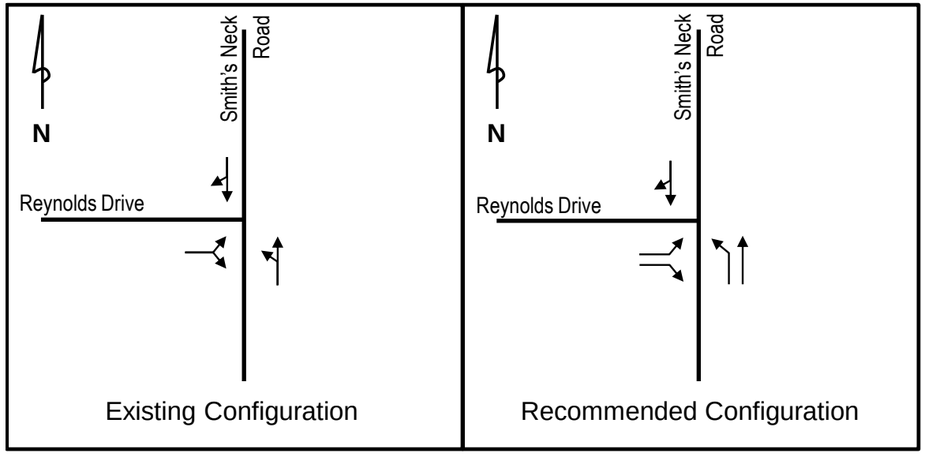
- Nike Park Road Extended (northbound) – one exclusive left-turn lane, one through lane, and one shared through/right-turn lane
- Nike Park Road (southbound) – one exclusive left-turn lane, two through lanes, and one exclusive right-turn lane
- Reynolds Drive (eastbound) – one shared left/through/right-turn lane
- Reynolds Drive (westbound) – one shared through/left-turn lane and one exclusive right-turn lane



Smith's Neck Road and Reynolds Drive (Intersection L)

To support future traffic volumes, this unsignalized "T" intersection should provide the following laneage:

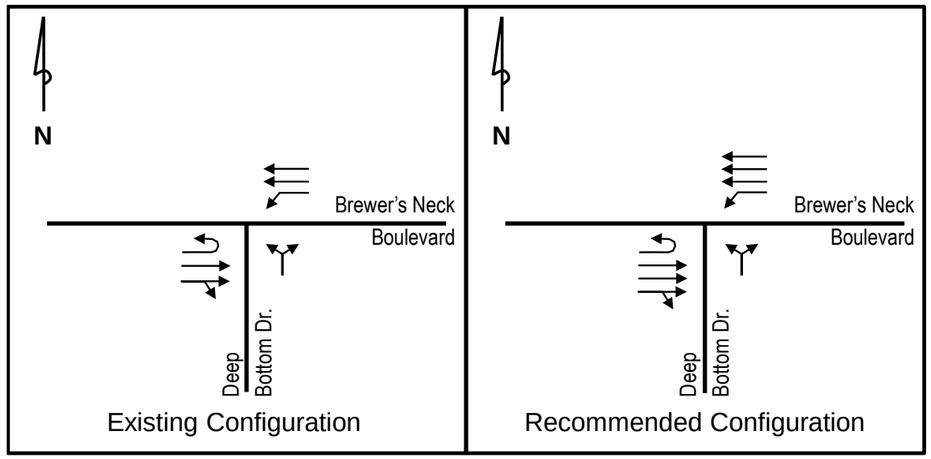
- Smith's Neck Road (northbound) – one exclusive left-turn lane and one through lane
- Smith's Neck Road (southbound) – one shared through/right-turn lane
- Reynolds Drive (eastbound) – one exclusive left-turn lane and one exclusive right-turn lane



Brewer's Neck Boulevard and Deep Bottom Drive (Intersection M)

To support future traffic volumes, this unsignalized "T" intersection should provide the following laneage:

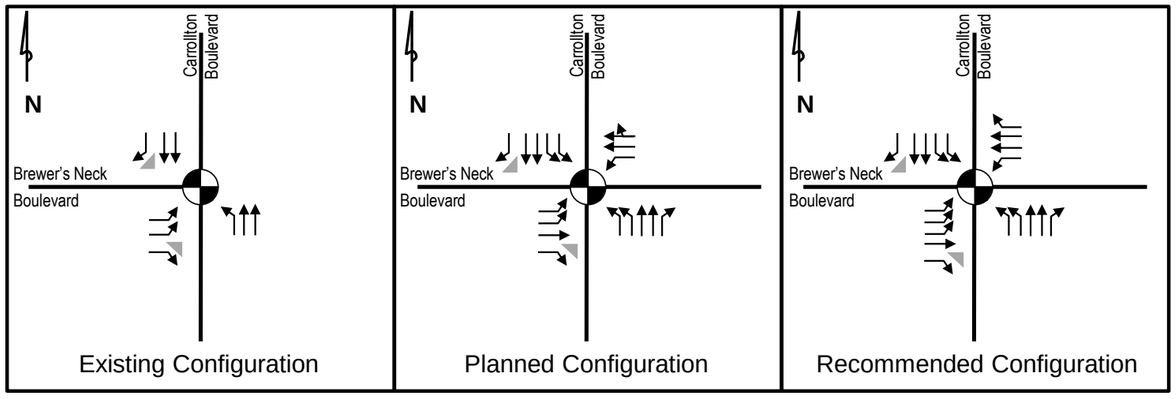
- Deep Bottom Drive (northbound) – one shared left and right-turn lane
- Brewer's Neck Boulevard (eastbound) – one exclusive left-turn lane, two through lanes, and one shared through/right-turn lane
- Brewer's Neck Boulevard (westbound) – one exclusive left-turn lane and three through lanes



Brewer's Neck Boulevard and Carrollton Boulevard (Intersection N)

To support future traffic volumes, this signalized intersection should provide the following laneage:

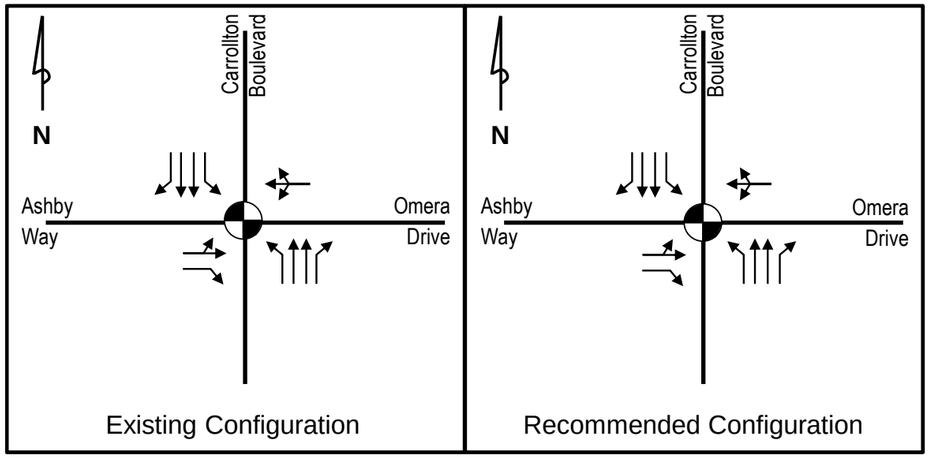
- Carrollton Boulevard (northbound) – two exclusive left-turn lanes, two through lanes, and one exclusive right-turn lane
- Carrollton Boulevard (southbound) – two exclusive left-turn lanes, two through lanes, and one channelized right-turn lane
- Brewer's Neck Boulevard (eastbound) – three exclusive left-turn lanes, one through lane and one channelized right-turn lane
- Brewer's Neck Boulevard/The Crossings (westbound) – one exclusive left-turn lane, two exclusive right-turn lanes, and one exclusive right-turn lane



Carrollton Boulevard and Ashby Way/Omera Drive (Intersection T)

To support future traffic volumes, this signalized intersection should continue to provide the following laneage:

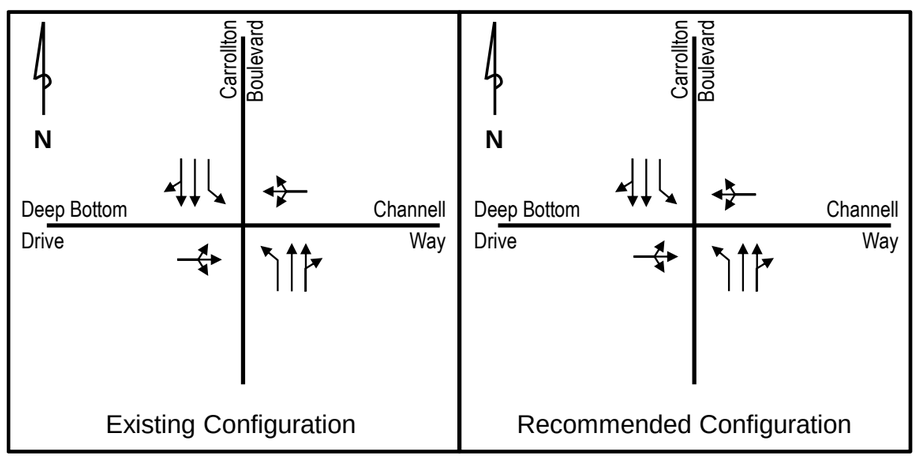
- Carrollton Boulevard (northbound) – one exclusive left-turn lane, two through lanes, and one exclusive right-turn lane
- Carrollton Boulevard (southbound) – one exclusive left-turn lane, two through lanes, and one exclusive right-turn lane
- Ashby Way (eastbound) – one shared through/left-turn lane and one exclusive right-turn lane
- Omera Drive (westbound) – one shared left/through/right-turn lane



Carrollton Boulevard and Deep Bottom Drive/Channell Way (Intersection O)

To support future traffic volumes, this unsignalized intersection should continue to provide the following laneage:

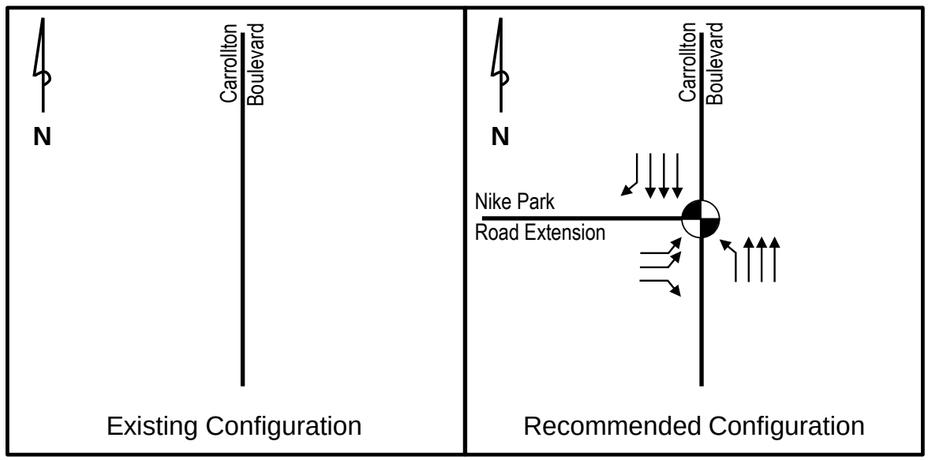
- Carrollton Boulevard (northbound) – one exclusive left-turn lane, one through lane, and one shared through/right-turn lane
- Carrollton Boulevard (southbound) – one exclusive left-turn lane, one through lane, and one shared through/right-turn lane
- Deep Bottom Drive (eastbound) – one shared left/through/right-turn lane
- Channell Way (westbound) – one shared left/through/right-turn lane



Carrollton Boulevard and Nike Park Road Extension (Intersection V)

To support future traffic volumes, this proposed new connection and signalized intersection should provide the following laneage:

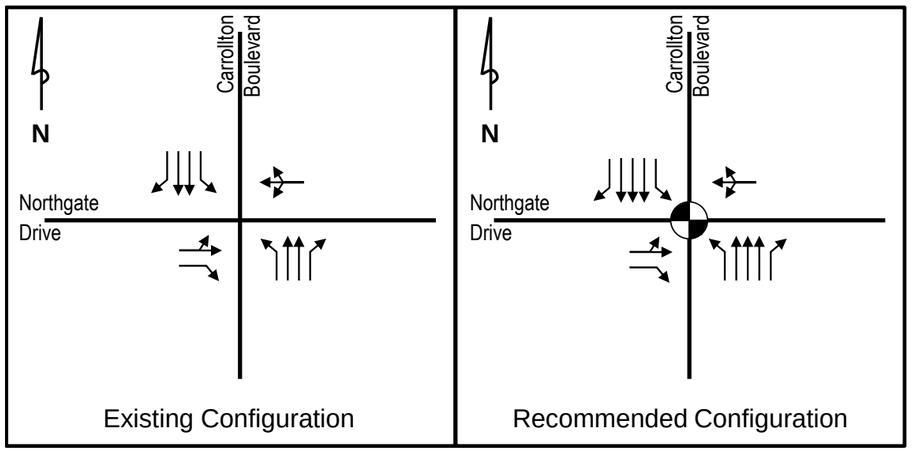
- Carrollton Boulevard (northbound) – one exclusive left-turn lane and three through lanes
- Carrollton Boulevard (southbound) – three through lanes and one exclusive right-turn lane
- Nike Park Road Extension (eastbound) – two exclusive left-turn lanes and one exclusive right-turn lane



Carrollton Boulevard and Northgate Drive (Intersection P)

To support future traffic volumes, this currently unsignalized intersection should be signalized and provide the following laneage:

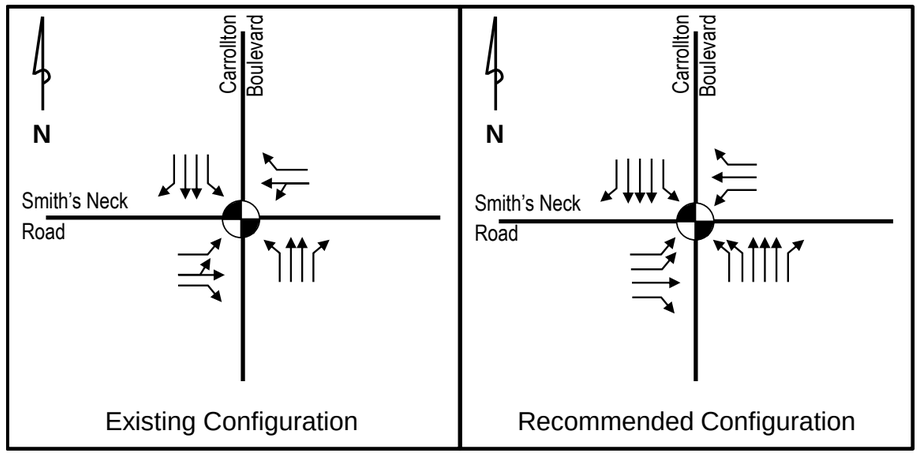
- Carrollton Boulevard (northbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane
- Carrollton Boulevard (southbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane
- Northgate Drive (eastbound) – one shared through/left-turn lane and one exclusive right-turn lane
- Northgate Drive (westbound) – one shared left/through/right-turn lane



Carrollton Boulevard and Smith's Neck Road (Intersection Q)

To support future traffic volumes, this signalized intersection should provide the following laneage:

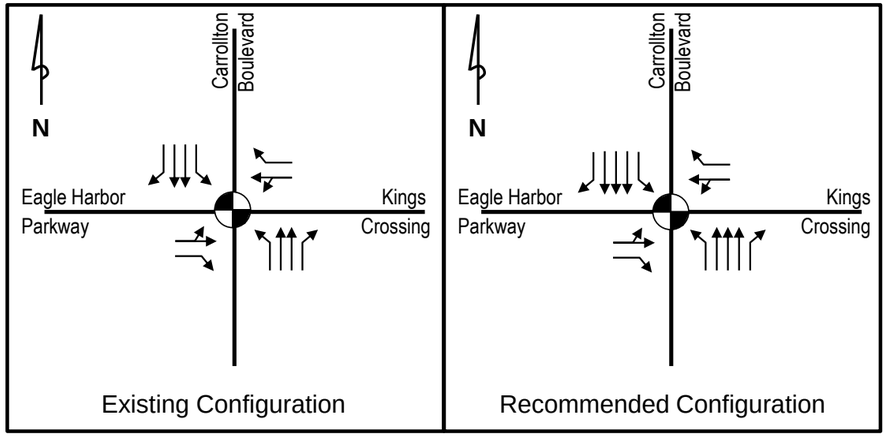
- Carrollton Boulevard (northbound) – two exclusive left-turn lanes, three through lanes, and one exclusive right-turn lane
- Carrollton Boulevard (southbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane
- Smith's Neck Road (eastbound) – two exclusive left-turn lanes, one through lane, and one exclusive right-turn lane
- Smith's Neck Road (westbound) – one exclusive left-turn lane, one through lane, and one exclusive right-turn lane



Carrollton Boulevard and Eagle Harbor Parkway/Kings Crossing (Intersection R)

To support future traffic volumes, this signalized intersection should provide the following laneage:

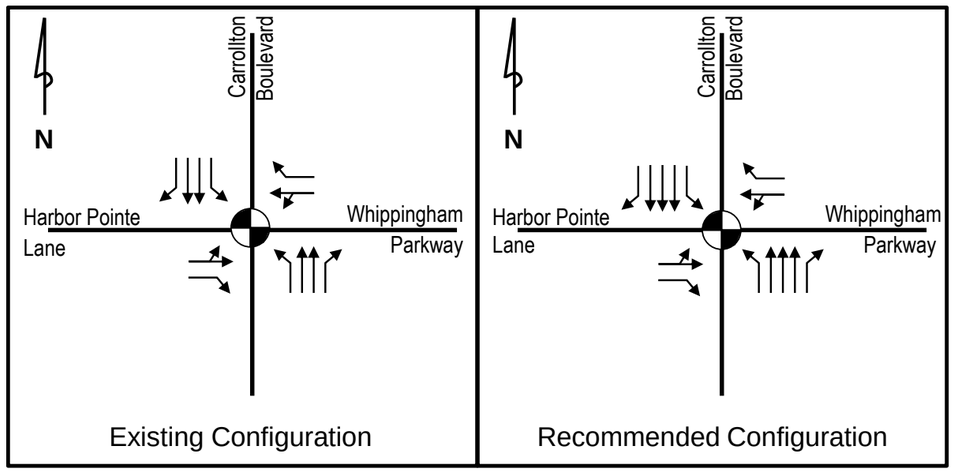
- Carrollton Boulevard (northbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane
- Carrollton Boulevard (southbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane
- Eagle Harbor Parkway (eastbound) – one shared through/left-turn lane and one exclusive right-turn lane
- Kings Crossing (westbound) – one shared through/left-turn lane and one exclusive right-turn lane



Carrollton Boulevard and Harbor Pointe Parkway/Whippingham Parkway (Intersection S)

To support future traffic volumes, this signalized intersection should provide the following laneage:

- Carrollton Boulevard (northbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane
- Carrollton Boulevard (southbound) – one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane
- Harbor Pointe Lane (eastbound) – one shared through/left-turn lane and one exclusive right-turn lane
- Whippingham Parkway (westbound) – one shared through/left-turn lane and one exclusive right-turn lane



Legend

- Signalized Intersection
- Unsignalized Intersection
- XX (XX) AM (PM) Peak Hour Approach Volumes

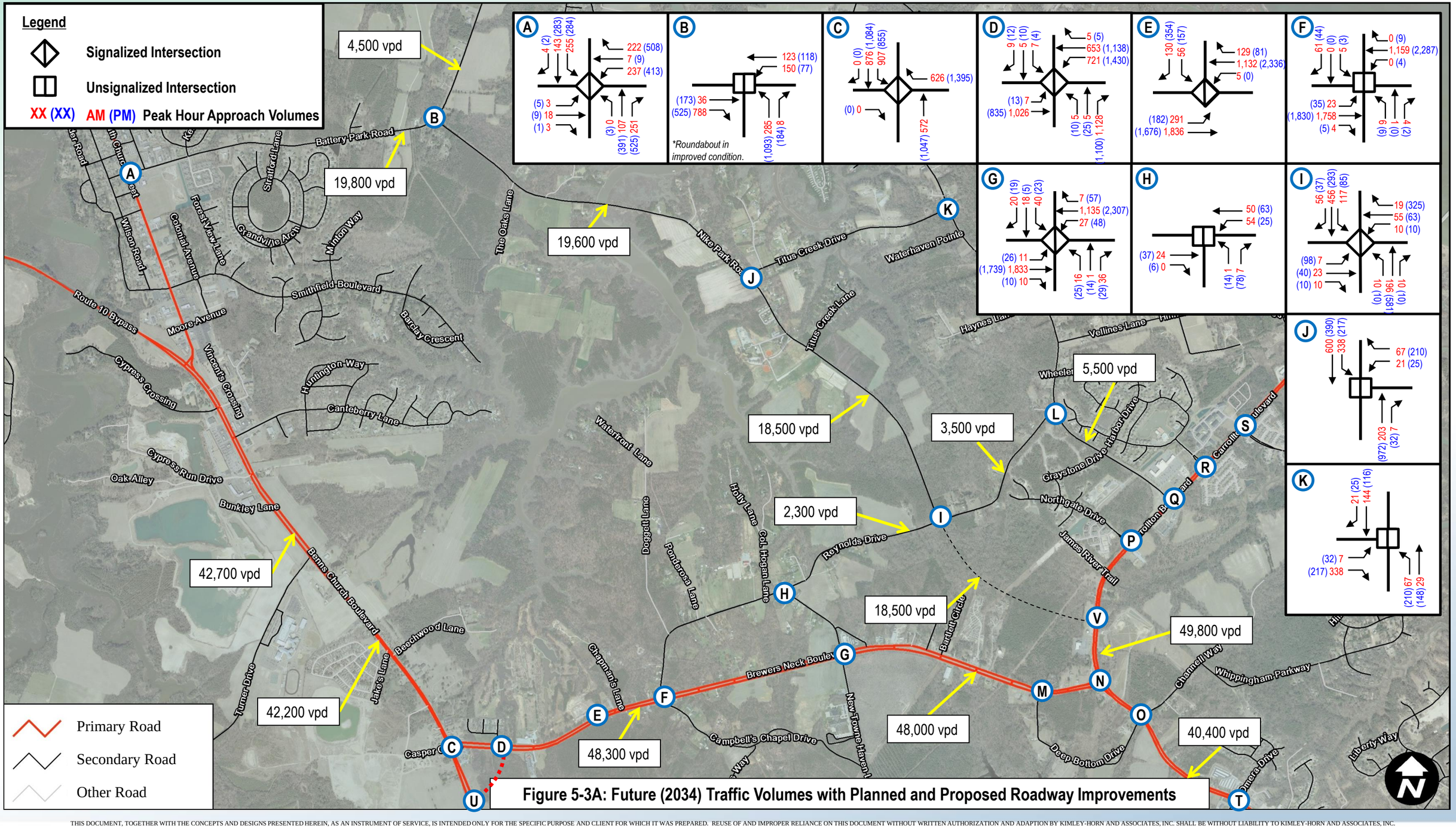


Figure 5-3A: Future (2034) Traffic Volumes with Planned and Proposed Roadway Improvements

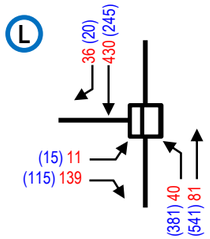
THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

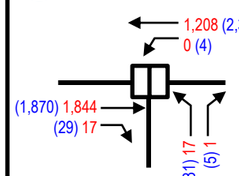
Legend

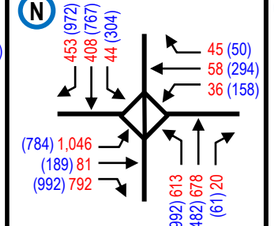
- Signalized Intersection
- Unsignalized Intersection
- XX (XX) AM (PM) Peak Hour Approach Volumes

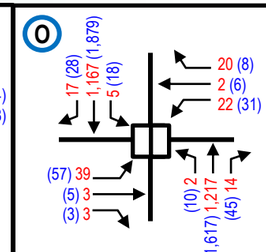
- Primary Road
- Secondary Road
- Other Road

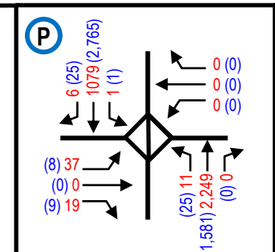
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19,800 vpd
19,600 vpd
18,500 vpd
3,500 vpd
2,300 vpd
42,700 vpd
42,200 vpd
48,300 vpd
48,000 vpd
18,500 vpd
49,800 vpd
40,400 vpd
5,500 vpd

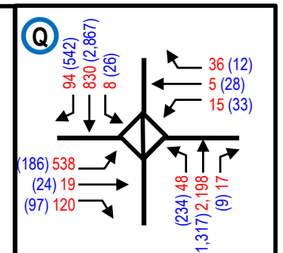
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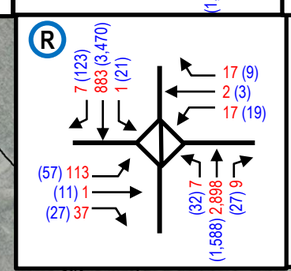
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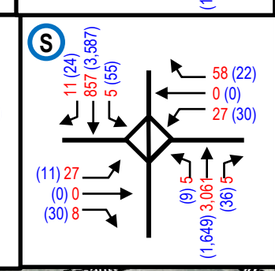
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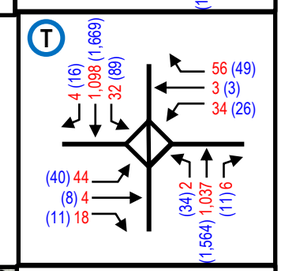
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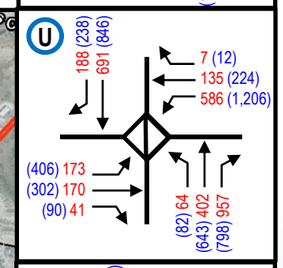
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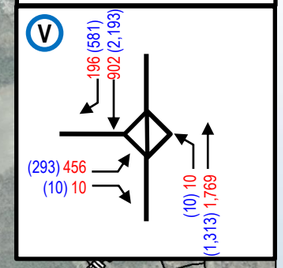
V


Figure 5-3B: Future (2034) Traffic Volumes with Planned and Proposed Roadway Improvements

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Section 5.5 Nike Park Road Extension

To support future traffic volumes, enhance operational safety, and to maintain adequate level-of-service conditions it is proposed that Nike Park Road be extended from its current terminus with Reynolds Drive to the west, eastward approximately 1 mile creating a new intersection with Carrollton Boulevard. In the initial phase of the extension it is recommended that Nike Park Road be constructed as a two-lane typical section with the option of going to an ultimate four-lane typical section when traffic volume projections warrant additional capacity. It is anticipated that with this proposed extension of Nike Park Road that a traffic signal will be installed at the intersection with Carrollton Boulevard. Details regarding the proposed extension and associated intersection improvements are outlined in **Chapter 7.0**.

As part of this study, two potential Nike Park Road alternative alignments were considered as depicted in **Figure 5-4**. As can be seen, the primary objective of the improvement to Nike Park Road was to enhance the connection or existing alternative route that traffic uses between the Town of Smithfield and Carrollton Boulevard. Both alignments were envisioned to more adequately accommodate traffic that uses this alternative route today as well as relieve anticipated future traffic congestion along the Carrollton Boulevard and Brewer's Neck Boulevard corridors. The primary difference between the two alignments is that **Alignment 1** goes along a longer segment of new alignment and would tie into the existing alignment of Smith's Neck Road in the vicinity of the Smith's Neck Road/Reynolds Drive intersection. Whereas, **Alignment 2** primarily follows along the existing alignment of Nike Park Road and then simply includes an extension along new alignment between the intersection of Nike Park Road/Reynolds Drive and a new intersection at Carrollton Boulevard. **Alignment 2** attempts to impact as few properties as possible, capitalizes on the existing alignment of Nike Park Road, is intended to draw cut-through traffic away from Titus Creek Drive as well as the intersection of Titus Creek Drive/Smith's Neck Road, and will relieve future traffic congestion conditions at the Carrollton Boulevard/Smith's Neck Road intersection. Based on feedback from VDOT, Isle of Wight County staff, as well as citizens of both Isle of Wight County and the Town of Smithfield, it was determined that **Alignment 2** or the Nike Park Road extension alternative was the preferred alignment.

Figure 5-5 and Figure 5-6 also present proposed typical sections for the Nike Park Road improvement. It is envisioned that the future typical section of Nike Park Road will be a four-lane typical section with the capacity necessary to accommodate future traffic demand associated with planned development while maintaining a context consistent with the surrounding study area.

Figure 5-7 reflects the proposed Nike Park Road Extension along its preferred alignment and conceptual laneage at its intersection with Carrollton Boulevard. The preferred typical section was chosen to best accommodate all users of the roadway as well as to provide an efficient and aesthetically pleasing corridor.

A traffic signal is proposed for traffic control at the Nike Park Road Extension/Carrollton Boulevard intersection. Based on future traffic volume projections it is anticipated that this new connection will serve as critical relief valve for the Carrollton Boulevard/Smith's Neck Road intersection as well as extend the operational life of Brewer's Neck Boulevard. Although it is anticipated that Brewer's Neck Boulevard will still need to be widened to a six-lane facility in the future. A traffic signal at this location will enable the intersection to efficiently process anticipated traffic volumes, will minimize delays for traffic, and will help facilitate the progression of traffic along Carrollton Boulevard.

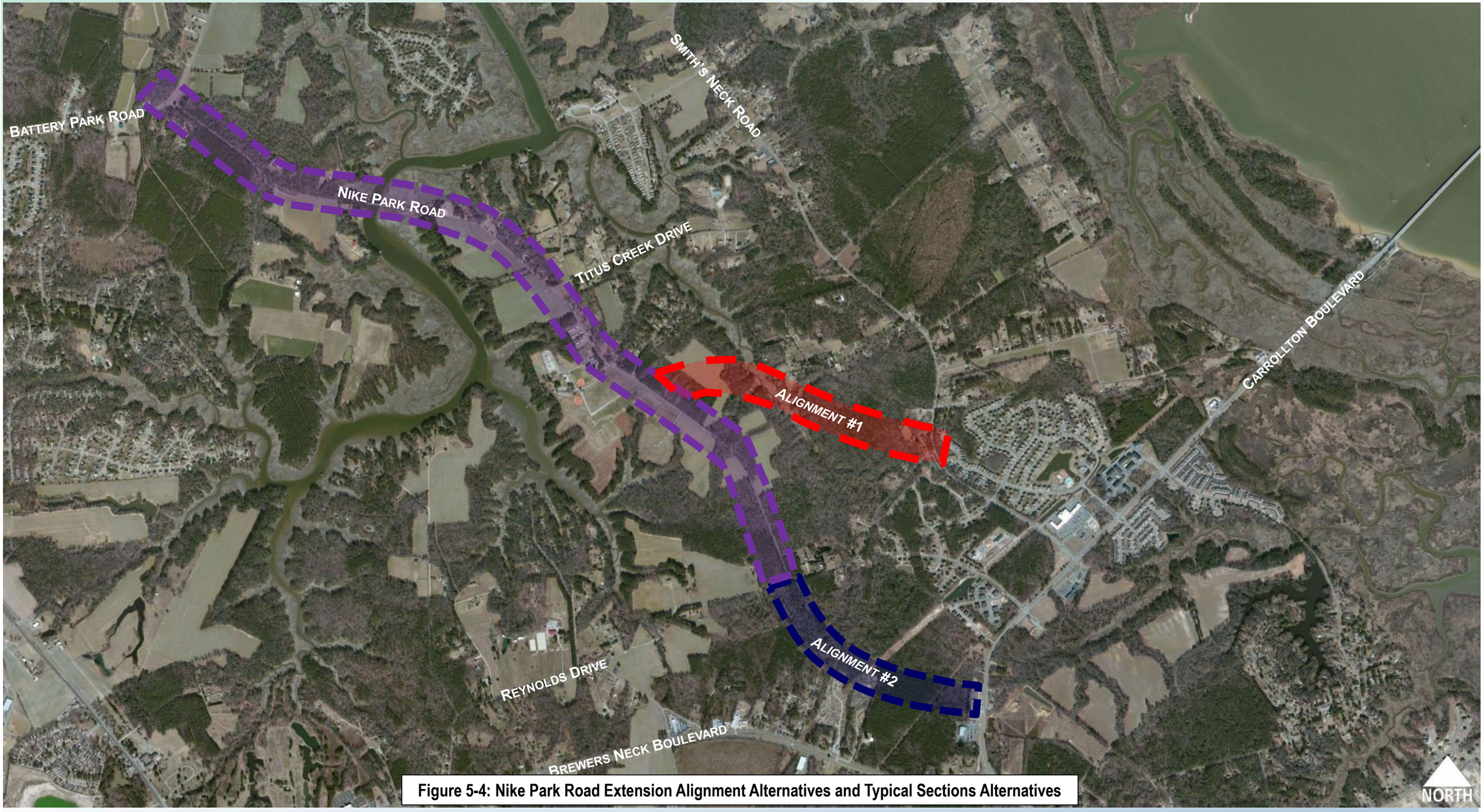


Figure 5-4: Nike Park Road Extension Alignment Alternatives and Typical Sections Alternatives

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Figure 5-5: Nike Park Road 4-Lane Typical Section – Option # 1

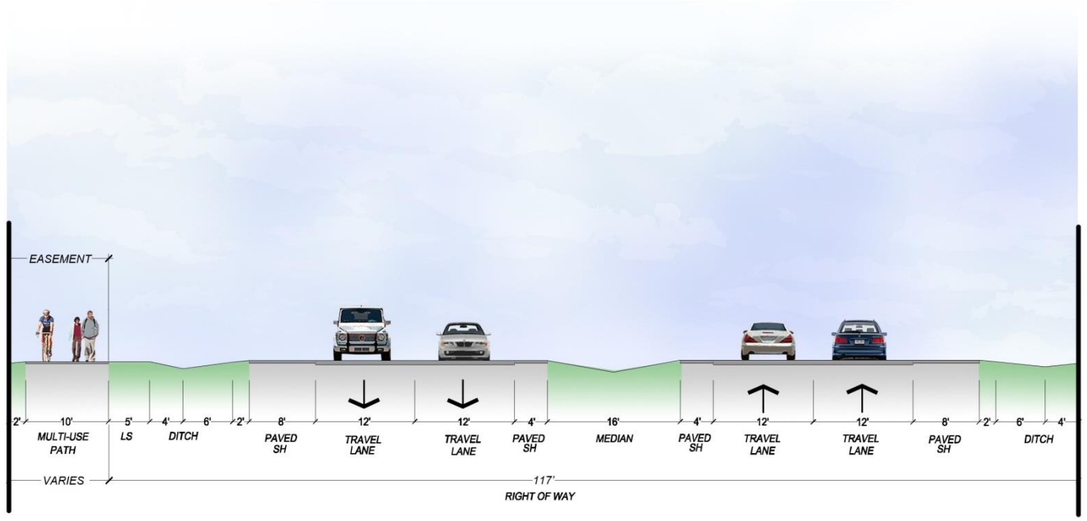


Figure 5-6: Nike Park Road 4-Lane Typical Section – Option # 2

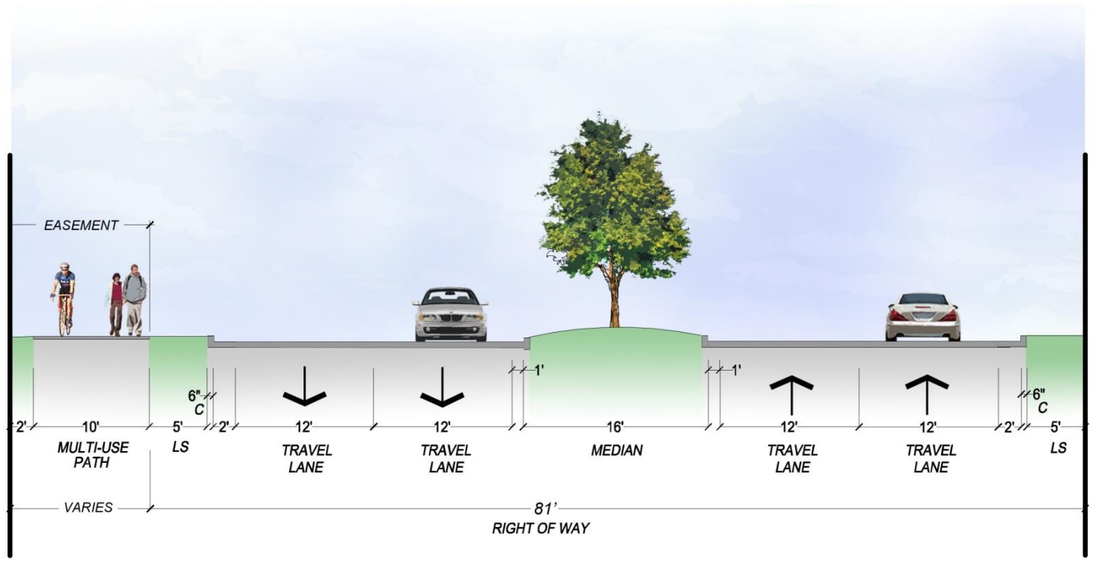




Figure 5-7: Nike Park Road Extension (Alignment 2) at Carrollton Boulevard

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Section 5.6 Future LOS

5.6.1 Intersection LOS Analysis

Year 2034 level of service analyses for signalized and unsignalized intersections in the AM and PM peak hours were performed for all study area intersections. Intersections were analyzed with existing laneage (Unimproved conditions) as well as with recommended improvements as outlined in **Chapter 7.0** Recommendations (Improved conditions). Lastly, future volume projections were adjusted to account for the proposed capacity and operational enhancements associated with the Nike Park Road Extension (as discussed in **Section 5.4**). *Synchro Professional 7.0*, which uses methodologies contained in the *2000 Highway Capacity Manual (HCM)* [TRB Special Report 209, 2000], was used for all intersection analyses. The 2034 Unimproved scenario serves as the "no build" scenario with only the planned/proffered improvements and illustrates particular locations in need of improvements. It is noted that signal timing was optimized for the 2034 Unimproved scenario which may result in little to no change when comparing existing to future conditions, despite traffic volumes being significantly higher. To supplement the analysis, *SimTraffic 7.0* simulations were performed to model anticipated operations along the corridor and at study area intersections.

Table 5-2 summarizes levels of service for both AM and PM peak hours and delays for each study area intersection under 2034 Unimproved, 2034 Improved, and 2034 Improved with Connector Road scenarios. Full LOS analysis results for all study area intersections are provided in **Table 5-3** through **Table 5-26**. **Figures 5-8A, 5-8B, 5-9A,** and **5-9B** reflect peak hour LOS throughout the study area under 2034 future unimproved and improved operational conditions. Overall intersection LOS operations are summarized as well as per approach LOS for signalized intersections and per lane LOS for unsignalized intersections.

Table 5-2: Signalized and Unsignalized Intersection HCM LOS Criteria

LOS	Intersection Delay per Vehicle(s)	
	Signalized	Unsignalized
A	0.0 - 10	0.0 - 10
B	>10 - 20	>10 - 15
C	>20 - 35	>15 - 25
D	>35 - 55	>25 - 35
E	>55 - 80	>35 - 50
F	>80	>50

Source: Transportation Research Board, Highway Capacity Manual 2000

Table 5-3: Future (2034) Overall Signalized Intersection LOS

ID	Intersection	2034 Unimproved		2034 Improved	
		AM LOS	PM LOS	AM LOS	PM LOS
A	S. Church Street and Battery Park Road	C (26.1)	C (33.3)	C (20.9)	C (29.1)
U	Benn's Church Boulevard and Brewer's Neck Boulevard Extended	D (39.9)	D (49.9)	C (28.4)	D (46.9)
C	Brewer's Neck Boulevard and Benn's Church Boulevard	C (20.6)	E (60.7)	B (14.9)	C (29.7)
D	Brewer's Neck Boulevard and Brewer's Neck Boulevard Extended Blvd/Queen Ann's Court	C (29.8)	C (30.3)	B (16.7)	C (20.2)
E	Brewer's Neck Boulevard and Sentara Way	C (20.3)*	F (140.8)*	B (13.2)	C (32.6)
G	Brewer's Neck Boulevard and Norsworthy Drive/New Towne Haven	C (28.1)	E (70.5)	B (15.0)	B (16.9)
I	Nike Park Road and Reynolds Drive	A (6.4)*	A (4.1)*	A (9.8)	C (21.1)
N	Brewer's Neck Boulevard and Carrollton Boulevard	D (42.8)	F (80.6)	C (29.8)	D (51.0)
T	Carrollton Boulevard and Ashby Way/Omera Drive	B (19.0)	C (23.8)	B (17.5)	C (21.1)
V	Carrollton Boulevard and Nike Park Road Extension	N/A**	N/A**	B (18.4)	B (11.0)
P	Carrollton Boulevard and Northgate Lane	A (9.1)*	C (19.8)*	A (7.6)	B (10.5)
Q	Carrollton Boulevard and Smith's Neck Road	E (72.6)	F (102.1)	C (34.9)	D (54.2)
R	Carrollton Boulevard and Eagle Harbor Pkwy/Kings Crossing	F (90.1)	F (130.1)	C (21.6)	E (62.5)
S	Carrollton Boulevard and Harbor Pointe Lane/Whippingham Pkwy	F (90.9)	F (144.9)	B (15.7)	E (63.9)

Source: Kimley-Horn and Associates, Inc.

** Note: reflects unimproved condition as unsignalized intersection.*

*N/A** Note: reflects that intersection is a future improvement/new intersection.*

Table 5-4: Future (2034) Overall Unsignalized Intersection LOS

ID	Intersection	2034 Unimproved		2034 Improved	
		AM LOS	PM LOS	AM LOS	PM LOS
B	Battery Park Road and Nike Park Road*	B (18.8)	F (133.9)	A (2.9)	B (12.6)
F	Brewer's Neck Boulevard and Reynolds Drive/Campbells Chapel Dr.	A (0.7)	A (2.5)	N/A**	N/A**
H	Reynolds Drive and Norsworthy Drive	A (3.5)	A (4.7)	A (3.5)	A (4.6)
L	Smith's Neck Road and Reynolds Drive	A (3.7)	A (8.9)	A (3.3)	A (4.9)
M	Brewer's Neck Boulevard and Deep Bottom Drive	A (0.6)	A (2.2)	A (2.1)	F (90.8)
O	Carrollton Boulevard and Deep Bottom Drive	B (15.0)	F (>300)	A (1.4)	B (10.7)
J	Titus Creek Drive and Nike Park Road	A (9.2)	C (24.0)	A (3.6)	A (5.7)
K	Titus Creek Road and Smith's Neck Road	B (13.4)	B (10.9)	A (7.7)	A (6.0)

Source: Kimley-Horn and Associates, Inc.

Note: reflects unimproved condition as existing signalized intersection
N/A** Note: LOS not reported due to Synchro analysis limitations

Table 5-5: S. Church Street and Battery Park Road Signalized Intersection LOS (Intersection A)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	C (34.8)	C (30.2)	C (24.2)	C (22.5)	C (26.1)
Improved (2034)	C (32.1)	B (18.6)	C (22.9)	C (20.9)	C (20.9)
PM Peak Hour					
Unimproved (2034)	D (50.8)	D (41.3)	C (25.2)	D (36.4)	C (33.3)
Improved (2034)	D (44.0)	C (29.9)	C (27.6)	C (29.8)	C (29.1)

Source: Kimley-Horn and Associates, Inc.

Table 5-6: Battery Park Road and Nike Park Road Intersection LOS (Intersection B)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)*	B (17.2)	B (19.8)	C (23.8)	-	B (18.8)
Improved (2034)**	A (0.3)	A (8.2)	A (4.6)	-	A (2.9)
PM Peak Hour					
Unimproved (2034)*	F (153.1)	F (115.2)	F (126.8)	-	F (133.9)
Improved (2034)**	A (1.5)	C (17.0)	C (18.0)	-	B (12.6)

Source: Kimley-Horn and Associates, Inc.

** Note: reflects unimproved condition as existing signalized intersection.*
*** Note: reflects improved condition as roundabout.*

Table 5-7: Brewer's Neck Boulevard and Benns Church Boulevard Signalized Intersection LOS (Intersection C)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	-	C (29.2)	C (22.2)	B (16.5)	C (20.6)
Improved (2034)	A (0.0)	B (16.5)	B (19.1)	B (12.9)	B (14.9)
PM Peak Hour					
Unimproved (2034)	-	F (130.2)	D (47.7)	A (7.5)	E (60.7)
Improved (2034)	A (0.0)	D (45.8)	D (52.1)	A (5.9)	C (29.7)

Source: Kimley-Horn and Associates, Inc.

Table 5-8: Brewer's Neck Blvd and Queen Anne's Court/Brewer's Neck Blvd Extended Signalized Intersection LOS (Intersection D)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	C (26.7)	B (17.4)	D (49.6)	E (67.3)	C (29.8)
Improved (2034)	B (13.8)	B (15.6)	C (20.2)	D (41.6)	B (16.7)
PM Peak Hour					
Unimproved (2034)	D (41.2)	C (28.1)	C (24.1)	E (66.7)	C (30.3)
Improved (2034)	D (35.3)	B (18.2)	B (12.3)	D (51.6)	C (20.2)
Source: Kimley-Horn and Associates, Inc.					

Table 5-9: Brewer's Neck Boulevard and Sentara Way Unsignalized Intersection LOS (Intersection E)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)*	B (14.7)	C (26.5)	-	D (37.0)	C (20.3)
Improved (2034)**	A (9.0)	B (18.5)	-	C (20.1)	B (13.2)
PM Peak Hour					
Unimproved (2034)*	E (57.2)	D (49.3)	-	F (>300)	F (140.8)
Improved (2034)**	B (12.2)	D (44.0)	-	D (45.7)	C (32.6)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

** Note: reflects unimproved condition as existing unsignalized intersection.*
*** Note: reflects improved condition as signalized intersection.*

Table 5-10: Brewer's Neck Blvd and Campbell's Chapel Drive/Reynolds Drive Unsignalized Intersection LOS (Intersection F)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	B (13.9)	A (0.0)	F (51.5)	C (21.2)	A (0.7)
Improved (2034)*	N/A	N/A	N/A	N/A	N/A
PM Peak Hour					
Unimproved (2034)	E (49.9)	C (23.4)	F (>300)	F (131.9)	A (2.5)
Improved (2034)*	N/A	N/A	N/A	N/A	N/A
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Note: Synchro analysis is limited to two lanes per leg for unsignalized intersections

Table 5-11: Brewer's Neck Blvd and Norsworthy Drive/New Towne Haven Lane Signalized Intersection LOS (Intersection G)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	C (33.4)	B (14.0)	E (65.7)	F (92.3)	C (28.1)
Improved (2034)	B (15.6)	B (10.7)	D (39.8)	D (45.4)	B (15.0)
PM Peak Hour					
Unimproved (2034)	C (34.7)	F (98.3)	F (85.3)	F (82.5)	E (70.5)
Improved (2034)	B (14.1)	B (17.3)	D (49.7)	D (48.8)	B (16.9)
Source: Kimley-Horn and Associates, Inc.					

Table 5-12: Norsworthy Drive and Reynolds Drive Unsignalized Intersection LOS (Intersection H)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	A (0.0)	A (4.0)	A (8.6)	-	A (3.5)
Improved (2034)	A (0.0)	A (4.0)	A (8.6)	-	A (3.5)
PM Peak Hour					
Unimproved (2034)	A (0.0)	A (2.2)	A (9.1)	-	A (4.7)
Improved (2034)	A (0.0)	A (2.2)	A (9.1)	-	A (4.6)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 5-13: Nike Park Road and Reynolds Drive Intersection LOS (Intersection I)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)*	A (1.8)	A (0.0)	-	B (10.1)	A (6.4)
Improved (2034)**	D (39.3)	D (40.9)	A (6.2)	A (4.6)	A (9.8)
PM Peak Hour					
Unimproved (2034)*	A (6.3)	A (0.0)	-	B (14.5)	A (4.1)
Improved (2034)**	C (33.0)	D (39.4)	B (14.2)	A (7.8)	C (21.1)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

** Note: reflects unimproved condition as existing unsignalized intersection.*
*** Note: reflects improved condition as signalized intersection.*

Table 5-14: Smith's Neck Road and Reynolds Drive Unsignalized Intersection LOS (Intersection L)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	C (22.1)	-	A (2.9)	A (0.0)	A (3.7)
Improved (2034)	B (14.0)	-	A (8.7)	A (0.0)	A (3.3)
PM Peak Hour					
Unimproved (2034)	E (41.3)	-	A (7.6)	A (0.0)	A (8.9)
Improved (2034)	C (22.4)	-	A (9.5)	A (0.0)	A (4.9)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 5-15: Brewer's Neck Boulevard and Deep Bottom Drive Unsignalized Intersection LOS (Intersection M)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	A (0.0)	A (0.0)	F (113.8)	-	A (0.6)
Improved (2034)	A (0.0)	A (0.0)	F (>300)	-	A (2.1)
PM Peak Hour					
Unimproved (2034)	A (0.0)	C (24.7)	F (298.7)	-	A (2.2)
Improved (2034)	A (0.0)	C (19.2)	F (≥ 300)	-	F (90.8)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 5-16: Brewer's Neck Boulevard and Carrollton Boulevard Signalized Intersection LOS (Intersection N)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	D (36.1)	E (61.9)	E (57.8)	D (35.4)	D (42.8)
Improved (2034)	C (28.5)	D (51.5)	D (39.4)	B (15.4)	C (29.8)
PM Peak Hour					
Unimproved (2034)	E (70.8)	F (108.5)	F (106.8)	E (66.9)	F (80.6)
Improved (2034)	D (37.5)	F (80.7)	E (61.2)	D (49.0)	D (51.0)
Source: Kimley-Horn and Associates, Inc.					

Table 5-17: Carrollton Boulevard and Ashby Way/Omera Drive Signalized Intersection LOS (Intersection T)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	C (32.5)	C (29.1)	B (18.1)	B (18.3)	B (19.0)
Improved (2034)	D (36.4)	D (37.3)	B (17.0)	B (15.2)	B (17.5)
PM Peak Hour					
Unimproved (2034)	D (52.5)	D (51.8)	C (24.1)	C (21.5)	C (23.8)
Improved (2034)	E (59.7)	E (59.9)	C (21.6)	B (17.6)	C (21.1)
Source: Kimley-Horn and Associates, Inc.					

Table 5-18: Carrollton Boulevard and Deep Bottom Drive/Channell Way Unsignalized Intersection LOS (Intersection O)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	F (>300)	F (190.1)	B (11.9)	B (11.7)	B (15.0)
Improved (2034)	E (44.6)	D (31.8)	A (0.0)	B (12.1)	A (1.4)
PM Peak Hour					
Unimproved (2034)	F (>300)	F (>300)	C (19.5)	C (15.4)	F (>300)
Improved (2034)	F (>300)	F (149.8)	C (19.0)	C (16.4)	B (10.7)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 5-19: Carrollton Boulevard and Nike Park Road Extension Signalized Intersection LOS (Intersection V)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	-	-	-	-	-
Improved (2034)	D (50.6)	-	B (14.7)	B (10.8)	B (18.4)
PM Peak Hour					
Unimproved (2034)	-	-	-	-	-
Improved (2034)	E (65.7)	-	B (10.6)	A (5.2)	B (11.0)
Source: Kimley-Horn and Associates, Inc.					
Note: New intersection associated with improved condition only.					

Table 5-20: Carrollton Boulevard and Northgate Drive Intersection LOS (Intersection P)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)*	F (>300)	A (0.0)	B (11.0)	C (20.2)	A (9.1)
Improved (2034)**	D (54.5)	A (0.0)	A (9.0)	A (2.3)	A (7.6)
PM Peak Hour					
Unimproved (2034)*	F (>300)	A (0.0)	E (37.3)	B (14.2)	C (19.8)
Improved (2034)**	E (71.7)	A (0.0)	A (1.6)	B (15.2)	B (10.5)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

** Note: reflects unimproved condition as existing unsignalized intersection.*
*** Note: reflects improved condition as signalized intersection.*

Table 5-21: Carrollton Boulevard and Smith's Neck Road Signalized Intersection LOS (Intersection Q)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	F (110.5)	F (85.4)	F (1.1)	B (18.9)	E (72.6)
Improved (2034)	E (58.9)	D (52.4)	D (36.9)	B (12.2)	C (34.9)
PM Peak Hour					
Unimproved (2034)	F (165.4)	F (82.3)	D (48.5)	F (121.4)	F (102.1)
Improved (2034)	E (76.0)	E (70.1)	C (26.9)	E (63.3)	D (54.2)
Source: Kimley-Horn and Associates, Inc.					

Table 5-22: Carrollton Boulevard and Eagle Harbor Parkway/Kings Crossing Signalized Intersection LOS (Intersection R)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	F (158.4)	F (86.4)	F (111.9)	A (8.3)	F (90.1)
Improved (2034)	E (65.0)	E (57.5)	C (23.4)	A (6.3)	C (21.6)
PM Peak Hour					
Unimproved (2034)	E (78.4)	E (74.3)	A (9.5)	F (195.2)	F (130.1)
Improved (2034)	F (82.0)	E (76.0)	B (10.2)	F (85.2)	E (62.5)
Source: Kimley-Horn and Associates, Inc.					

Table 5-23: Carrollton Boulevard and Harbor Pointe Lane/Whippingham Parkway Signalized Intersection LOS (Intersection S)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	F (88.6)	F (83.8)	F (115.3)	A (7.8)	F (90.9)
Improved (2034)	E (59.0)	D (54.9)	B (16.3)	A (7.9)	B (15.7)
PM Peak Hour					
Unimproved (2034)	E (69.8)	E (71.1)	A (5.8)	F (219.3)	F (144.9)
Improved (2034)	E (69.9)	E (71.1)	A (4.8)	F (90.5)	E (63.9)
Source: Kimley-Horn and Associates, Inc.					

Table 5-24: Titus Creek Drive and Nike Park Road Unsignalized Intersection LOS (Intersection J)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	-	C (19.3)	A (0.0)	A (7.7)	A (9.2)
Improved (2034)	-	C (17.6)	A (0.0)	A (8.7)	A (3.6)
PM Peak Hour					
Unimproved (2034)	-	F (59.3)	A (0.0)	A (8.0)	C (24.0)
Improved (2034)	-	D (32.0)	A (0.0)	B (14.0)	A (5.7)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 5-25: Titus Creek Drive and Smith's Neck Road Unsignalized Intersection LOS (Intersection K)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	C (19.0)	-	A (6.3)	A (0.0)	B (13.4)
Improved (2034)	B (12.0)	-	A (7.7)	A (0.0)	A (7.7)
PM Peak Hour					
Unimproved (2034)	C (21.7)	-	A (7.4)	A (0.0)	B (10.9)
Improved (2034)	B (11.3)	-	A (8.0)	A (0.0)	A (6.0)
Source: Kimley-Horn and Associates, Inc.					
Note: Worst Control Delay is provided under each approach					

Table 5-26: Benn's Church Boulevard and Brewer's Neck Boulevard Extended Signalized Intersection LOS (Intersection U)

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound	Westbound	Northbound	Southbound	
AM Peak Hour					
Unimproved (2034)	E (63.1)	F (82.6)	B (17.3)	C (31.0)	D (39.9)
Improved (2034)	D (38.9)	E (58.0)	B (13.7)	C (23.0)	C (28.4)
PM Peak Hour					
Unimproved (2034)	E (73.8)	D (51.6)	C (25.1)	E (64.9)	D (49.9)
Improved (2034)	D (44.3)	E (65.8)	B (20.0)	E (61.6)	D (46.9)
Source: Kimley-Horn and Associates, Inc.					

Legend

AM PM — AM/PM Peak Hour LOS

Signalized Intersection

Unsignalized Intersection

Intersection LOS A or B

Intersection LOS C or D

Intersection LOS E or F

X (X) — AM (PM) Approach LOS

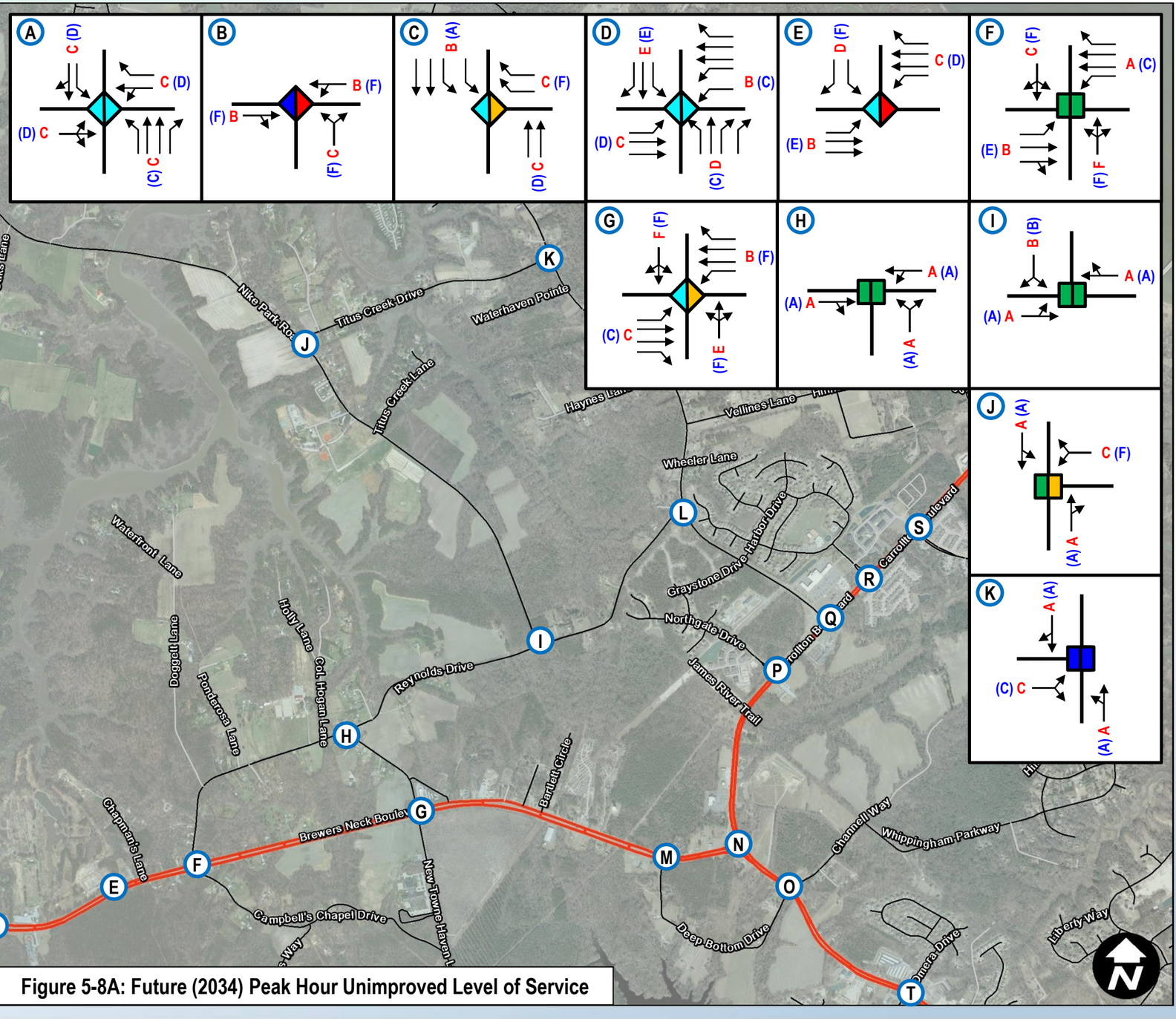


Figure 5-8A: Future (2034) Peak Hour Unimproved Level of Service

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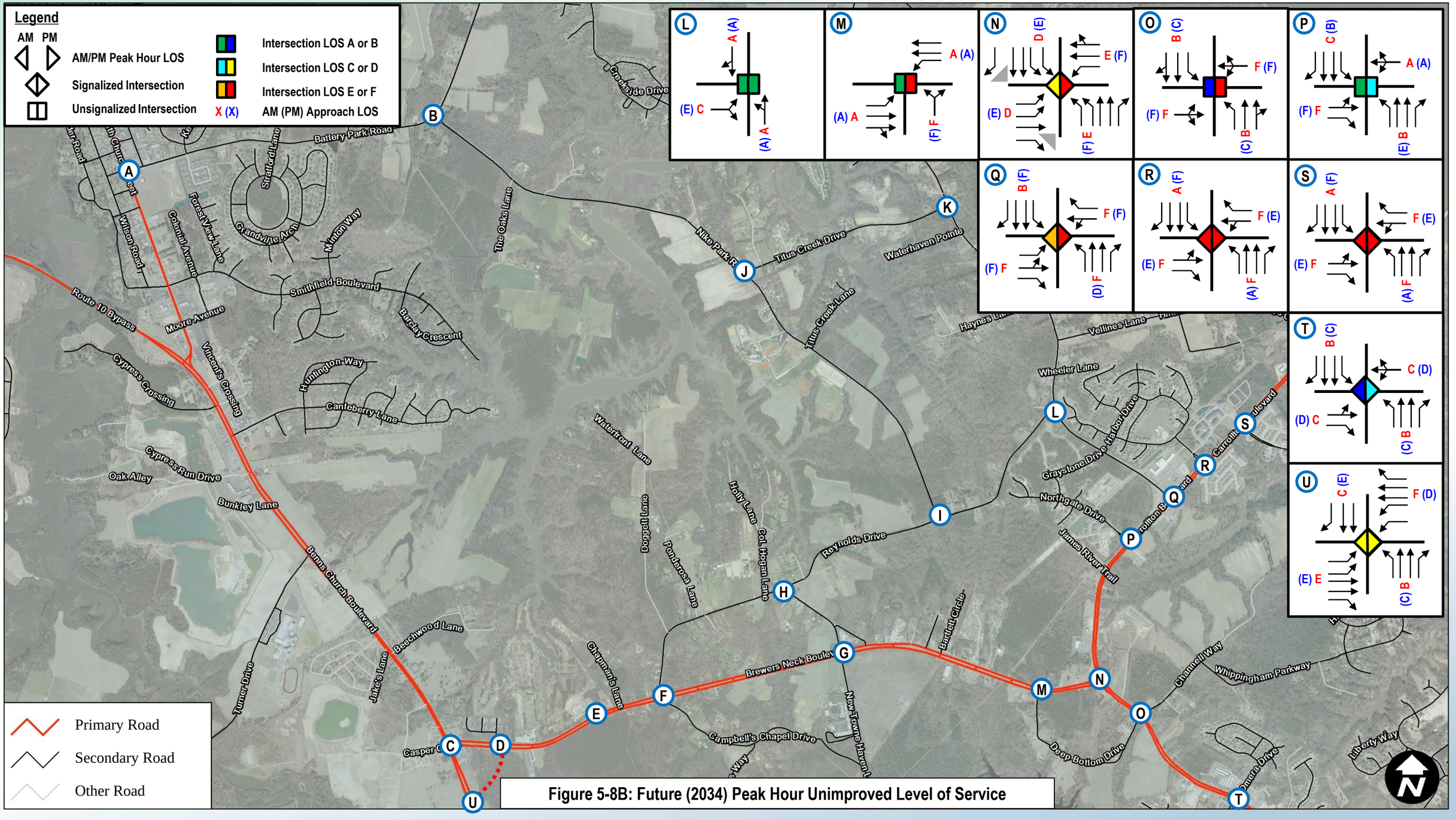


Figure 5-8B: Future (2034) Peak Hour Unimproved Level of Service

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Legend

AM PM — AM/PM Peak Hour LOS

Signalized Intersection

Unsignalized Intersection

Intersection LOS A or B

Intersection LOS C or D

Intersection LOS E or F

X (X) — AM (PM) Approach LOS

A — C (C); B (C); (D) C; (C) C

B — A (C); (A) A; (C) A

*Roundabout in improved condition.

C — B (A); B (D); (A) A; (D) B

D — D (D); B (B); (D) B; (B) C

E — C (D); B (D); (B) A

F — *LOS not reported due to Synchro limitations

G — D (D); B (B); (B) B; (D) D

H — A (A); (A) A; (A) A

I — A (A); D (D); (C) D; (B) A

J — A (B); C (D); (A) A

K — A (A); (B) B; (A) A

Primary Road

Secondary Road

Other Road

Figure 5-9A: Future (2034) Peak Hour Improved Level of Service

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Legend

AM PM — AM/PM Peak Hour LOS

Signalized Intersection

Unsignalized Intersection

Intersection LOS A or B

Intersection LOS C or D

Intersection LOS E or F

X (X) — AM (PM) Approach LOS

L: A (A), (B) C, (A) A

M: A (C), (A) A, (F) F

N: B (D), D (F), (D) C, (E) D

O: B (C), D (F), (F) E, (C) A

P: A (B), A (A), (E) D, (A) A

Q: B (E), D (E), (E) E, (C) D

R: A (F), E (E), (F) E, (B) C

S: A (F), D (E), (E) E, (A) B

T: B (B), D (E), (E) D, (C) B

U: C (E), E (E), (D) D, (B) B

V: B (A), (E) D, (B) B

Primary Road

Secondary Road

Other Road

Figure 5-9B: Future (2034) Peak Hour Improved Level of Service

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5.6.2 Roadway Capacity Analysis

Roadway level of service capacity analyses were performed for weekday AM and PM peak hours under the 2034 Unimproved and 2034 Improved traffic conditions. These analyses were performed using *Synchro Professional 7.0* which uses methodologies contained in the *2000 Highway Capacity Manual (HCM)* [TRB Special Report 209, 2000].

Using the traffic volumes forecasted in **Section 5.1**, along with the planned roadway improvements identified in **Section 5.3**, and the Nike Park Road Extension concept discussed in **Section 5.4**, arterial level of service was determined for the study area's primary roadways. Level of service describes traffic conditions at an intersection or on a roadway. LOS ranges from A to F—A indicating a condition of little or no congestion and F indicating a condition with severe congestion, unstable traffic flow, and stop-and-go conditions. For roadways, the arterial LOS is determined based on the arterial speed and distance between intersections. LOS D or better is generally considered acceptable. **Table 5-26** and **Table 5-27** summarize the results of the arterial LOS analyses for Brewer's Neck Boulevard and Carrollton Boulevard under 2034 conditions. Detailed reports are presented in **Appendix D** – Capacity Analysis.

Table 5-27: Brewer's Neck Boulevard Arterial LOS

Scenario	Eastbound				Westbound			
	AM		PM		AM		PM	
	ATS (mph)	LOS	ATS (mph)	LOS	ATS (mph)	LOS	ATS (mph)	LOS
2034 Unimproved								
Total	**34.4**	**B**	**30.7**	**C**	**36.9**	**B**	**21.4**	**D**
2034 Improved								
Total	**32.4**	**B**	**27.6**	**C**	**36.6**	**A**	**29.3**	**B**

Table 5-28: Carrollton Boulevard Arterial LOS

Scenario	Northbound				Southbound			
	AM		PM		AM		PM	
	ATS (mph)	LOS	ATS (mph)	LOS	ATS (mph)	LOS	ATS (mph)	LOS
2034 Unimproved								
Total	**17.5**	**E**	**32.2**	**C**	**27.7**	**C**	**10.4**	**F**
2034 Improved								
Total	**25.0**	**C**	**26.4**	**C**	**31.0**	**C**	**16.5**	**E**

Overall, arterial LOS and associated operations along both Brewer's Neck Boulevard and Carrollton Boulevard are expected to improve, primarily as a result of the additional travel lane capacity and enhanced traffic signal operations (especially traffic signal coordination) at the Brewer's Neck Boulevard/Carrollton Boulevard and Smith's Neck Road/Carrollton Boulevard intersections. However, the eastbound Brewer's Neck Boulevard AM and PM as well as the northbound Carrollton Boulevard PM arterial LOS decrease slightly in the 2034 Improved scenario due to the balance between additional capacity and operations.

Chapter 6.0 Future Access Management

As the region's most traveled corridors continue to attract commercial development, protecting mobility becomes essential for the efficiency of the transportation system and continued economic growth. Access management balances the needs of motorists using a roadway with the needs of adjacent property owners dependent upon access to the roadway. In an environment with limited funds for transportation projects and competing agendas, ***access management*** is not only good policy but also crucial to the health of the entire transportation network.

The Federal Highway Administration (FHWA) defines access management as "the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding system in terms of safety, capacity, and speed." According to the Access Management Manual, access management results from a cooperative effort between state and local agencies and private land owners to systematically control the "location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway."[1] Access management requires cooperation between government agencies and private land owners.

The 2008 Virginia General Assembly session enacted Chapter 274 legislation proposed to develop and implement access management regulations and standards in phases. The first phase which included standards and regulations applying only to VDOT highways classified as principal arterials took effect on July 1, 2008 while the second phase which includes minor arterials, collectors, and local streets went into effect on October 14, 2009. Based on VDOT's functional classification data, Carrollton Boulevard (U.S. Route 17) and Brewer's Neck Boulevard (U.S. Route 258/State Route 10) are federally designated as urban principal arterials. Nike Park Road (between Titus Creek Drive and Battery Park Road), Reynolds Drive (between Norsworthy Drive and Smith's Neck Road), along with Titus Creek Drive and Smith's Neck Road are designated as urban collectors between Carrollton Boulevard and the Town of Smithfield.

VDOT regulations stipulate that access points must meet both VDOT standards, outlined in VDOT's Access Management Regulations and any local standards that are equal to or exceed VDOT standards. Since Isle of Wight County does not have a formal set of access management regulations/guidelines, VDOT Access Management Regulations are relevant to all access proposals within the study area.

In general, the following access management strategies should be considered:

- Upon redevelopment or capital improvement projects, adjustments to median crossover spacing and driveway spacing should be considered to achieve VDOT standards.
- Upon development of vacant parcels or redevelopment of existing private residences, encourage shared use right-in/right-out driveways with internal connections between parcels.
- Upon redevelopment or capital improvement projects, adjustments to turn lanes and driveways (private and commercial) should be considered to achieve VDOT standards.
- All turn lane recommendations are preliminary and based upon operational and safety concerns.
- All recommendations for improvements should meet minimum VDOT design standards unless otherwise noted and justified.

Additionally, the National Cooperative Highway Research Program (NCHRP) has published *Report 420, Impact of Access Management Techniques*, which provides an assessment of access management techniques. Common examples of access management strategies are as follows:

- Eliminating and consolidating access driveways
- Establishing adequate signalized intersection spacing
- Establishing adequate unsignalized intersection access spacing
- Establishing appropriate median spacing
- Providing exclusive turn lanes

Section 6.1 Symptoms and Benefits of Access Management

Poor access management directly affects the livability and economic vitality of commercial corridors, ultimately discouraging potential customers from entering the area. A corridor with poor access management lengthens commute times, creates unsafe conditions, lowers fuel efficiency, and increases vehicle emissions. Signs of a corridor with poor access management include:

- Increased crashes between motorists, pedestrians, and cyclists
- Worsening efficiency of the roadway
- Congestion outpacing growth in traffic
- Spillover cut-through traffic on adjacent residential streets
- Limited sustainability of commercial development

Without access management, the function and character of major roadway corridors can deteriorate rapidly and adjacent properties can suffer from declining property values and high turnover. Access management results from a cooperative effort between state and local agencies and private land owners to systematically control the "location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway". Access management has wide-ranging benefits to a variety of users as shown in **Table 6-1**.

[1] Access Management Manual, Transportation Research Board, National Academy of Sciences, Washington DC, 2003

Table 6-1: Benefits of Corridor Access Management

User	Benefit
Motorists	▪ Fewer delays and reduced travel times ▪ Safer traveling conditions
Bicyclists	▪ Safer traveling conditions ▪ More predictable motorists movements ▪ More options in a connected street network
Pedestrians	▪ Median refuges and fewer access points increases safety ▪ More pleasant/comfortable walking environment
Transit Users	▪ Fewer delays and reduced travel times ▪ Safer, more convenient trips to and from transit stops in a connected street and sidewalk network
Freight	▪ Fewer delays and reduced travel times ▪ Lowers operational costs of delivering goods and services
Business Owners	▪ More efficient roadway system serves local and regional customers ▪ More pleasant roadway corridor attracts customers ▪ Improved corridor aesthetics ▪ Potential to stabilize property values
Government Agencies	▪ Lower costs to achieve transportation goals and objectives ▪ Protection of long-term investment in transportation infrastructure
Communities	▪ More attractive, efficient roadways without the need for constant roadway widening

Section 6.2 Access Management Strategies

Access management is not a one-size fits all solution to corridor congestion. Successful strategies differ throughout a region and even along the same road. A comprehensive access management program includes evaluation methods and supports the efficient and safe use of the corridors for all transportation modes. The purpose of the toolkit is to provide local engineering and planning officials with access management strategies as well as an overview of their application, use, and in some cases unit costs.

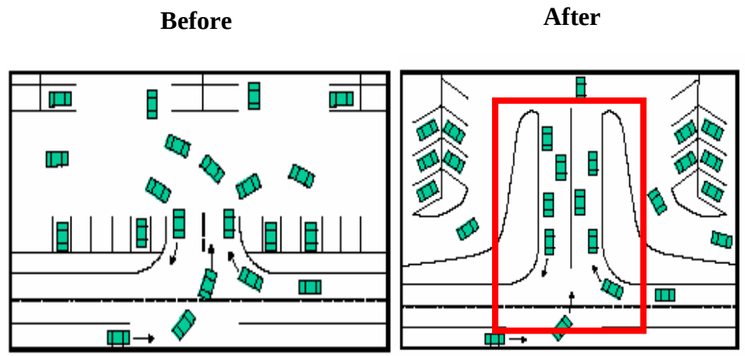
Section 6.3 Site Access Treatments

Improvements that reduce the total number of vehicle conflicts should be a key consideration during the approval of redeveloped sites along corridors identified for access management programs. Site access treatments include the following:

- Improved On-Site Traffic Circulation
- Number of Driveways
- Driveway Placement/Relocation
- Cross Access

Improved On-Site Traffic Circulation

One way to reduce traffic congestion is to promote on-site traffic circulation. Increasing the throat length of an entrance, as shown in the figures to the right, helps to avoid spillback onto the arterial. This action improves both the safety and efficiency of the roadway. A minimum separation of 100 feet should be provided to prevent internal site operations from affecting an adjacent public street and causing spillback problems. Approximate construction cost varies and usually is the responsibility of private development.



Number of Driveways

Only the minimum number of connections necessary to provide reasonable access should be permitted. For those situations where outparcels are under separate ownership, easements for shared access can be used to reduce the number of necessary connections. Reducing the number of access points also decreases the number of conflict points, making the arterial safer and more efficient. Approximate construction cost varies and is usually the responsibility of private development.

Driveway Placement/Relocation

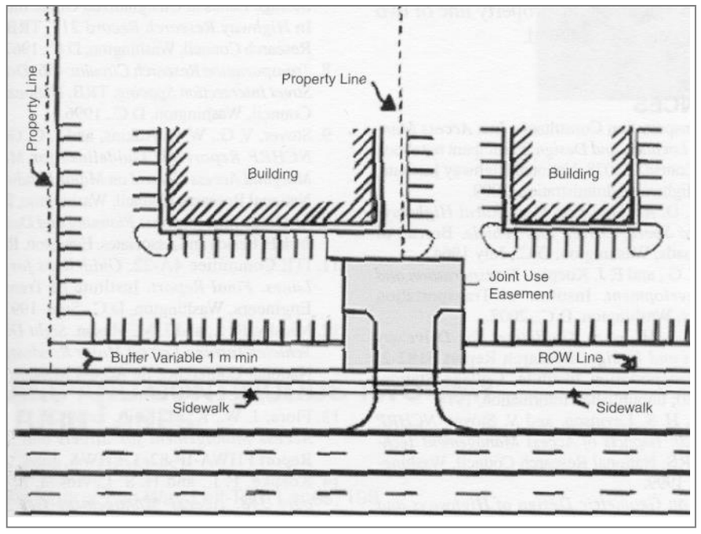
Driveways located close to intersections create and contribute to operational and safety issues. These issues include intersection and driveway blockages, increased points of conflict, frequent/unexpected stops in the through travel lanes, and driver confusion as to where vehicles are turning. Driveways that are close to intersections should be relocated or closed, as appropriate. As a best planning practice, no driveway should be allowed within 100 feet of the nearest intersection.

Cross Access or Shared Access

Cross access refers to a service drive or secondary roadway that provides vehicular access between two or more contiguous properties. Such access prevents the driver from having to enter the public street system to travel between adjacent uses. Cross access can be a function of good internal traffic circulation at large developments with substantial frontage along a major roadway. Similarly, backdoor access occurs when a parcel has access to a parallel street behind buildings and away from the main line. When combined with a median treatment, cross access and backdoor access ensure that all parcels have access to a median opening or traffic signal for left-turn movements.

Shared access and cross-access between adjacent developments will also offer the opportunity to better accommodate different amenities (bike lane, sidewalks, multi-use path) expected as a part of the roadway design. This will also assist in reducing the number of conflict points between different users. A schematic of a shared access driveway is illustrated in **Figure 6-1**.

Figure 6-1: Shared Access Driveway Schematic



Section 6.4 Signal Spacing for Coordination

Appropriate traffic signal spacing is critical in being able to provide good two-way vehicle progression along a corridor. It has become understood that appropriate spacing of traffic signals can dramatically improve safety and traffic operations. To achieve good signal coordination and provide traffic progression in both directions of travel, traffic signal spacing at multiples of ¼ mile is generally recommended for roadways in developed segments of the corridor, although this does not mean that a signal is warranted every ¼ mile interval. Depending on desired speeds and development along a roadway, signal spacing should be adjusted accordingly. The first priority for a proposed signal should be based on demand. In addition, consideration should be given to the type of property being served whether it is a centralized location of neighborhood use or direct access for industrial development. Per VDOT Access Management Design Standards for Entrances and Intersections, signalized intersection spacing must be a minimum of ½ mile for a principal arterial with a posted speed limit over 50 mph such as Brewer's Neck Boulevard. However, the ½ mile minimum spacing is not conducive to promoting efficient corridor traffic progression while the ¼ mile signal spacing reference is in regards to promoting signal coordination and traffic progression.

Section 6.5 Median Treatments

Non-Traversable Median



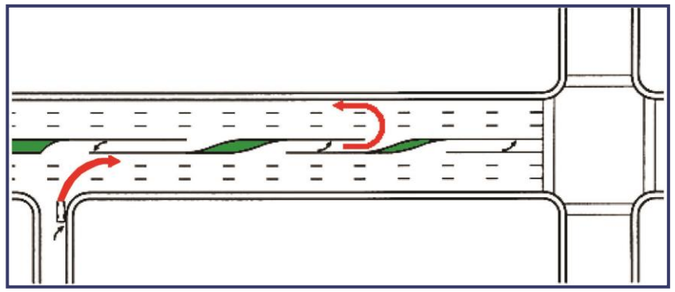
These features are raised or depressed barriers that physically separate opposing traffic flows. Inclusion in a new cross-section or retrofit of an existing cross-section should be considered for multi-lane roadways with high pedestrian volumes or collision rates as well as in locations where aesthetics are a priority. A non-traversable median requires sufficient cross and backdoor access. As these treatments are considered, sufficient spacing and locations for U- and left-turn bays must be identified.

The advantage of non-traversable medians include increased safety and capacity due to the separation of opposing vehicle flows, providing space for pedestrians to find refuge, and restricting turning movements to locations with appropriate turn lanes. Disadvantages include increased emergency vehicle response time (indirect routes to some destinations), inconvenience, increased travel distance for some movements, and potential opposition from the general public and affected property owners. To overcome some of these disadvantages, sufficient spacing and location of U-turn and left-turn bays must be identified. Approximate construction cost varies.

Median U-Turn Treatment

These treatments involve prohibiting or preventing side street or driveway left-turn movements between signalized intersections. Instead, these turns are made by first making a right turn and then making a U-turn at a nearby median crossover or intersection. These treatments can increase safety and efficiency of roadway corridors with high volumes of through traffic, but should not be used where there is not sufficient space available for the provision of U-turn movements. The location of U-turn bays must consider weaving distance while not contributing to excessive travel distance.

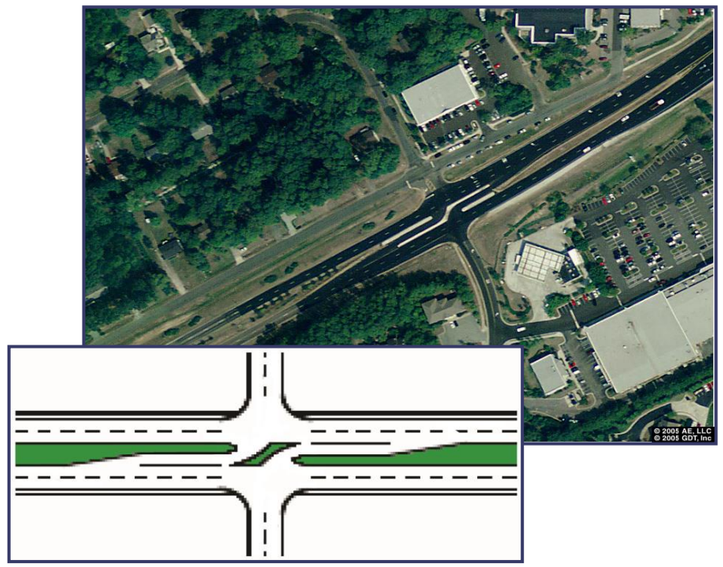
Advantages of median U-turn treatments include reduced delay for major intersection movements, potential for better two-way traffic progression (major and minor streets), fewer stops for through traffic, and fewer points of conflict for pedestrians and vehicles at intersections. Disadvantages include increased delay for some turning movements, increased travel distance, increased travel time for minor street left-turn movements, and increased driver confusion. Approximate construction cost is $50,000 to $60,000 per median crossover.



Median U-Turn Movement

Directional Crossover (Left-Over Crossing)

When a median exists on a corridor, special attention must be given to locations where left-turn movements are necessary. A left-over is a type of directional crossover that prohibits drivers on the cross road (side street) from proceeding straight through the intersection with the main road but allows vehicles on the mainline to turn left onto the cross road. Such designs are appropriate in areas with high traffic volumes on the major road and lower volumes of through traffic on the cross road, particularly where traffic needs to make left turns from the mainline onto the minor street. A properly implemented left-over crossing reduces delay for through-traffic and diverts some left-turn maneuvers from intersections. By reducing the number of conflict points for vehicles along the corridor, these treatments improve safety.



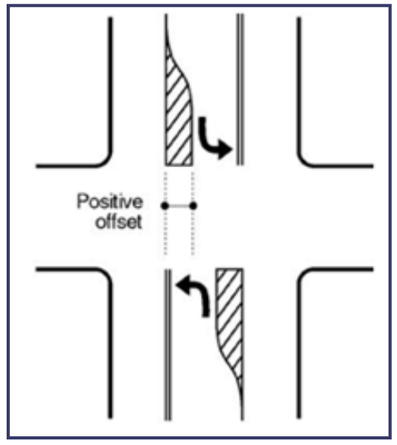
Left-Over Crossing

Left-Turn Storage Bays

Where necessary, exclusive left-turn lanes/bays should be constructed to provide adequate storage space exclusive of through traffic for turning vehicles. The provision of these bays reduces vehicle delay related to waiting for vehicles to turn and also may decrease the frequency of collisions attributable to lane blockages. In some cases, turn lanes/bays can be constructed within an existing median. Where additional right-of-way is required, construction may be more costly.

Offset Left-Turn Treatment

Exclusive left-turn lanes at intersections generally are configured to the right of one another, which causes opposing left-turning vehicles to block one another's forward visibility. An offset left-turn treatment shifts the left-turn lanes to the left, adjacent to the innermost lane of oncoming through traffic. In cases where permissive left-turn phasing is used, this treatment can improve efficiency by reducing crossing and exposure time and distance for left-turning vehicles. In addition, the positive offset improves sight distance and may improve gap recognition. In locations with sufficient median width, this treatment can be easily retrofitted. Where insufficient right-of-way width exists, the construction of this treatment can be difficult and costly. As a result, approximate construction costs vary.



Section 6.6 Managing Access

The relationships that will exist between the transportation system of Brewer's Neck Boulevard, Carrollton Boulevard, Nike Park Road, and future adjacent roadway network improvements, as well as future development within this study area will require coordination between the Isle of Wight County, the Town of Smithfield, and VDOT. This coordination was a key step in determining the location for proposed full-movement signalized intersections, shared/cross-access driveway locations, and additional turn-lane capacity. Managing access through land use planning and roadway design is necessary to establish and sustain orderly growth patterns that will minimize the impacts of land use on the transportation system.

Section 6.7 Short-Term Access Management Strategies

Short-term recommendations generally include improvements that are relatively inexpensive and easily implemented. These kinds of improvements usually do not require right-of-way acquisition and can be completed in a relatively short period of time. Some common short-term access recommendations include the addition of turn lanes, the installation of additional signage, and the consolidation of multiple access points for single parcels. In the short-term, these types of undertakings should be achieved.

Section 6.8 Mid-Term and Long-Term Access Management Strategies

The mid-term and long-term goal for this corridor is full compliance with VDOT access management regulations. To reach this goal it will be necessary to enact more significant and stringent access improvements over time. Mid-term and long-term recommendations generally include improvements that are more expensive or are more difficult to implement. These kinds of improvements also usually require right-of-way acquisition or easement agreements between land owners. Common long-term access recommendations include the restriction of movements at driveways, closure or realignment of driveways, as well as closure or modification of median openings.

There are several overarching principles which should guide access management strategies along the Brewer's Neck Boulevard and Carrollton Boulevard corridors. Upon development of vacant parcels or redevelopment of existing private residences, the creation of shared use right-in/right-out driveways with internal connections and/or reverse frontage roads between parcels should be highly encouraged. Shared-use access points will limit the impact of redevelopment on the corridor and will improve efficiency while still accommodating an increasing demand for access. Adjustments to driveway spacing and turn lanes should also be considered to achieve VDOT standards as opportunities arise.

The most significant access management strategy for the Brewer's Neck Boulevard corridor between Benn's Church Boulevard and Carrollton Boulevard will be the conversion of the existing 4-lane median divided typical section to a 6-lane median divided typical section and the need to truly restrict full movement median openings to only key intersection locations. Partial access should be provided at all other driveway locations. Significant access management strategies for the Brewer's Neck Boulevard/Carrollton Boulevard corridor may include modification, closing, or relocation of existing median crossovers and the reduction of the number of driveways along the corridor.

Chapter 7.0 Corridor Study Recommendations

There are two types of recommendations for the Brewer's Neck Boulevard Corridor Study area. Ongoing recommendations consist of recommended ongoing activities, policies, and procedures. These ongoing recommendations include the following:

- Closing/modifying access points and consolidating commercial and residential driveways as site plan approval, rezoning approval, and conditional use permits are given.
- Routinely clearing vegetation that blocks sign visibility, especially on minor street approaches.
- Retiming all traffic signals along the corridor on a regular schedule at 3 to 5 year intervals once all signals along the corridor are interconnected.
- Bicycle and pedestrian facilities throughout the study area should be consistent with the Isle of Wight *Pedestrian and Bicycle Facilities Master Plan* and be implemented/constructed as development occurs.

Recommendations for specific improvements to the Brewer's Neck Boulevard and Carrollton Boulevard corridors, as well as Nike Park Road have been split into short-term (six months to five years), mid-term (five to fifteen years), and long-term (fifteen to twenty-plus years) categories based primarily on their scale as well as the time frame in which they will be needed. Planning-level cost estimates, expressed in year 2013 dollars, have been included for all recommendations (See **Table 7-1** through **Table 7-3**). These planning-level cost estimates have been based on VDOT's statewide two-year cost averages for 2013, the VDOT Transportation & Mobility Planning Division's "Statewide Planning Level Cost Estimates" worksheet from 2009, and familiarity with similar projects and improvements throughout Virginia. Due to fluctuations in the costs of labor, materials, and equipment, fluctuations in the market and the outcome of competitive bidding as well as the general planning-level nature of the recommendations, these estimated costs are neither exact nor guaranteed.

Variation between actual and estimated costs will change as time passes, and the time value of money has not been taken into account. Cost estimations performed using the "Statewide Planning Level Cost Estimates" worksheet include right-of-way acquisition cost estimates developed with the sheet's methodology. The cost breakdown per scenario includes engineering/design costs, roadway/intersection improvement costs (e.g., cost per mile for a particular roadway typical section, turn-lane improvements, roundabout, bridges, milling, overlay, sidewalks, multi-use paths, channelization, etc.), traffic signal equipment improvement costs (e.g., poles, mast arms, signal heads, pedestrian signal head equipment and construction), construction engineering and inspection (CEI) costs, and right-of-way (ROW) acquisition. Furthermore, a 10 percent contingency was applied to construction cost. In the following cost summary tables, estimated dollars were rounded to the nearest $1,000.

Section 7.1 Short Term Recommendations and Planning Level Cost Estimates

Short term recommendations for the Brewer's Neck Boulevard Corridor study area consist of plan adoption, signage and pavement marking improvements, ongoing maintenance and upkeep, roadway safety enhancements (e.g., drainage and shoulder widening), the Nike Park Road Extension, as well as select intersection improvements needed in the near future.

Brewer's Neck Corridor Study Adoption

To memorialize the plan and the associated improvements envisioned for the corridor study area, Isle of Wight County must formally adopt the Brewer's Neck Corridor Study. The findings and recommendations from the study must then be incorporated in the County's Comprehensive Plan and the Hampton Roads Transportation Planning Organization's (HRTPO) Long Range Transportation Plan. It will be important for Isle of Wight County to work closely with the HRTPO so key projects can be incorporated into the VDOT Six Year Improvement Program (SYIP), and that funding sources are identified to ensure implementation.

Carrollton Boulevard (U.S. Route 17) Signal System

Develop and implement interim "time of day clock" coordinated signal timing plans to accommodate vehicle demands during the AM, Midday, PM, Off, and Weekend peak hours for the Carrollton Boulevard coordinated signal system consisting of the Brewer's Neck Boulevard, Smith's Neck Road, Eagle Harbor Parkway/Kings Crossing and Harbor Pointe Lane/Whippingham Parkway signalized intersections. Plans will have to be monitored and updated periodically until communications equipment can be installed to maintain consistent coordination between corridor traffic signals.

Nike Park Road Extension

- Proposed construction of a new roadway/connection between the existing terminus/intersection of Nike Park Road at Reynolds Drive to a location along Carrollton Boulevard approximately midway between the Brewer's Neck Boulevard intersection to the south and the Northgate Drive intersection to the north. This new segment is approximately 1 mile in length.
- Construct initially as a two-lane typical section on right-of-way capable of accommodating an ultimate four-lane median divided typical section.
- Employ desirable access management strategies to accommodate, prohibit, restrict, or best mitigate full-movement crossovers/intersections located along the corridor for proposed developments.

Nike Park Road Extension at Carrollton Boulevard

- Install traffic signal as a part of the roadway extension/intersection project.
- Coordinate traffic signal timings/operations with adjacent signalized intersections.
- Optimize traffic signal phasing and timing plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard.

<u>Northbound Carrollton Boulevard</u>

- Construct one exclusive left-turn lane
- Maintain two through lanes

<u>Southbound Carrollton Boulevard</u>

- Maintain two through lanes
- Construct one exclusive right-turn lane

<u>Eastbound Nike Park Road Extension</u>

- Construct two exclusive left-turn lanes
- Construct one exclusive right-turn lane

Battery Park Road at Nike Park Road Roundabout

- Construct a single-lane roundabout to serve as traffic control at the Battery Park Road and Nike Park Road intersection. This will replace the existing traffic signal at this location.
- Install "roundabout ahead" advance warning signage along northbound Nike Park Road as well as eastbound and westbound Battery Park Road.
    - Consider the construction and installation of a free-flow right "slip-lane"
    - Construct a 750' receiving lane along southbound Nike Park Road to receive right-turning traffic traveling from eastbound Battery Boulevard to southbound Nike Park Road

Nike Park Road Roadway Improvements

- Improve portions of Nike Park Road to address stormwater drainage deficiencies.
  - Roadway needs to be improved in low lying areas to prevent ponding and/or flooding in the vicinity of Reynolds Drive and near the Jones Creek Bridge.
  - Maintain ditches on a regular basis to ensure roadway is able to drain appropriately.
- Improve portions of Nike Park Road to address safety concerns.
  - Improve/strengthen shoulders along Nike Park Road to enhance safety of the roadway.
  - Install "intersection ahead" advance warning signage and/or flashing beacons along Nike Park Road for traffic approaching Reynolds Drive, Titus Creek Drive, Carrollton Nike Park Entrance Driveway.

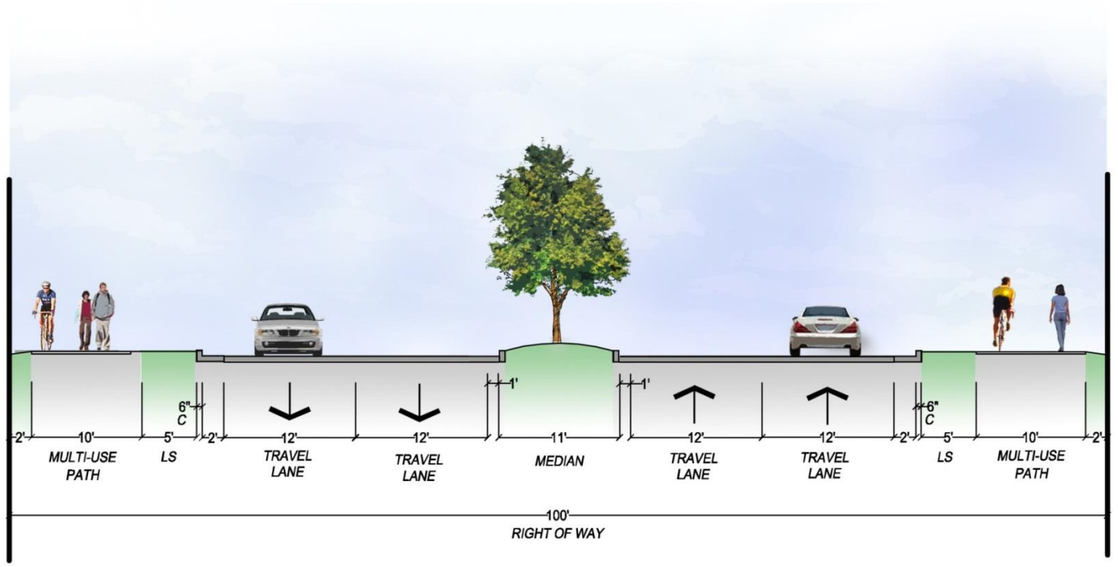
Smith's Neck Road Roadway Improvements

- Improve portions of Nike Park Road to address stormwater drainage deficiencies.
  - Roadway needs to be improved in low lying areas to prevent ponding and/or flooding.
- Improve portions of Smith's Neck Road to address safety concerns.
  - Improve/strengthen shoulders along Smith's Neck Road to enhance driver safety along the roadway.
  - Install "intersection ahead" advance warning signage and/or flashing beacons along Smith's Neck Road for traffic approaching Reynolds Drive and Titus Creek Drive intersections.

Battery Park Road Corridor

- As a result of the public involvement process, Option 1 (as shown in **Figure 7-1)** was identified as the preferred option to widen Battery Park Road from a 2-lane to a 4-lane, median divided typical section with a 10-foot multi-use path on either side of Battery Park Road.
- Construct a 10 to 12-foot variable width raised landscaped median along the corridor between the S. Church Street intersection to the west and Nike Park Road intersection to the east.
  - This will allow for the accommodation of an exclusive left-lane at primary full-movement intersections.
- Employ desirable access management strategies to accommodate, prohibit, restrict, or best mitigate full-movement crossovers/intersections located along the roadway. Maintain or locate full-movement intersections at the following locations:
  - John Rolfe Drive
  - Kendall Haven/Villa Drive
  - Stratford Lane
  - Location and spacing of other subsequent full-movement intersections will be based on the immediately adjacent full-movement intersection(s) or partial access intersection(s), VDOT Access Management Guidelines, and intersections serving high traffic demand side streets locations.

Figure 7-1: Battery Park Road 4-Lane Typical Section – Option # 1



Carrollton Boulevard at Northgate Drive

- Install traffic signal (when signal warrants are met)
- Coordinate traffic signal timings/operations with adjacent signalized intersections
- Optimize traffic signal phasing and timing plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard

Northbound Carrollton Boulevard

- Maintain one exclusive left-turn lane
- Maintain two through lanes
- Maintain one exclusive right-turn lane

Southbound Carrollton Boulevard

- Maintain one exclusive left-turn lane
- Maintain two through lanes
- Maintain one exclusive right-turn lane

Eastbound Northgate Drive

- Maintain one shared through/left-turn lane
- Maintain one exclusive right-turn lane

Westbound Northgate Drive

- Maintain one shared left/through/right-turn lane

Nike Park Road at Titus Creek Drive

Northbound Nike Park Road

- Maintain one through lane
- Construct one exclusive right-turn lane

Southbound Nike Park Road

- Construct one exclusive left-turn lane
- Maintain one through lane

Westbound Titus Creek Drive

- Stripe/delineate one exclusive left-turn lane
- Construct one exclusive right-turn lane

Smith's Neck Road at Titus Creek Drive

Northbound Smith's Neck Road

- Construct one exclusive left-turn lane
- Maintain one through lane

Southbound Smith's Neck Road

- Maintain one shared through/right-turn lane

Eastbound Titus Creek Drive

- Stripe/delineate one exclusive left-turn lane
- Construct one exclusive right-turn lane

Nike Park Road/Nike Park Road Extended at Reynolds Drive

Northbound Nike Park Road Extended

- Construct one exclusive left-turn lane
- Construct one shared through/right-turn lane

Southbound Nike Park Road

- Construct one exclusive left-turn lane
- Maintain one shared through/right-turn lane

Eastbound Reynolds Drive

- Maintain one shared left/through/right-turn lane

Westbound Reynolds Drive

- Construct one exclusive left-turn lane
- Maintain one through lane
- Construct one exclusive right-turn lane

7.1.1 Planning Level Cost Estimates – Short Term

Item	Total
Engineering/Design	$3,992,000.00
Roadway/Intersection Improvements*	$22,322,500.00
Traffic Signal Equipment Improvements	$1,308,250.00
Construction Engineering and Inspection (CEI)	$2,365,000.00
Right-of-Way (ROW)	$3,810,000.00
Construction Contingency (10%)	$2,365,000.00
Total	**$36,162,750.00**

**Roadway/intersection improvement costs include applicable signage, turn-lane, and pavement marking costs.*

Table 7-1: Short-Term "Recommendations and Action Items"	Cost Estimate [A]	Timeframe [B]	Responsible Party
Formally Adopt the *Brewer's Neck Corridor Study*	$0	2014	IOW County
Carrollton Boulevard Signal System – Develop and implement interim "time of day clock" coordinated signal timing plans to accommodate vehicle demands during the AM, Midday, PM, Off, and Weekend peak hours.	$30,000.00	2014	VDOT
Nike Park Road Extension – Construct a new two-lane roadway/connection between the existing terminus/intersection of Nike Park Road at Reynolds Drive to a location along Carrollton Boulevard approximately midway between Brewer's Neck Boulevard and Northgate Drive.	$8,025,000.00	2018	VDOT/IOW County/Developers
Nike Park Road Extension and Carrollton Boulevard – Install a traffic signal, coordinate traffic signal timings/operations with adjacent signalized intersections, optimize traffic signal phasing and timings plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard. Construct one exclusive northbound left-turn lane, one exclusive southbound right-turn lane, two exclusive eastbound left-turn lanes, and one exclusive eastbound right-turn lane.	$1,263,000.00	2018	VDOT/County
Battery Park Road and Nike Park Road – Construct a single-lane roundabout to replace the existing traffic signal. Install "Roundabout Ahead" advance warning signage along northbound Nike Park Road and eastbound/westbound Battery Park Road. Construct a 750-foot receiving lane along southbound Nike Park Road.	$1,961,000.00	2017	VDOT/Town of Smithfield/IOW County
Nike Park Road – Improve portions of road to address stormwater drainage deficiencies such as low lying areas to prevent ponding and/or flooding near Jones Creek Bridge as well as maintain ditches on a regular basis to ensure roadway drains properly. Improve portions of the road to address safety concerns such as improve/strengthen shoulders and install "Intersection Ahead" advance warning signage and/or flashing beacons for traffic approaching key intersections.	$2,664,000.00	2016	VDOT/County
Smith's Neck Road – Improve portions of road to address stormwater drainage deficiencies such as low lying areas to prevent ponding and/or flooding. Improve portions of the road to address safety concerns such as improve/strengthen shoulders and install "Intersection Ahead" advance warning signage and/or flashing beacons for traffic approaching key intersections.	$3,793,000.00	2016	VDOT/County
Battery Park Road – Widen to a four-lane, median divided typical section with 10-foot multi-use paths on both sides of the corridor. The median should be a 10 to 12-foot variable width raised, landscaped median between South Church Street and Nike Park Road.	$13,889,000.00	2017	VDOT/County
Carrollton Boulevard and Northgate Drive – Install a traffic signal, coordinate traffic signal timings/operations with adjacent signalized intersections, optimize traffic signal phasing and timings plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard.	$406,000.00	2015	Developer
Nike Park Road and Titus Creek Drive – Construct one exclusive northbound right-turn lane, one exclusive southbound left-turn lane, and one exclusive westbound right-turn lane as well as stripe/delineate one exclusive westbound left-turn lane.	$1,471,000.00	2016	VDOT/County
Smith's Neck Road and Titus Creek Drive – Construct one exclusive northbound left-turn lane and one exclusive westbound right-turn lane as well as stripe/delineate one exclusive westbound left-turn lane.	$1,100,000.00	2016	VDOT/County
Nike Park Road and Reynolds Drive – Construct one exclusive southbound left-turn lane, one exclusive northbound left-turn lane, and improve the westbound approach to include one exclusive right-turn lane and one shared through/left-turn lane. Reynolds Drive approaches to the intersection will be STOP controlled.	$1,563,000.00	2016	VDOT/County

[A] Cost estimate includes estimated design cost and ten percent contingency. Probable cost estimate is engineer's approximation in 2013 dollars and is subject to change based on increased construction materials, design, or time of implementation.
[B] Timeframe for implementation is an estimate based on project need and available funding. Actual timeframe may vary based on externalities.

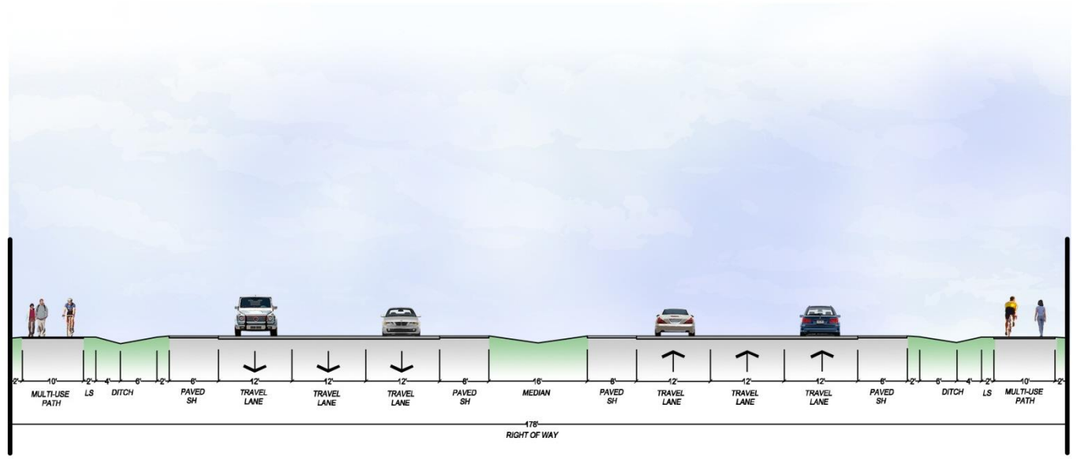
Section 7.2 Mid-Term Recommendations and Planning Level Cost Estimates

Mid-term recommendations for the Brewer's Neck Boulevard corridor study area include the widening of Brewer's Neck Boulevard and Carrollton Boulevard from 4-lane typical sections to 6-lane typical sections, the installation of new or the modification of existing traffic signals, as well as smaller scale intersection capacity improvements.

Carrollton Boulevard Corridor

- As a result of the public involvement process, Option 1 (as shown in **Figure 7-2**) was identified as the preferred option to widen Carrollton Boulevard from a 4-lane to a 6-lane, median divided typical section with 10-foot multi-use paths on either side of the roadway.
- Construct 16 to 20-foot variable width median along the corridor between Brewer's Neck Boulevard to the south and Harbor Pointe Lane/Whippingham Parkway to the north
    - This will allow for the construction of 12-foot full width left turn-lanes where applicable while maintaining a 4 to 8-foot median to provide physical separation between traffic located in the turn-lane and traffic in the opposing/oncoming travel lane.
- Transition of the roadway from a 6-lane facility back down to a 4-lane facility should occur over a distance of approximately 2,200 feet north of the Harbor Pointe Lane/Whippingham Parkway intersection.
    - This will allow for an adequate transition between the two typical sections and mitigate the potential for congestion as vehicles merge down from 3 to 2 lanes traveling northbound toward the James River Bridge.
- Maintain and/or implement desirable access management strategies to accommodate, prohibit, restrict, or best mitigate full-movement crossovers/intersections located along the corridor. Maintain or locate full-movement intersections at the following locations:
    - Nike Park Road Extension
    - Northgate Drive
    - Smith's Neck Road
    - Eagle Harbor Parkway/Kings Crossing
    - Harbor Pointe Lane/Whippingham Parkway
    - Location and spacing of other subsequent full-movement intersections will be based on the immediately adjacent full-movement intersection or partial access intersection, VDOT Access Management Guidelines, and intersections serving high traffic demand side streets locations.
- Construct exclusive left-turn lanes along Carrollton Boulevard at designated full-movement intersections
- Construct partial access intersections along Brewer's Neck Boulevard consisting of right-in/right-out/left –over laneage or channelized U-Turns

Figure 7-2: Carrollton Boulevard 6-Lane Typical Section – Option # 1



Carrollton Boulevard Signal System Wireless Interconnect

- Install wireless interconnect (underground fiber or overhead) and coordinate all signals along Carrollton Boulevard to operate as one coordinated signal system.
    - Implement coordinated signal timing plans to accommodate vehicle demands during the AM, Midday, PM, Off, and Weekend peak hours as needed.
- Interconnect installation and coordination of traffic signals along Carrollton Boulevard should take place as a part of the proposed Carrollton Boulevard widening project
- Maintain coordination of traffic signals between Brewer's Neck Boulevard/Carrollton Boulevard to the south and Carrollton Boulevard/Harbor Pointe Lane/Whippingham Parkway intersections to the north

Carrollton Boulevard at Nike Park Road Extended

- Install a new traffic signal to accommodate proposed roadway widening and intersection capacity/operational changes
- Optimize traffic signal phasing and timing plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard

<u>Northbound Carrollton Boulevard</u>

- Maintain/construct one exclusive left-turn lane
- Construct three through lanes

<u>Southbound Carrollton Boulevard</u>

- Construct three through lanes
- Maintain/construct one exclusive right-turn lane

Eastbound Nike Park Road Extension
- Maintain/construct two exclusive left-turn lanes
- Maintain one exclusive right-turn lane

Carrollton Boulevard at Northgate Drive
- Install a traffic signal to accommodate proposed roadway widening and intersection capacity/operational changes
- Optimize traffic signal phasing and timing plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard

Northbound Carrollton Boulevard
- Maintain/construct one exclusive left-turn lane
- Construct three through lanes
- Maintain/construct one exclusive right-turn lane

Southbound Carrollton Boulevard
- Maintain/construct one exclusive left-turn lane
- Construct three through lanes
- Maintain/construct one exclusive right-turn lane

Eastbound Northgate Drive
- Maintain approach to reflect:
  - One shared through/left-turn lane
  - One exclusive right-turn lane

Westbound Northgate Drive
- Maintain approach to reflect one shared left/through/right-turn lane

Carrollton Boulevard at Smith's Neck Road
- Install a new traffic signal to accommodate proposed roadway widening and intersection capacity/operational changes
- Optimize traffic signal phasing and timing plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard

Northbound Carrollton Boulevard
- Construct two exclusive left-turn lanes
- Construct three through lanes
- Construct one exclusive right-turn lane

Southbound Carrollton Boulevard
- Construct one exclusive left-turn lane
- Construct three through lanes
- Construct one exclusive right-turn lane

Eastbound Smith's Neck Road
- Construct two exclusive left-turn lanes
- Construct one exclusive through lane
- Maintain/construct one exclusive right-turn lane

Westbound Smith's Neck Road
- Construct one exclusive left-turn lane
- Construct one exclusive through lane
- Maintain/construct one exclusive right-turn lane

Carrollton Boulevard at Eagle Harbor/Kings Crossing
- Install a new traffic signal to accommodate proposed roadway widening and intersection capacity/operational changes
- Optimize traffic signal phasing and timing plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard

Northbound Carrollton Boulevard
- Construct one exclusive left-turn lane
- Construct three through lanes
- Construct one exclusive right-turn lane

Southbound Carrollton Boulevard
- Construct one exclusive left-turn lane
- Construct three through lanes
- Construct one exclusive right-turn lane

Eastbound Eagle Harbor Parkway
- Maintain one shared through/left-turn lane
- Maintain one exclusive right-turn lane

Westbound Kings Crossing
- Maintain one shared through/left-turn lane
- Maintain one exclusive right-turn lane

Carrollton Boulevard at Harbor Pointe Lane/Whippingham Parkway

- Install a new traffic signal to accommodate proposed roadway widening and intersection capacity/operational changes
- Optimize traffic signal phasing and timing plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard

Northbound Carrollton Boulevard

- Construct one exclusive left-turn lane
- Construct three through lanes
- Construct one exclusive right-turn lane

Southbound Carrollton Boulevard

- Construct one exclusive left-turn lane
- Construct three through lanes
- Construct one exclusive right-turn lane

Eastbound Harbor Pointe Lane

- Maintain one shared through/left-turn lane
- Maintain one exclusive right-turn lane

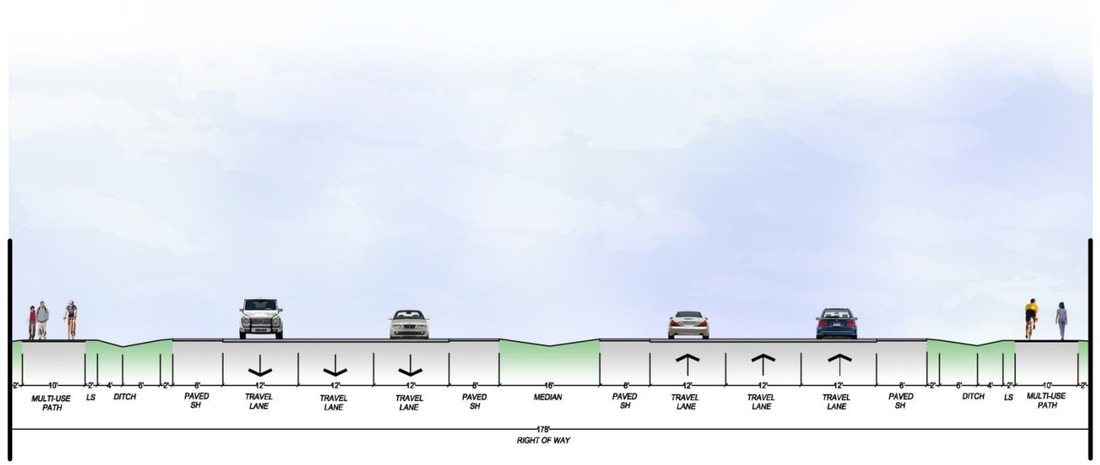
Westbound Whippingham Parkway

- Maintain one shared through/left-turn lane
- Maintain one exclusive right-turn lane

Brewer's Neck Boulevard Corridor

- As a result of the public involvement process, Option 1 (as shown in **Figure 7-3**) was identified as the preferred option to widen Brewer's Neck Boulevard from a 4-lane to a 6-lane, median divided typical section with a 10-foot multi-use path on both sides of the roadway.
- Construct a 16 to 20-foot variable width median along the corridor between the proposed /Queen Anne's Court intersection to the west and Carrollton Boulevard to the east.
    - This will allow for the construction of a 12-foot full width left-turn lane as well as a 4 to 8-foot median to provide/maintain physical separation between traffic located in the left-turn lane and traffic in the opposing/oncoming travel lane.
- Employ desirable access management strategies to accommodate, prohibit, restrict, or best mitigate full-movement crossovers/intersections located along the corridor. Maintain or locate full-movement intersections at the following locations:
    - Brewer's Neck Boulevard Extended/Queen Anne's Court
    - Sentara Way
    - Reynolds Drive/Campbell's Chapel Way
    - Norsworthy Drive/New Towne Haven Lane
    - Deep Bottom Drive
    - Location and spacing of other subsequent full-movement intersections will be based on the immediately adjacent full-movement intersection(s) or partial access intersection(s), VDOT Access Management Guidelines, and intersections serving high traffic demand side streets locations.
- Construct exclusive left-turn lanes along Brewer's Neck Boulevard at designated full-movement intersections
- Construct partial access intersections along Brewer's Neck Boulevard consisting of right-in/right-out/left –over laneage or channelized U-Turns

Figure 7-3: Brewer's Neck Boulevard 6-Lane Typical Section – Option # 1



Brewer's Neck Boulevard Signal System Wireless Interconnect

- Install wireless interconnect (underground fiber or overhead) and coordinate all signals along Brewer's Neck Boulevard to operate as one coordinated signal system.
    - Implement coordinated signal timing plans to accommodate vehicle demands during the AM, Midday, PM, Off, and Weekend peak hours as needed.
- Interconnect installation and coordination of traffic signals along Brewer's Neck Boulevard should take place as a part of the proposed Brewer's Neck Boulevard widening project
- Maintain coordination of traffic signals between the Brewer's Neck Boulevard/Carrollton Boulevard intersection to the east and the Brewer's Neck Boulevard/Queen Ann's Court/Brewer's Neck Boulevard Extended intersection to the west.

Brewer's Neck Boulevard at Queen Anne's Court/Brewer's Neck Boulevard Extended

- Modify/upgrade traffic signal as a part of road widening project
- Coordinate traffic signal timings/operations with Benn's Church Boulevard/Brewer's Neck Boulevard Extended traffic signal timings/operations

Northbound Brewer's Neck Boulevard Extended

- Construct one exclusive left-turn lane
- Maintain one through lane
- Maintain two exclusive right-turn lanes

Southbound Queen Anne's Court

- Construct one exclusive left-turn lane
- Construct one through lane
- Construct one exclusive right-turn lane

Eastbound Brewer's Neck Boulevard

- Modify/improve one exclusive left-turn lane
- Construct three through lanes

Westbound Brewer's Neck Boulevard

- Maintain/construct two exclusive left-turn lanes
  - The outside exclusive left-turn lane will be a "trap" lane for the inside through lane
- Construct two through lanes
- Construct one exclusive right-turn lane

Brewer's Neck Boulevard at Sentara Way

- Install traffic signal when signal warrants are met
- Coordinate traffic signal timings/operations with Brewer's Neck Boulevard/Queen Anne's Court/Brewer's Neck Boulevard Extended traffic signal timings/operations

Southbound Sentara Way

- Maintain approach to reflect:
  - One exclusive left-turn lane
  - One exclusive right-turn lane

Eastbound Brewer's Neck Boulevard

- Modify/improve one exclusive left-turn lane
- Construct three through lanes

Westbound Brewer's Neck Boulevard

- Maintain/construct one exclusive left-turn lane
- Construct three through lanes
- Maintain/construct one exclusive right-turn lane

Brewer's Neck Boulevard at Norsworthy Drive/New Towne Haven Lane

- Install new traffic signal to accommodate proposed roadway widening and intersection capacity/operational changes
- Coordinate traffic signal timings/operations with Brewer's Neck Boulevard/Queen Anne's Court/Brewer's Neck Boulevard Extended traffic signal timings/operations

Northbound New Towne Haven Lane

- Construct one exclusive left-turn lane
- Construct one shared through/right-turn lane

Southbound Norsworthy Drive

- Construct one exclusive left-turn lane
- Construct one shared through/right-turn lane

Eastbound Brewer's Neck Boulevard

- Maintain/construct one exclusive left-turn lane
- Construct three through lanes
- Maintain/construct one exclusive right-turn lane

Westbound Brewer's Neck Boulevard

- Maintain/construct one exclusive left-turn lane
- Construct three through lanes
- Maintain/construct one exclusive right-turn lane

Brewer's Neck Boulevard at Carrollton Boulevard

- Install new traffic signal to accommodate proposed roadway widening and intersection capacity/operational changes
- Maintain coordination of traffic signals as a part of the Carrollton Boulevard corridor coordinated signal system between the Brewer's Neck Boulevard/Carrollton Boulevard intersection and Carrollton Boulevard Harbor Pointe Lane/Whippingham Parkway intersection
- Optimize traffic signal phasing and timing plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard

Northbound Carrollton Boulevard

- Construct two exclusive left-turn lanes
- Maintain/construct two through lanes
- Construct one exclusive right-turn lane

Southbound Carrollton Boulevard

- Construct two exclusive left-turn lanes
- Maintain/construct two through lanes
- Construct one exclusive free-flow right-turn lane
  - Right-turn lane is a "drop" lane for outside through lane.

Eastbound Brewer's Neck Boulevard

- Construct three exclusive left-turn lanes
- Construct one through lane
- Construct one exclusive free-flow right-turn lane

Westbound Brewer's Neck Boulevard (The Crossings)

- Construct one exclusive left-turn lane
- Construct two through lanes
- Construct one exclusive right-turn lane

7.2.1 Planning Level Cost Estimates – Mid Term

Item	Total
Engineering/Design	$4,580,000.00
Roadway/Intersection Improvements*	$24,876,000.00
Traffic Signal Equipment Improvements	$3,441,500.00
Construction Engineering and Inspection (CEI)	$2,833,000.00
Right-of-Way (ROW)	$2,518,000.00
Construction Contingency (10%)	$2,833,000.00
Total	**$41,081,500.00**

**Roadway/intersection improvement costs include applicable signage, turn-lane, and pavement marking costs.*

Table 7-2: Mid-Term "Recommendations and Action Items"	Cost Estimate [A]	Timeframe [B]	Responsible Party
Carrollton Boulevard – Widen to a six-lane, median divided typical section with 10-foot multi-use paths on both sides of the corridor. The median should be a 10 to 12-foot variable width median between Brewer's Neck Boulevard and Harbor Pointe Lane/Whippingham Parkway. Transition from a six-lane roadway back down to a four-lane roadway should occur over a distance approximately 2,200 feet north of Harbor Lane/Whippingham Parkway to allow adequate transition before the James River Bridge.	$15,299,000	2023	VDOT/IOW County
Carrollton Boulevard Signal System Wireless Interconnect – Install wireless interconnect (underground fiber or overhead) and coordinate all signals along Carrollton Boulevard to operate as one system. Implement coordinated signal timing plans to accommodate vehicle demands during the AM, Midday, PM, Off, and Weekend peak hours as needed.	$461,000	2023	VDOT/IOW County
Carrollton Boulevard and Nike Park Road Extended – Install a traffic signal, coordinate traffic signal timings/operations with adjacent signalized intersections, optimize traffic signal phasing and timings plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard. On the northbound and southbound approaches, construct three through lanes and maintain/construct one exclusive northbound left-turn lane and one exclusive southbound right-turn lane.	$429,000	2023	VDOT/IOW County/Developers
Carrollton Boulevard and Northgate Drive – Install a new traffic signal, maintain coordination with adjacent signalized intersections, and optimize traffic signal phasing and timings plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard. On the northbound and southbound approaches, construct one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane.	$429,000	2023	VDOT/IOW County
Carrollton Boulevard and Smith's Neck Road – Install a new traffic signal, maintain coordination with adjacent signalized intersections, and optimize traffic signal phasing and timings plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard. On the northbound approach, construct two exclusive left-turn lanes, three through lanes, and one exclusive right-turn lane. On the southbound approach, construct one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane. On the eastbound approach, construct two exclusive left-turn lanes, one through lane, and one exclusive right-turn lane. On the westbound approach, construct one exclusive left-turn lane, one through lane, and on exclusive right-turn lane.	$438,000	2023	VDOT/IOW County
Carrollton Boulevard and Eagle Harbor/Kings Crossing – Install a new traffic signal, maintain coordination with adjacent signalized intersections, and optimize traffic signal phasing and timings plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard. On the northbound and southbound approaches, construct one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane.	$438,000	2023	VDOT/IOW County
Carrollton Boulevard and Harbor Pointe Lane/Whippingham Parkway – Install a new traffic signal, maintain coordination with adjacent signalized intersections, and optimize traffic signal phasing and timings plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard. On the northbound and southbound approaches, construct one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane.	$438,000	2023	VDOT/IOW County
Brewer's Neck Boulevard – Widen to a six-lane, median divided typical section with 10-foot multi-use paths on both sides of the corridor. The median should be a 10 to 12-foot variable width median between Queen Anne's Court and Carrollton Boulevard.	$21,026,000	2028	VDOT/IOW County
Brewer's Neck Boulevard Signal System Wireless Interconnect – Install wireless interconnect (underground fiber or overhead) and coordinate all signals along Brewer's Neck Boulevard to operate as one system. Implement coordinated signal timing plans to accommodate vehicle demands during the AM, Midday, PM, Off, and Weekend peak hours as needed.	$263,000	2028	VDOT/IOW County
Brewer's Neck Boulevard and Queen Anne's Court/Brewer's Neck Boulevard Extension – Modify/upgrade the traffic signal and coordinate traffic signal timings/operations with Benn's Church Boulevard/Brewer's Neck Boulevard Extended signal. Construct one exclusive northbound left-turn lane, three eastbound through lanes, two westbound through lanes, two exclusive westbound left-turn lanes, and one exclusive westbound right-turn lane. Modify/stripe the southbound approach to have one shared through/left-turn lane and one exclusive right-turn lane as well as the eastbound approach to have one exclusive left-turn lane.	$376,000	2028	VDOT/IOW County/Developers
Brewer's Neck Boulevard and Sentara Way – Install a traffic signal once signal warrants are met; coordinate traffic signal timings/operations with Brewer's Neck Boulevard/Queen Anne's Court. Construct three eastbound and westbound through lanes as well as modify the eastbound approach to have one exclusive left-turn lane and the westbound approach to contain one exclusive left-turn lane and one exclusive right-turn lane.	$444,000	2028	VDOT/IOW County/Developers
Brewer's Neck Boulevard and Norsworthy Drive/Towne Haven Lane – Install a new traffic signal and coordinate traffic signal timings/operations with Brewer's Neck Boulevard/Queen Anne's Court. Construct one exclusive northbound left-turn lane and one shared through/right-turn lane. On the southbound approach, construct one exclusive left-turn lane and one shared through/right-turn lane. On the eastbound and westbound approaches, construct one exclusive left-turn lane, three through lanes, and one exclusive right-turn lane.	$458,000	2028	VDOT/IOW Count/Developers

Table 7-2: Mid-Term "Recommendations and Action Items"	Cost Estimate [A]	Timeframe [B]	Responsible Party
Brewer's Neck Boulevard and Carrollton Boulevard – Install a new traffic signal, maintain coordination with adjacent signalized intersections, and optimize traffic signal phasing and timings plans to accommodate peak/off-peak hour traffic along Carrollton Boulevard. On the northbound and southbound approaches, construct two exclusive left-turn lanes, two through lanes, and one exclusive right-turn lane. On the eastbound approach construct three exclusive left-turn lanes, one through lane, and one exclusive free-flow right-turn lane. On the westbound approach construct one exclusive left-turn lane, two through lanes, and one exclusive right-turn lane.	$587,000	2028	VDOT/IOW County/Developers

[A] Cost estimate includes estimated design cost and ten percent contingency. Probable cost estimate is engineer's approximation in 2013 dollars and is subject to change based on increased construction materials, design, or time of implementation.
[B] Timeframe for implementation is an estimate based on project need and available funding. Actual timeframe may vary based on externalities.

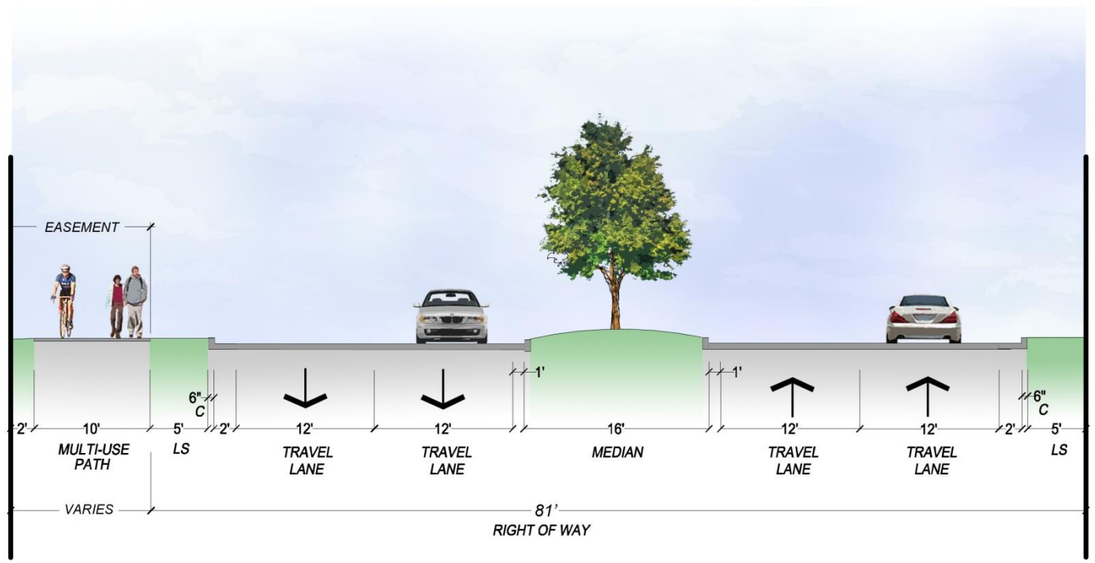
Section 7.3 Long Term Recommendations and Planning Level Cost Estimates

Long-term recommendations for the Brewer's Neck Boulevard Corridor study area consist of the widening of Nike Park Road between Battery Park Road and Carrollton Boulevard, modification/upgrade of the proposed Battery Park Road/Nike Park Road roundabout, the installation of new or modification of existing traffic signals, as well as select intersection improvements anticipated over time.

Nike Park Road Corridor

- As a result of the public involvement process, Option 2 (as shown **Figure 7-4)** was identified as the preferred option to widen Nike Park Road from a 2-lane to a 4-lane, median divided typical section with a multi-use path along the west side of the roadway.
- Construct a 16 to 20-foot variable width raised landscaped median along the corridor between the Battery Park Road intersection to the north and the Carrollton Boulevard intersection to the south/east
    - This will allow for the construction of 12-foot full width left turn-lanes where necessary while maintaining a 4 to 8-foot median to provide physical separation between traffic located in the turn-lane and traffic in the opposing/oncoming travel lane.
- Employ desirable access management strategies to accommodate, prohibit, restrict, or best mitigate full-movement crossovers/intersections located along the corridor Maintain or locate full-movement intersections at the following locations:
    - Carrollton Nike Park Entrance
    - Titus Creek Drive
    - Reynolds Drive
    - Location and spacing of other subsequent full-movement intersections will be based on the immediately adjacent full-movement intersection(s) or partial access intersection(s), VDOT Access Management Guidelines, and intersections serving high traffic demand side streets locations.

Figure 7-4: Nike Park Road 4-Lane Typical Section – Option # 2



Nike Park Road at Reynolds Drive

- Install a new traffic signal to accommodate proposed roadway widening and intersection capacity/operational changes
- Optimize traffic signal phasing and timing plans to accommodate peak/off-peak hour vehicle demands during the AM, Midday, PM, and Off peak hours as needed

Northbound Nike Park Road

- Construct one exclusive left-turn lane
- Construct one through lane
- Construct one shared through/right-turn lane

Southbound Nike Park Road

- Construct one exclusive left-turn lane
- Construct one through lane
- Construct one shared through/right-turn lane

Eastbound Reynolds Drive

- Maintain/construct one shared left/through/right-turn lane

Westbound Reynolds Drive

- Construct one shared through/left-turn lane
- Construct one exclusive right-turn lane

Nike Park Road at Titus Creek Drive

- Monitor intersection operations and consider the installation of a traffic signal when warrants are met

Northbound Nike Park Road

- Construct two through lanes
- Construct one exclusive right-turn lane

Southbound Nike Park Road

- Construct one exclusive left-turn lane
- Construct two through lanes

Westbound Titus Creek Drive

- Construct one exclusive left-turn lane
- Construct one exclusive right-turn lane

Battery Park Road at Nike Park Road

- Modify/upgrade originally proposed single lane roundabout to a two lane roundabout as shown in **Figure 7-5**

Northbound Nike Park Road

- Construct two lane approach to accommodate northbound to westbound traffic volumes

Southbound Nike Park Road

- Construct one lane approach to accommodate right/through/left-turn traffic

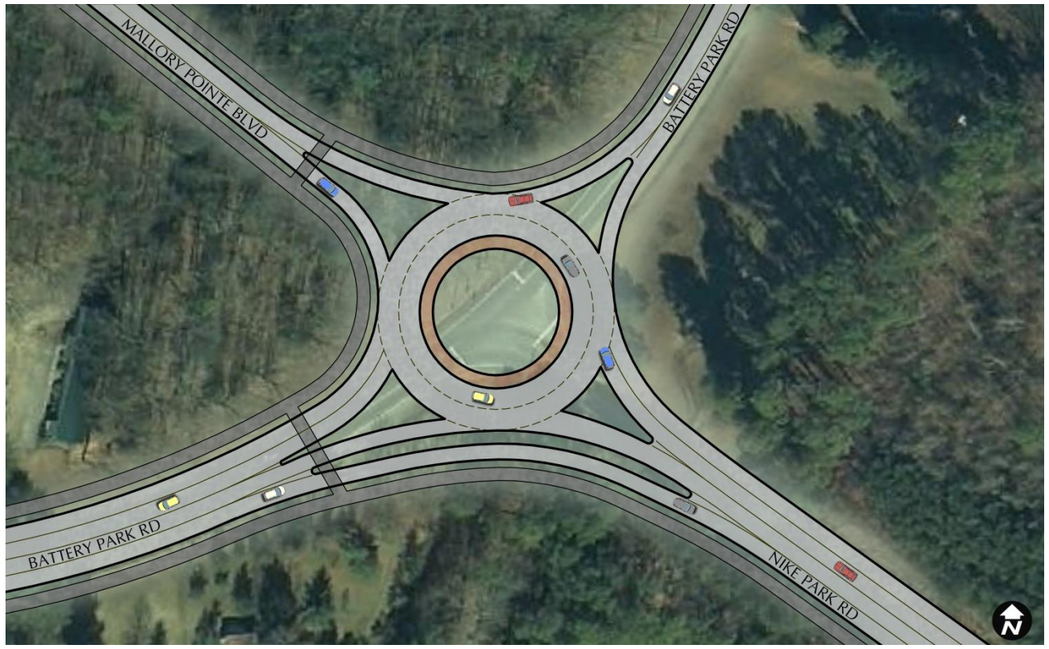
Eastbound Battery Park Road

- Construct two approach lanes – one for through/left traffic and one free-flow right slip-lane

Westbound Battery Park Road

- Construct one approach lane to accommodate right/through/left-turn traffic

Figure 7-5: Battery Park Road at Nike Park Road Roundabout



7.3.1 Planning Level Cost Estimates – Long Term

Item	Total
Engineering/Design	$4,017,000.00
Roadway/Intersection Improvements*	$23,840,500.00
Traffic Signal Equipment Improvements	$751,750.00
Construction Engineering and Inspection (CEI)	$2,502,000.00
Right-of-Way (ROW)	$3,482,000.00
Construction Contingency (10%)	$2,460,000.00
Total	**$37,054,000.00**

**Roadway/intersection improvement costs include applicable signage, turn-lane, pavement marking costs, and construction of a new bridge over Jones Creek.*

Table 7-3: Long-Term "Recommendations and Action Items"	Cost Estimate [A]	Timeframe [B]	Responsible Party
Nike Park Road/Nike Park Road Corridor – Widen to a four-lane, median divided typical section with a 10-foot multi-use path along the west side of the roadway. The median should be a 10 to 12-foot variable width median between Battery Park Road and Carrollton Boulevard. Based on current planning activities it is expected that the multi-use path will be constructed and in place prior to the widening of the roadway.	$35,331,000	2034	VDOT/IOW County/Developers
Nike Park Road and Reynolds Drive – Install a new traffic signal and optimize traffic signal phasing and timings plans to accommodate peak/off-peak hour traffic. On the northbound and southbound approaches, construct one exclusive left-turn lane, one through lane, and one shared through/right-turn lane. On the westbound approach, construct one shared through/left-turn lane and one exclusive right-turn lane.	$415,000	2034	VDOT/IOW County
Nike Park Road and Titus Creek Road – Monitor the unsignalized intersection operations and consider the installation of a new traffic signal when warrants are met. Construct two through lanes and one exclusive right-turn lane on the northbound approach. Construct one exclusive left-turn lane and two through lanes on the southbound approach. Construct one exclusive left-turn lane and one exclusive right-turn lane on the westbound approach.	$425,000	2034	VDOT/IOW County
Battery Park Road and Nike Park Road – Modify/upgrade the originally proposed single lane roundabout to a two lane roundabout. Construct a two lane approach on the northbound leg, a one lane approach on the southbound leg, a two lane approach on the eastbound leg, and a one lane approach on the westbound leg.	$883,000	2034	VDOT/Town of Smithfield/IOW County

[A] Cost estimate includes estimated design cost and ten percent contingency. Probable cost estimate is engineer's approximation in 2013 dollars and is subject to change based on increased construction materials, design, or time of implementation.
[B] Timeframe for implementation is an estimate based on project need and available funding. Actual timeframe may vary based on externalities.

Chapter 8.0 Conclusions

The Isle of Wight County *Brewer's Neck Boulevard Study* provides a comprehensive understanding of the operational and capacity improvements necessary along Brewer's Neck Boulevard, Carrollton Boulevard, and Nike Park Road to accommodate anticipated growth and economic vitality within the study area and identifies a preferred alignment for the extension of Nike Park Road from its terminus with Reynolds Drive in the west to its terminus with Carrollton Boulevard in the east. The implementation of system-wide improvements will occur through local policies, programs, and funding as well as state contributions and private investment. The study provides a blueprint for a coordinated approach to fulfilling the County's vision.

The report will serve as a beneficial tool to both Isle of Wight County and VDOT in their discussions with developers as they convey future plans and projects for the Brewer's Neck Boulevard and Carrollton Boulevard corridors as well as Nike Park Road. This strategic vision will provide the opportunity to obtain right-of-way, as well as realize implementation of both specific and regional improvements through the development review process. On a much broader scale, the study will ultimately be used as a planning tool by the County and VDOT to manage growth and assess the transportation network impacts created by regional influences internally and externally to the study area.

The study examined existing and future conditions for the horizon year of 2034, with the intent of gaining a better understanding of the more immediate needs along Nike Park Road, Smith's Neck Road, and Battery Park Road as well as coordinated signal system needs along Carrollton Boulevard. Growth within and adjacent to the study area corridor is very dynamic in terms of anticipated residential and commercial/retail development, as well as increases in traffic volumes stemming from the corridor's role in the regional transportation network. This study considered a robust list of planned and approved growth opportunities within the study area (e.g., Benn's Grant, The Crossings, St. Luke's Village, Norsworthy, Bridge Point Commons, etc). The comprehensive approach to the development of future traffic projections was necessary due to regional travel pattern behavior, the anticipated cumulative impact on the Brewer's Neck Boulevard/Carrollton Boulevard intersection operations, as well as the need to capture the operational benefit of the proposed extension of Nike Park Road. This will assist the County in making informed land use and economic development decisions as they relate to roadway and utility infrastructure improvements/investments necessary to support development.

As a result of the field reviews, traffic analyses, policy review, and discussions with the County, project stakeholders, and VDOT, recommendations for improvements have been identified within the study area to include; operational and capacity improvements as well as bike and pedestrian improvements along the corridor, and the extension of Nike Park Road to Carrollton Boulevard to relieve corridor congestion through the enhancement of network connectivity. The recommendations were based on the desire to safely and efficiently address future internal and external traffic growth associated with the key study area components (i.e., operational and capacity enhancements along the corridor, network connectivity, and overall traffic safety). A key short-term recommendation of the study is the proposed extension of Nike Park Road approximately 1.0 mile from its current intersection with Reynolds Drive in the west to a proposed intersection with Carrollton Boulevard in the east. This will address a missing link in the local street network and provide local travelers and/or local residents with a more direct and safe alternate route to the Smith's Neck Road to Titus Creek Drive to Nike Park Road route used by many today. Thus this new connection is expected to reduce traffic volumes through the Smith's Neck Road/Reynolds Drive, Smith's Neck Road/Titus Creek Drive, and Carrollton Boulevard/Brewer's Neck Boulevard intersections. The major recommendations of the study involve the widening of Brewer's Neck Boulevard, Carrollton Boulevard, and ultimately Nike Park Road. These projects are economically significant in nature and therefore it is not practical under current economic conditions to expect that the construction of these improvements would all occur within a relatively short period of one another. Rather, projects are grouped and/or categorized into short, mid, and long-term based on the magnitude of the project (i.e., cost), timing/schedule of when the particular project could be constructed, as well as the scale of the issue a particular project is intended to address. This approach allows communities to prioritize larger scale projects over time while also being able to implement "quick hitter" projects that mitigate immediate needs.

Project specific recommendations focus on operational, capacity, and safety improvements within the study area. Planning-level cost estimates, expressed in year 2013 dollars, have been included for all recommendations. These planning-level cost estimates have been based on VDOT's statewide four-year cost averages for 2009, the VDOT Transportation & Mobility Planning Division's (TMPD) "Statewide Planning Level Cost Estimates" worksheet from 2006, as well as familiarity with similar project and improvement costs throughout Virginia. Due to fluctuations in the costs of labor, materials, and equipment, variability in the market and the outcome of competitive bidding, and the general planning-level nature of the recommendations, these estimated costs are neither exact nor guaranteed.

Variation between actual and estimated costs will change as time passes, and the time value of money has not been taken into account. Cost estimations performed using the "Statewide Planning Level Cost Estimates" worksheet include right-of-way acquisition cost estimates developed with the sheet's methodology. The cost breakdown per scenario includes engineering costs, landscaping costs, pavement marking costs, urban roadway costs, rigid material costs (milling, overlay, sidewalks, channelization, etc.), signal costs (timing and construction), signing costs, and miscellaneous costs which includes, mobilization, sediment and erosion control, traffic control (i.e., maintenance of traffic (MOT) during construction), right-of-way (ROW) and utility costs, and stormwater management. **Chapter 7.0** reflects the cost estimates for those all projects that fall within a particular time frame (i.e., short term, mid-term, long term). **Table 7-1** through **Table 7-3** provides recommendations and action times for improvements to include general project description, overall cost estimate, general timeframe for implementation, and likely responsible parties.

The study outlines the long-term vision for the corridor and its associated transportation network needs. The intent is to now use the vision as projects emerge, whether small or large, public or private, to ensure that the ultimate overarching desires and needs of the corridor study area are achieved. Each project should be evaluated against the overall *Isle of Wight County Brewer's Neck Corridor Study* to determine specifically how it can best contribute towards realizing the County's vision.

The next key step in the planning process is to determine how the recommended improvements will be implemented. Both the County and VDOT officials will need to determine implementation strategies as well as establish project priorities. Implementation strategies to consider include seeking and identifying funding streams, both public and private, to construct improvements. There are several potential public programs that may assist with funding projects. At the federal level there are earmarks, National Highway System funds, bridge funds, and Highway Safety Improvement Program (HSIP) funds to name a few. At the state level there is the VDOT six-year improvement program (SYIP), multimodal planning grants, and enhancement funds. At the local level Isle of Wight County is a member of the Hampton Roads Transportation Planning Organization (HRTPO) which can assist local planning efforts by providing services and guidance on funding strategies/coordination with VDOT. Private funds may be realized through rezoning action and proffer contributions, as well as dedication of right-of-way. All these programs must be considered for each recommended improvement as outlined in the report. The recommended improvements should be prioritized into projects with both County and VDOT input. Each project should be thoroughly evaluated then identified for priority order, time frame from implementation and potential funding sources.

Technical Appendix

Appendix A. Data Collection

Appendix B. Environmental Screening

Appendix C. Future Development Trip Generation

Appendix D. Capacity Analysis

Appendix E. Typical Section Options

Appendix F. Public Meeting Comments

















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