ROUTE 221 CORRIDOR MANAGEMENT STUDY
BEDFORD COUNTY, VIRGINIA

BEDFORD 221 COUNTY



JUNE 2002

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Executive Summary

The Route 221 Corridor Management Study was prepared to provide a plan by which Bedford County can preserve and enhance this major transportation resource, while also accommodating and enhancing economic development. The 5.15-mile corridor extending from Jefferson Ridge Parkway west to Route 663 (Perrowville Road) has 214 access points (including roads and driveways on both sides of Route 221). Traffic volumes in 2002 ranged from 18,000 vehicles per day in the southern portion of the corridor to just over 25,000 vehicles per day at the northern end. Development, new access points, and traffic volumes are expected to grow substantially over the next 20 years. Traffic volumes in the year 2025 are expected to range between 29,000 vehicles per day in the south and 39,000 vehicles per day in the north, an increase of approximately 60 percent

This study's plans and guidelines for managing Route 221 will support economic development, promote travel efficiency, and enhance traffic safety in the corridor. A conceptual Corridor Circulation Plan describes a proposed area circulation system that can be used to guide the expenditure of public and private transportation funds, and that anticipates potential changes in the corridor, as well as the need for improvements to support these changes. Guidelines for coordinated actions by various stakeholders (corridor businesses and landowners, Bedford County, and the Virginia Department of Transportation) provide the mechanism for realizing a vision for the Route 221 corridor: a safe, efficient, and attractive gateway that supports long-term economic development for Bedford County.

The recommended plans and guidelines include:

- **Implementing regulations that support long-term, sustainable economic development and preserve the mobility function of Route 221:** Additions to the Bedford County Comprehensive Plan are recommended, as is the implementation of overlay zoning that provides incentives for shared or indirect access to Route 221.
- **Roadway design that supports the improvement of Route 221 as Bedford County's Gateway into the City of Lynchburg:** Control of access and roadway improvements will both increase the attractiveness of Route 221 as a gateway corridor into Lynchburg. A Corridor Circulation Plan will provide motorists with safe options to turning left onto and off of Route 221 for many trips and to using Route 221 for short, local trips. Once local circulation options are developed, improvements can be made to the cross-section of Route 221 to enhance its safety, efficiency, and appearance. These improvements would include the installation of a landscaped median. The full range of roadway and access improvements to Route 221 will greatly enhance this Bedford County Gateway Corridor.

Section 1: Introduction

Route 221 (Forest Road) in Bedford County is a major thoroughfare that is critical to the economic vitality of the County and surrounding region. This roadway serves local residents going to work, to shop, and to other activities, as well as local businesses that rely on Route 221 to bring customers to them and to carry their goods to other markets. Route 221 also serves as the major connector between the City of Bedford and the City of Lynchburg. Maintaining Route 221 as a safe and efficient corridor for both local and regional traffic is important to its role in supporting the economic vitality and quality of life in eastern Bedford County and the City of Lynchburg. This study investigated ways for Bedford County to manage this important resource for the benefit of its citizens and businesses, both now and into the future.

1.1 Study Approach

The primary goal of this study was to promote long-term economic development in the corridor while maximizing traffic flow and safety. Route 221 is an important economic resource for Bedford County and it is important to develop ways to best take advantage of this resource for the county as a whole and for the long term. The Virginia Department of Transportation has developed engineering plans for widening the current two-lane portions of Route 221 (from south of the railroad bridge to Route 663). Construction is underway for improving the intersection of Route 221 with Route 663 and widening the portions of Route 221 immediately on either side. Funding for the remainder of the currently designed project has been delayed due to Virginia's current transportation financial constraints. Beyond these projects (and particularly for any potential improvements for the current 4-lane section of Route 221 between the railroad bridge and the City of Lynchburg), any other improvements to Route 221 would occur only as funds become available or as changes in land uses occur. This study's approach, therefore, focused more on planning and responding to change than on major, immediate changes in the corridor. With this approach, the study identified opportunities, whether from changes in traffic patterns or safety, or through changes in land use, and provides guidance on how best to capitalize on these opportunities.

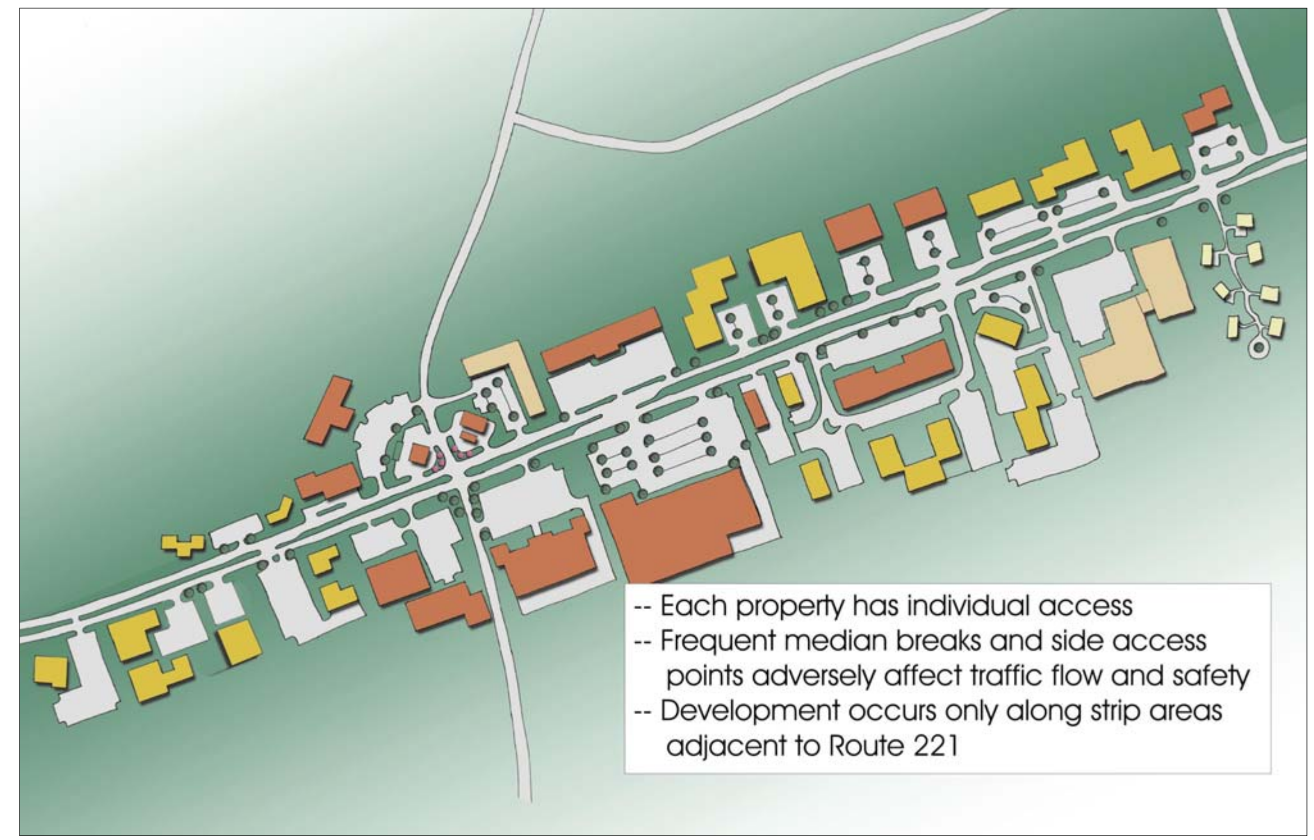
While managing Route 221 will be important for Bedford County as a whole, this study recognizes that those who own businesses, live, or work immediately along Route 221 will be most affected by changes to the road. The changes could be positive and/or negative, depending on location, type of land use, and type of change. As a result, a group of corridor businesses and residents were identified and their input was solicited. This group initially helped to identify concerns; later in the study they were asked to provide feedback on initial study recommendations.

Finally, this study incorporated an emphasis on the implementation process. Study recommendations are intended to be comprehensive, viable, and realistic. This document describes the study process and recommendations, but also includes detailed information on the implementation of the recommendations.

1.2 Managing Route 221

As indicated above, Route 221 is an important economic resource for Bedford County. Vehicles on Route 221 are potential customers, or people going to work, or commercial vehicles carrying goods to markets. In general, properties directly on Route 221 are best positioned to make use of this resource, particularly if they have direct access to traffic going in both directions. It is in the immediate and short-term interest of these adjacent property owners and, indirectly, local jurisdictions, to exploit the value of the road. The result is typical "strip" development, with property owners seeking the maximum level of access to and from the road. Exhibit 1 shows an example of this type of development, with its attendant high density of driveways and median crossovers.

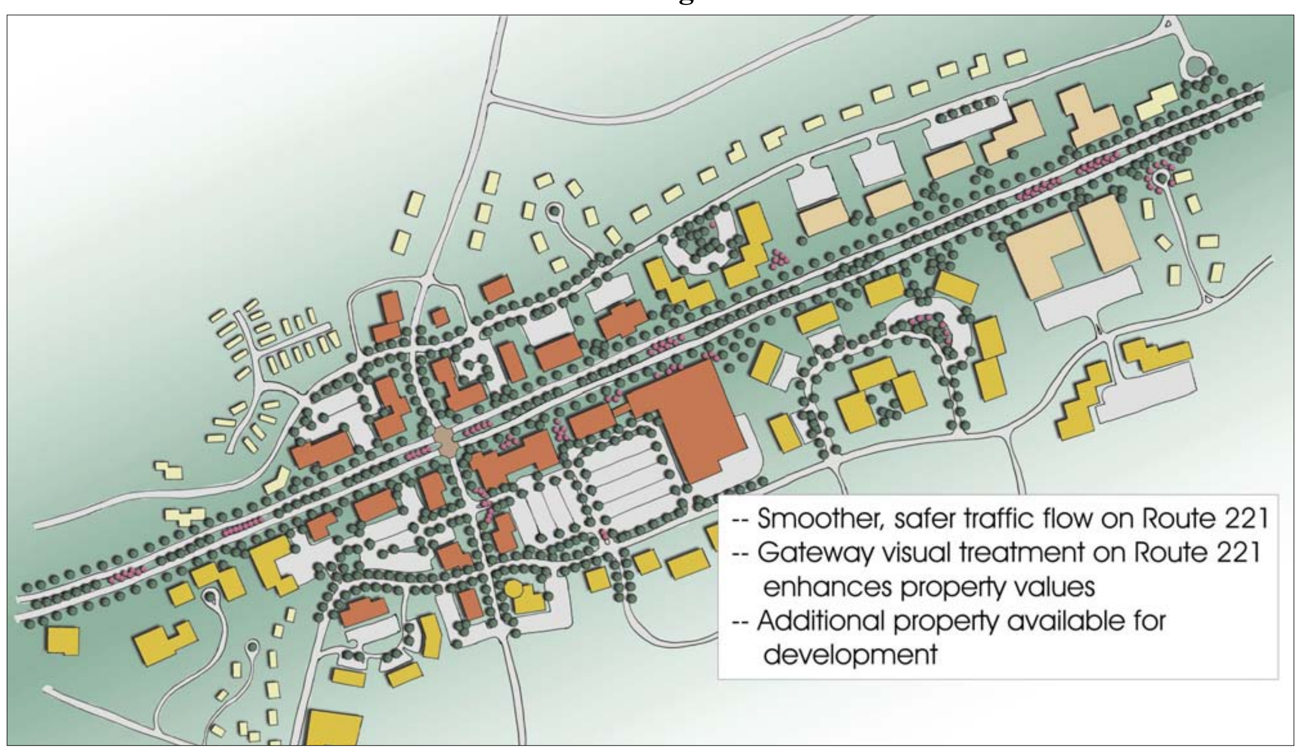
Exhibit 1: "Strip" Development on Route 221



The downside to this type of development is that, by exploiting the roadway resource, its value will become depleted. Route 221 will become more congested, and motorists getting on and off the road along its length will create speed variations and safety concerns. In general, Route 221 will become less safe, traffic lights will be added, traffic will move at slower speeds, and the road will become less attractive. Customers may start avoiding businesses in the corridor, not because the roadway design limits access (with medians, for example), but because they believe that they cannot get to and from roadside businesses quickly and safely. In addition, the total economic development of the corridor will be limited by the amount of available frontage property. Property that is not directly on Route 221 will not only not have access to the road, but its value will be harmed by the congested conditions and general unattractiveness of Route 221 itself.

The alternative to exploiting the economic resource of Route 221 is to manage it. Managing this resource will provide both higher and more sustainable long-term economic benefits to Bedford County. Exhibit 2 provides a snapshot example of the Route 221 corridor with long-term planning and management. By constructing additional roads for property access, twice as much land is open for development. The result is increased options for the location and spacing of buildings, as well as the potential for additional open space and visual amenities. Separating the longer distance traffic (which will remain on Route 221) from the shorter trips going to and from properties (which will use the parallel access roads) will improve traffic flow and safety. Fewer driveways and median breaks on Route 221 will increase its attractiveness as a gateway into Bedford County. Improved traffic flow on Route 221 will also enhance the overall corridor's attractiveness, benefiting the entire corridor and not just the properties immediately on Route 221.

Exhibit 2: Corridor Management on Route 221



Section 2: Study Corridor Transportation Conditions

Route 221 is designated as a state primary route, and connects the cities of Lynchburg and Bedford. It has also developed as a major commercial corridor in the Lynchburg area. The specific study area for this project extends from Route 663 (Perrowville Road) in Bedford County east to the City of Lynchburg corporate limits. In order to assess the effects of traffic and roadway conditions as Route 221 enters the City of Lynchburg, traffic data was also collected at the first signalized intersection in the City, at Jefferson Ridge Parkway. Route 221 is two lanes from Route 663 east to the railroad bridge between Route 620 and Route 1415, where it becomes four lanes with a center turn lane, or flush median.

On the 5.15 miles from Route 663 to Jefferson Ridge Parkway, there are currently 214 access points on both sides of Route 221 (including roads and driveways). On average, the corridor now has an access point every 127 feet (41.6 access points per mile). Traffic volumes in 2002 ranged from 18,000 vehicles per day in the southern portion of the corridor to over 25,000 vehicles per day at the northern end. Development continues in the Route 221 corridor, and additional access points can certainly be expected by the year 2025.

Traffic in the corridor will also continue to grow. Traffic forecasts, developed using the Lynchburg region's computerized transportation model, show that traffic volumes in the corridor by the year 2025 will range from a low of about 29,000 vehicles per day to close to 40,000 vehicles per day. These traffic forecasts are primarily a function of expected changes in land use (i.e., increases in population and employment in Bedford County and the Lynchburg region as a whole).

Traffic engineers evaluate the traffic operations of roads based on the concept of level of service. The analysis rates traffic operations as a level of service rating from A to F, with A representing excellent traffic flow with minimal delays and F representing failure in traffic operations and very long delays. For most areas in the state, VDOT rates levels of service A, B, or C as acceptable and levels of service D, E, or F as unacceptable. This level-of-service analysis using grades A through F was used for roadway segments and signalized intersections. Unsignalized intersections were analyzed using a planning-level approach, which rates intersections as operating at conditions that are under, near, or over capacity. Under- and near-capacity operations are judged as acceptable, while over-capacity conditions are judged to be unacceptable.

A total of 7 intersections in the corridor (all signalized) were analyzed for traffic operations for both 2002 and 2025 traffic. Turning movements for each of the intersections that were analyzed for this study are included in Appendix A.

A summary of traffic operations on Route 221 in 2001 and 2020 is shown in Exhibit 4. In general, 2002 traffic operations are acceptable with the exception of two intersections in the western part of the study corridor (Route 663 and Route 811). For the year 2025, the projected increases in traffic on Route 221 will substantially increase the delay for motorists trying to get onto Route 221 from side streets. The result is that, for six of the seven intersections analyzed, delays for the side street traffic will exceed the planning-level threshold for acceptable delay. These results indicate that there will likely be an increase in the number of traffic signals on Route 221 to accommodate this side street traffic. It is important to note that the installation of traffic signals is based on actual, not projected, traffic and safety data. The actual number and locations of additional traffic signals in the study corridor cannot be pinpointed, but the projected increases in traffic will almost certainly result in a substantial increase in their number.

Exhibit 3: Summary of Roadway Conditions

Segment Endpoint		Distance	Daily Traffic		Number of Access Points			Access Points per Mile		
From	To	(miles)	2002	2025	NB	SB	Total	NB	SB	Total
VA 663	VA 811	0.95	21,500	32,800	21	13	34	22.1	13.7	35.8
VA 811	VA 609	0.50	18,100	29,100	7	2	9	14.0	4.0	18.0
VA 609	VA 620	0.80	18,100	29,100	19	6	25	23.8	7.5	31.3
VA 620	VA 1415	0.70	18,100	29,100	9	2	11	12.9	2.9	15.7
VA 1415	VA 1426	0.50	23,500	39,900	11	5	16	22.0	10.0	32.0
VA 1426	VA 1425	0.20	25,400	37,400	5	11	16	25.0	55.0	80.0
VA 1425	VA 621	0.50	22,300	34,100	21	17	38	42.0	34.0	76.0
VA 621	Jefferson Ridge Parkway	1.00	24,300	38,300	38	27	65	38.0	27.0	65.0
TOTALS (Average for Daily Traffic)		5.15	21,413	33,725	131.0	83.0	214.0	25.4	16.1	41.6

Note: NB = Access points adjacent to northbound lanes, SB = Access points adjacent to southbound lanes

Exhibit 4: Summary of Intersection Operations

	Existing Traffic	Traffic Operations	
Intersecting Route	Control	2002	2025
VA 663	Signal	Unacceptable	Unacceptable
VA 811	Signal	Unacceptable	Unacceptable
VA 1415	Signal	Acceptable	Unacceptable
VA 1426	Signal	Acceptable	Unacceptable
VA 1425	Signal	Acceptable	Unacceptable
VA 621	Signal	Acceptable	Unacceptable
Jefferson Ridge Parkway	Signal	Acceptable	Acceptable

Section 3: Route 221 Corridor Management Plan

In order to address both existing and projected transportation problems in the corridor, as well as maximize the long-term economic benefit of the corridor, a comprehensive plan to manage Route 221 was developed. This management plan combines roadway capacity and safety improvements, access management principles, and a corridor circulation plan. While some changes and improvements can be made relatively quickly, others will take time and money, and still others will be necessary only if and when certain changes take place in the corridor. The Route 221 Corridor Management Plan, therefore, categorizes recommendations as short-term (5 to 10 years to implement), mid- to long-term (15 to 20 years to implement), and others that have an indefinite planning horizon (they are intended to guide changes and/or will be implemented if and when such changes occur). The overall Corridor Management Plan is described in this section. Location-specific improvements are shown on the aerial photography in Exhibits A1 to A4 in Appendix A.

3.1 Roadway Improvement Plan

Route 221 is a critically important road for Bedford County as the primary connection between Bedford City and Lynchburg. Its importance comes from its ability to move people and goods safely and efficiently and most of the funding for construction and maintenance of Route 221 is dedicated to ensuring that it maintains this ability. The Corridor Management Plan includes recommendations to enhance the safety and functionality of Route 221 through Bedford County. Elements of the roadway improvement plan include (*the approximate timing of these recommendations is included in italics after each*):

- Turn lane improvements at Perrowville Road, Thomas Jefferson Road, Gumtree Road, Enterprise Road, and Cottontown Road as illustrated in Exhibit 5 – *short/mid-term planning horizon*
- Over time, construct a system of parallel roads that can serve localized traffic along Route 221 and focus access to a limited number of signalized intersections. – *mid/long-term planning horizon*
- Widen Route 221 from 2 through traffic lanes to 4 through lanes between just west of Enterprise Drive and just west of Perrowville Road. Over the long-term, this section of Route 221 should also include a landscaped median (see proposed typical section in Exhibit 6). – *long-term planning horizon*
- Widen Route 221 from 4 to 6 lanes between the City of Lynchburg and just west of Enterprise Drive. Construct a landscaped median with this improvement (the proposed typical section for this improvement is depicted in Exhibit 7) – *long-term planning horizon*
- Add traffic signals when warrants are met – *long-term planning horizon*
- Construct multi-use trails (pedestrian/bicycle) on both sides of Route 221 along the entire corridor (priority would be from north to south) – *long-term planning horizon*

Exhibit 5: Recommended Lane Use Improvements

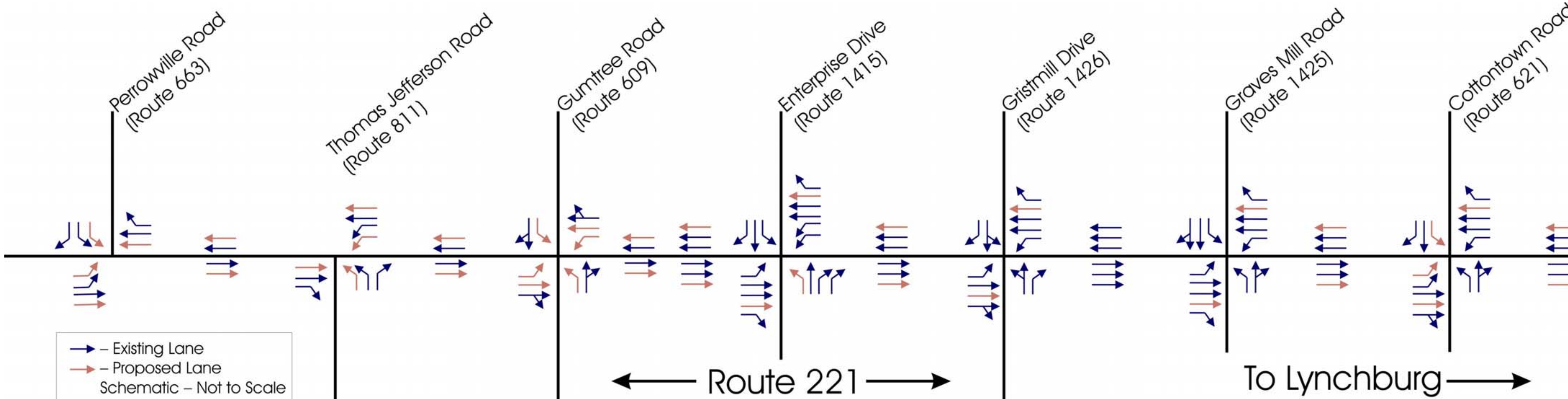
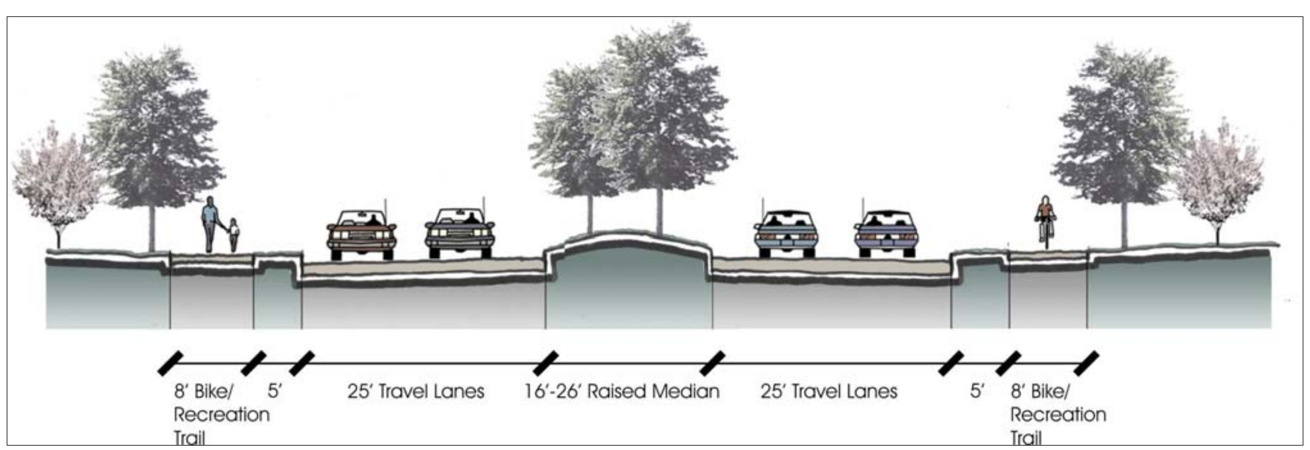
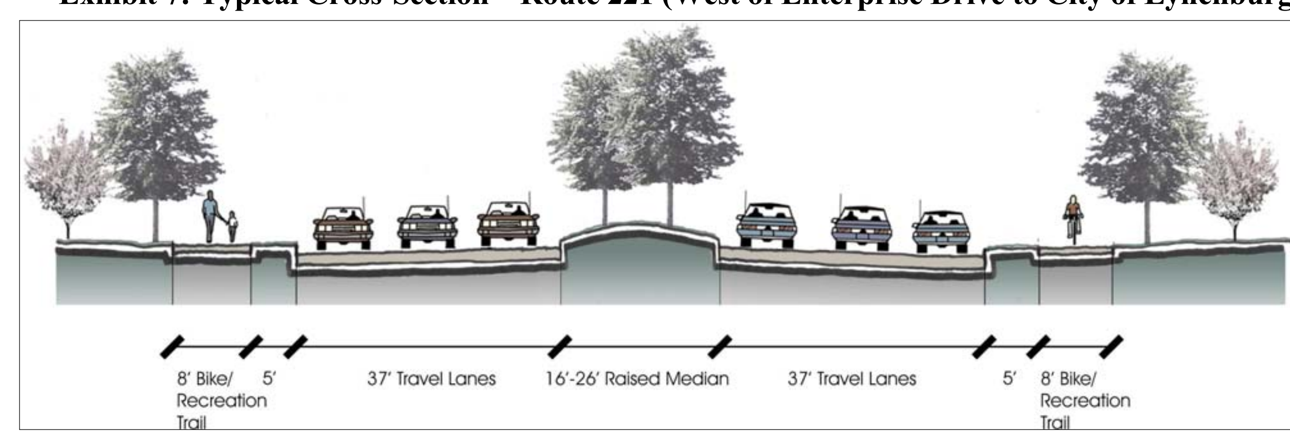


Exhibit 6: Typical Cross-Section – Route 221 (Route 663 to West of Enterprise Drive)



Total estimated right-of-way width extending from the outside edges of the bicycle/recreational trail would be 92'-102'

Exhibit 7: Typical Cross-Section – Route 221 (West of Enterprise Drive to City of Lynchburg)



Total estimated right-of-way width extending from the outside edges of the bicycle/recreational trail would be 116'-126'.

3.2 Access Management Plan

An effective corridor management plan must balance the property access and through traffic mobility functions of Route 221. This should be accomplished through the strategic location of access points and allowed vehicular turning movements. The access management plan portion of the corridor plan focuses on guidelines to prevent the overcrowding of driveways, traffic signals, and median crossovers that will ultimately overburden Route 221 with excessive vehicular conflicts. The following guidelines are recommended:

- Prohibit left turns onto and off of Route 221 between Graves Mill Road and Gristmill Drive – *short/mid-term planning horizon*
- Install landscaped median along the entire corridor with median crossovers located only at signalized intersections – *long-term planning horizon*
- Maintain a minimum spacing between traffic signals of 2,500 feet – *long-term planning horizon*

Considering these traffic signal spacing guidelines and the characteristics of the Route 221 corridor, recommendations for specific traffic signal/median crossover locations were developed. The characteristics include the existing location of Route 221 junctions with key roadways and the recommended location of planned parallel circulation roadways described in the following section. The installation of new traffic signals should be limited to locations depicted on Exhibits A2 through A4 in Appendix A.

3.3 Corridor Circulation Plan

While the Corridor Circulation Plan provides the blueprint for what the corridor will ultimately look like, the overall corridor management plan includes recommendations that first ensure that existing problems do not get any worse and then ultimately support the implementation of the circulation plan.

- Develop a system of parallel roads that can serve localized traffic along Route 221. While this would ultimately be a complete system, this roadway system could evolve as properties are developed or redeveloped. As properties develop, right-of-way to construct sections of this parallel road system should be reserved. In some cases, large developments may construct portions of the roadway to facilitate their own internal circulation in addition to serving the interests of the entire corridor. Other portions may be built by VDOT, again to facilitate overall corridor goals (for example, construction of parallel roads would reduce or put off the need to widen Route 221 itself). The recommended parallel roadways are conceptual and their actual location would be determined based on property development and engineering considerations when they are actually designed. An illustration of the recommended parallel roadway system is presented on Exhibits A2 through A4. These parallel roads should meet the following criteria:
  - Wherever possible, the parallel roads should be located between 300 to 700 feet of the centerline of existing Route 221 (generally along the rear, not the front, of the land parcels along Route 221).
  - The parallel roads should provide a means for motor vehicles to access Route 221 at designated access points (Perrowville Road, Thomas Jefferson Road, Gumtree Road, Enterprise Drive, Gristmill Road, Graves Mill Road, and Cottontown Road) and should minimize the need for motorists to use Route 221 for short local trips that have both origins and destinations within the study corridor.
  - The parallel roads should provide connections to and between the recommended access points.
  - The parallel roads should be constructed to meet appropriate VDOT standards. These roads should be designed to serve projected levels of land development, as well as projected traffic volumes. The three types of parallel roads recommended for the corridor are:
    a. Type I (high-volume roads): Four lanes with sidewalks and 24' median. Total right of way is 90'. Illustrated on Exhibit 8
    b. Type II (moderate-volume roads): Two lanes with sidewalks. Total right of way is 50'. Illustrated on Exhibit 9.
    c. Type III (low-volume roads for access to small residential clusters): Two lanes. Total right of way is 24'. Illustrated on Exhibit 10.
- Initial consideration for this parallel roadway system should be given to connecting Graves Mill Road and Enterprise Drive (on the east, extending Route 1426; on the west, extending Route 1209).

Exhibit 8: Typical Cross-Section: Type I Parallel Access Road

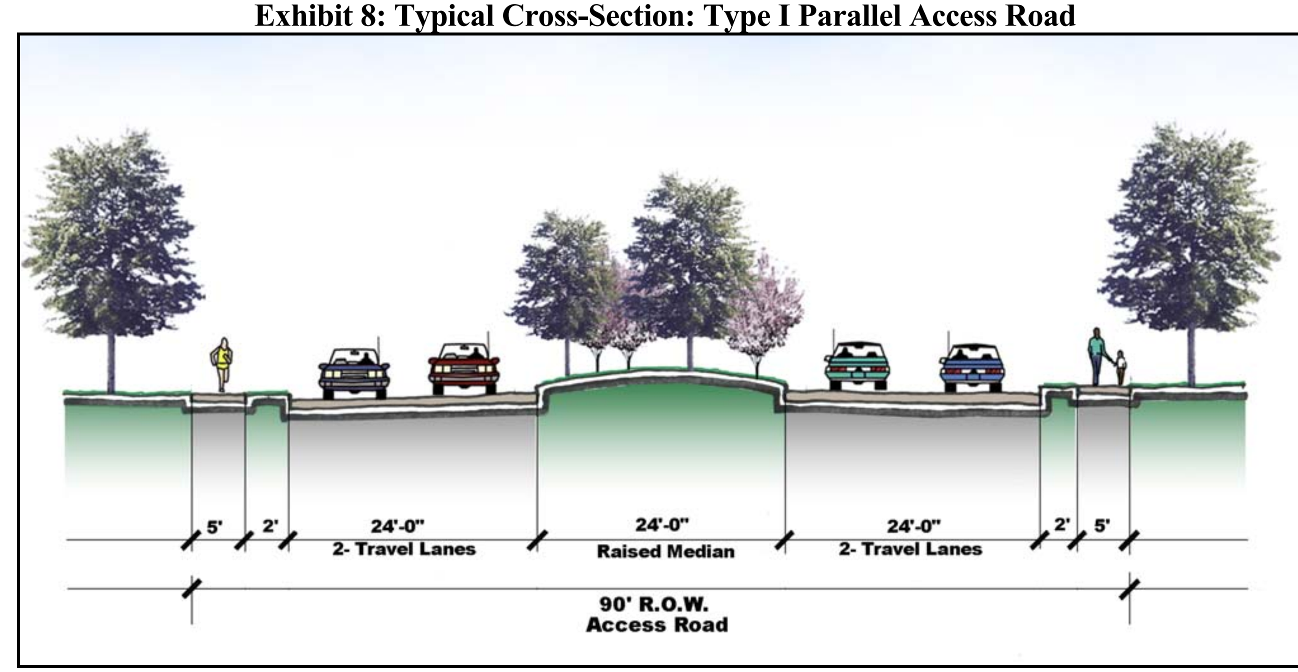


Exhibit 9: Typical Cross-Section: Type II Parallel Access Road

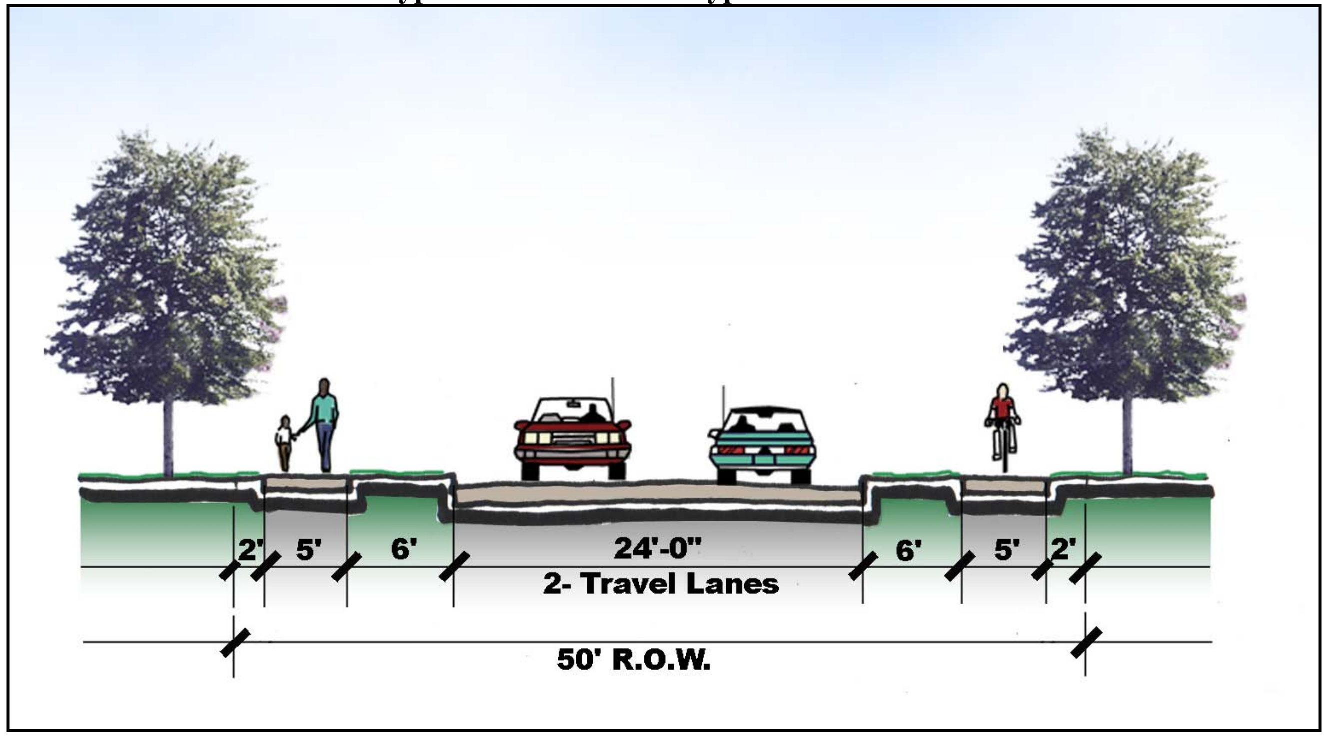
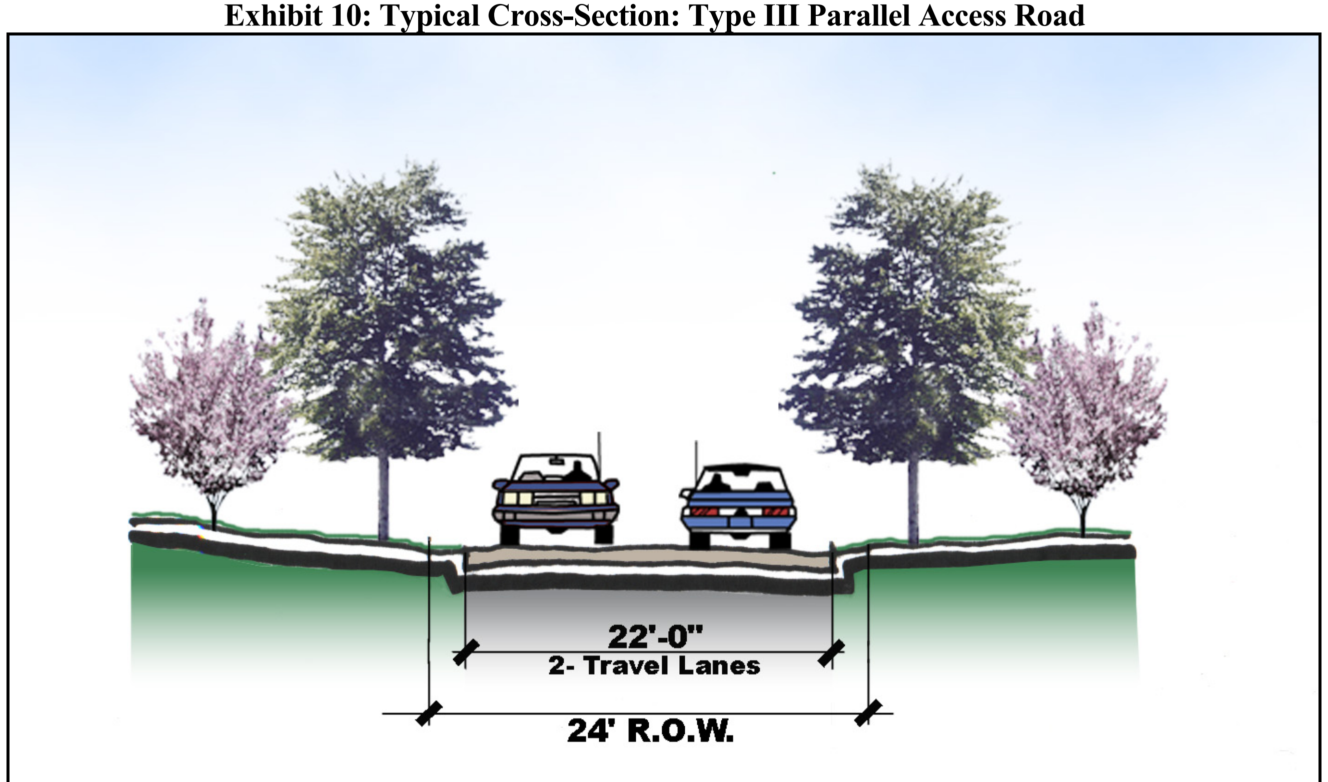


Exhibit 10: Typical Cross-Section: Type III Parallel Access Road



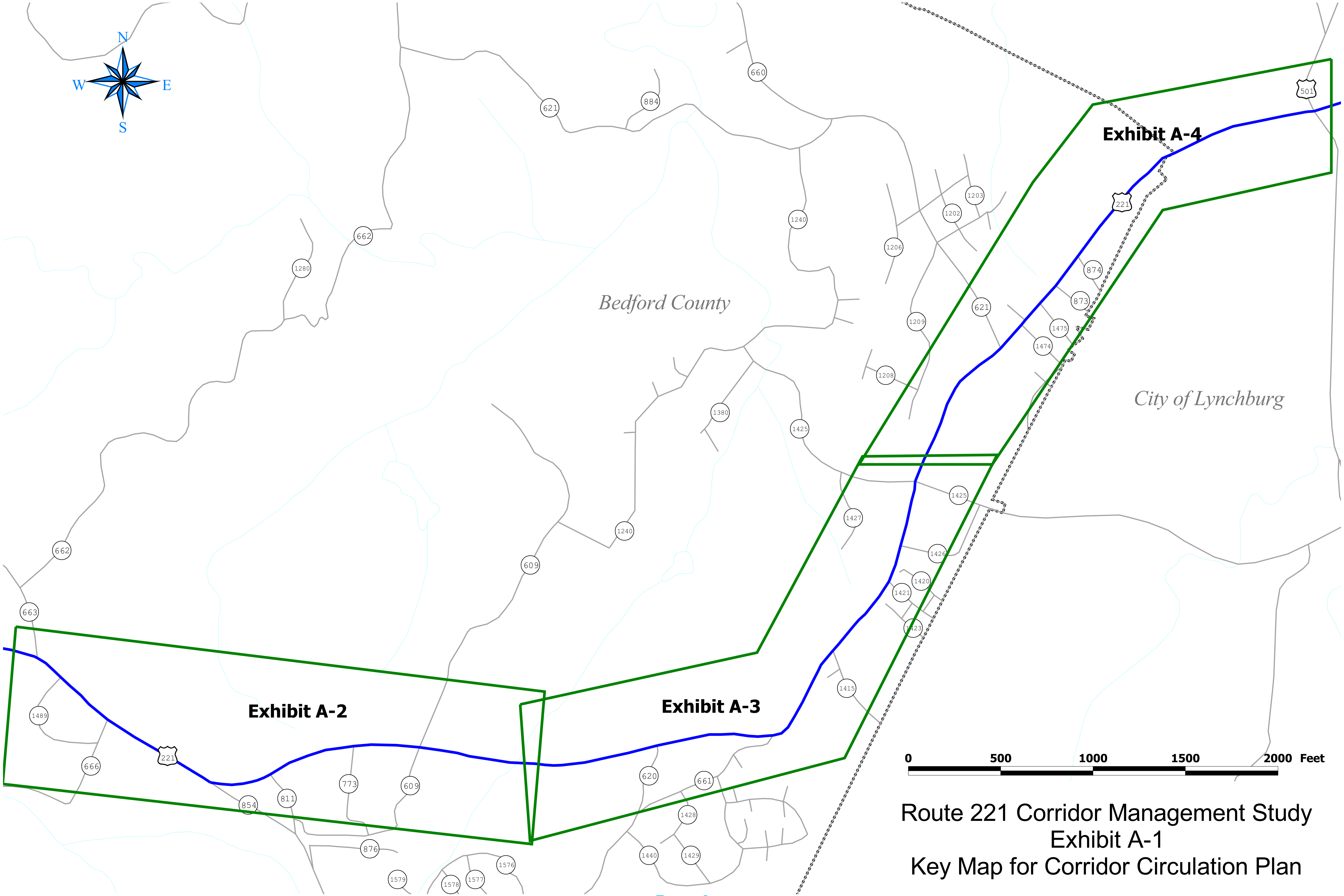
3.4 Implementation Considerations

Bedford County should adopt an overlay zoning ordinance to implement transportation access management within the Route 221 corridor. This ordinance will:

a. Provide favorable consideration for new development that incorporates shared entrances, inter-parcel access, or access via internal and/or secondary roads;
b. Provide incentives and bonuses for combining access points (shared and inter-parcel access);
c. Allow one access point per parcel and institute minimum parcel frontage requirements.

Sample language for the overlay district ordinance is provided in Appendix C.

Appendix A:
Corridor Circulation Plan



Route 221 Corridor Management Study
Exhibit A-1
Key Map for Corridor Circulation Plan

Note: This aerial photograph depicts the study recommendations for a Corridor Circulation Plan. Note that the parallel roads are conceptual and the lines showing the locations for these roads represent a planning concept only. If and when these roads are constructed, the actual alignments may vary substantially from those shown.

Exhibit A-2

Bedford County
Route 221Corridor Study
June 14, 2002 Final Draft

– Existing Signal
– Planned Signal
– Recommended Roadway Improvement
– Proposed Circulation Plan Road
– Circulation Plan Roadway (Existing – No Improvements Recommended)

0 750 1500 2250 3000
Approximate Scale in Feet

N

Note: This aerial photograph depicts the study recommendations for a Corridor Circulation Plan. Note that the parallel roads are conceptual and the lines showing the locations for these roads represent a planning concept only. If and when these roads are constructed, the actual alignments may vary substantially from those shown.

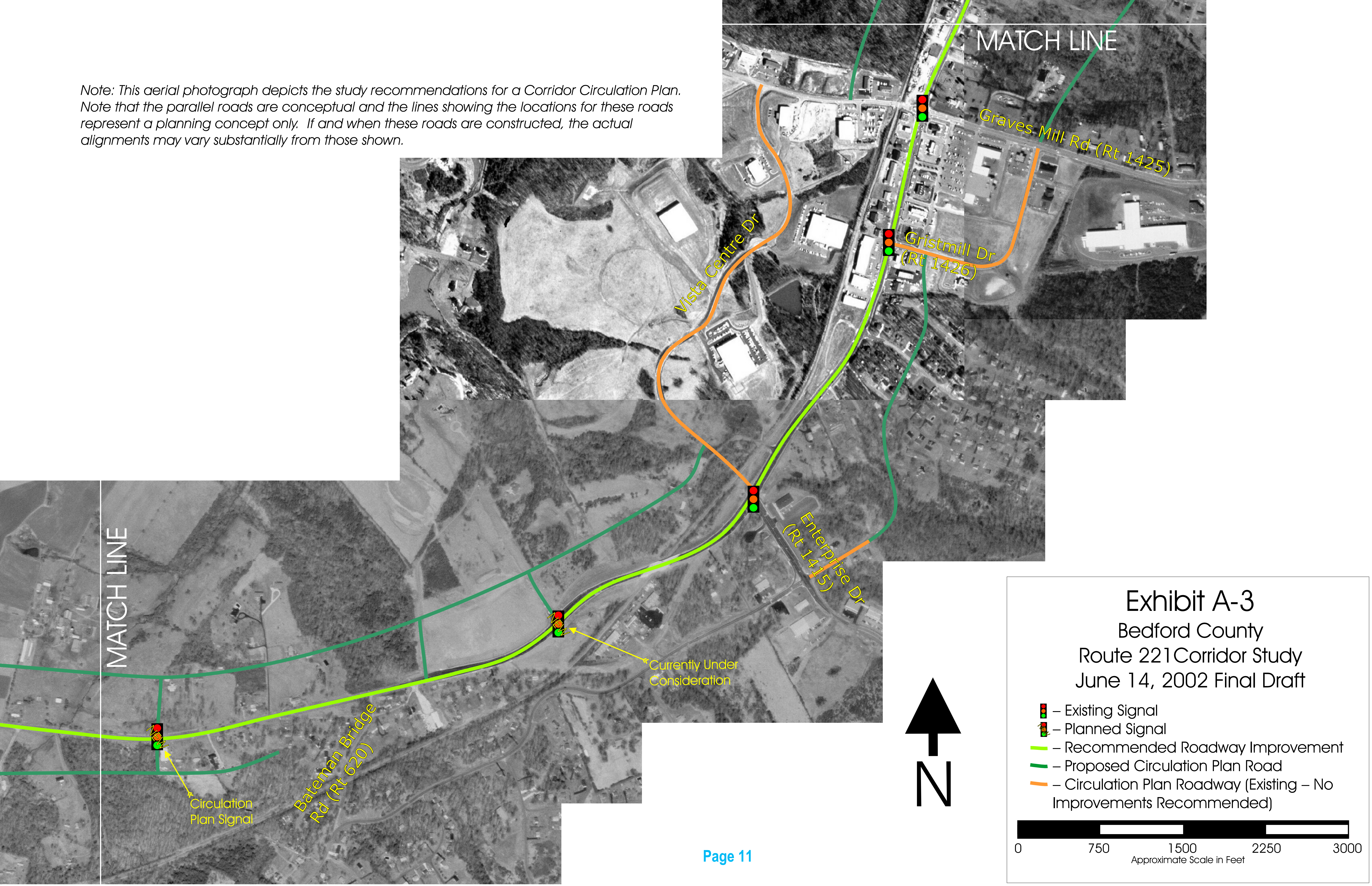


Exhibit A-4

Bedford County
Route 221Corridor Study
June 14, 2002 Final Draft

- – Existing Signal
- – Planned Signal
- – Recommended Roadway Improvement
- – Proposed Circulation Plan Road
- – Circulation Plan Roadway (Existing – No Improvements Recommended)

0 750 1500 2250 3000
Approximate Scale in Feet

N

Note: This aerial photograph depicts the study recommendations for a Corridor Circulation Plan. Note that the parallel roads are conceptual and the lines showing the locations for these roads represent a planning concept only. If and when these roads are constructed, the actual alignments may vary substantially from those shown.

Appendix B: 2001/2025 AM Peak Hour and 2001/2025 PM Peak Hour Traffic Volumes at Corridor Intersections

Exhibit B-1: 2001 AM Peak Traffic Volumes at Route 221 Intersections

Cross Street	2001 AM Peak Volumes											
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
VA 663				712		210	414	569			787	889
VA 811	497		386					1295	65	238	859	
VA 1415	81	80	651	3	14	9	38	950	61	319	608	37
VA 1426	107	3	22	8	1	1	2	1548	105	17	811	6
VA 1425	268	67	73	10	24	22	22	997	545	195	657	52
VA 621	2	1	0	339	2	302	57	969	2	0	637	63
JRP				148		22	45	1328			737	131

Abbreviations: NBL= northbound left, NBT= northbound through, NBR= northbound right, SBL= southbound left, SBT= southbound through, SBR= southbound right, EBL= eastbound left, EBT= eastbound through, EBR= eastbound right, WBL= westbound left, WBT= westbound through, WBR= westbound right. *For purposes of this table, Route 221 is assumed to be an east-west road.*

Exhibit B-2: 2025 AM Peak Traffic Volumes at Route 221 Intersections

Cross Street	2025 AM Peak Volumes											
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
VA 663				1002		295	583	897			1241	1250
VA 811	783		608					2045	102	375	1354	
VA 1415	199	100	1604	5	22	14	60	1498	96	503	958	58
VA 1426	107	3	22	12	3	3	5	2440	105	17	1278	6
VA 1425	268	67	73	10	24	22	22	1572	545	195	1036	82
VA 621	2	1	0	535	4	477	90	1531	2	0	1006	99
JRP				233		35	71	2098			1162	131

Abbreviations: NBL= northbound left, NBT= northbound through, NBR= northbound right, SBL= southbound left, SBT= southbound through, SBR= southbound right, EBL= eastbound left, EBT= eastbound through, EBR= eastbound right, WBL= westbound left, WBT= westbound through, WBR= westbound right. *For purposes of this table, Route 221 is assumed to be an east-west road.*

Exhibit B-3: 2001 PM Peak Traffic Volumes at Route 221 Intersections

Cross Street	2001 PM Peak Volumes											
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
VA 663				694		75	80	494			703	508
VA 811	212		288					1014	178	440	815	
VA 1415	99	23	483	46	54	14	12	629	35	472	826	37
VA 1426	305	9	49	37	6	11	5	941	158	34	1284	24
VA 1425	461	38	234	84	97	31	17	795	382	259	1167	16
VA 621	38	18	7	117	4	174	332	788	33	18	1051	276
JRP				152		49	14	961			1316	104

Abbreviations: NBL= northbound left, NBT= northbound through, NBR= northbound right, SBL= southbound left, SBT= southbound through, SBR= southbound right, EBL= eastbound left, EBT= eastbound through, EBR= eastbound right, WBL= westbound left, WBT= westbound through, WBR= westbound right. *For purposes of this table, Route 221 is assumed to be an east-west road.*

Exhibit B-4: 2025 PM Peak Traffic Volumes at Route 221 Intersections

Cross Street	2025 PM Peak Volumes											
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
VA 663				955		103	115	778			1108	731
VA 811	334		454					1598	280	693	1285	
VA 1415	378	87	1844	72	85	22	12	991	35	744	1302	37
VA 1426	305	9	49	58	9	17	8	1483	158	34	2024	37
VA 1425	461	38	234	132	152	48	26	1253	382	259	1840	25
VA 621	59	28	11	184	6	274	523	1242	52	28	1657	435
JRP				239		77	22	1515			2075	164

Abbreviations: NBL= northbound left, NBT= northbound through, NBR= northbound right, SBL= southbound left, SBT= southbound through, SBR= southbound right, EBL= eastbound left, EBT= eastbound through, EBR= eastbound right, WBL= westbound left, WBT= westbound through, WBR= westbound right. *For purposes of this table, Route 221 is assumed to be an east-west road.*

Appendix C: Proposed Zoning Overlay District Ordinance

Section XX – Highway Corridor Overlay District

XX.1 Purpose and Intent
The purpose of this district is to protect and promote the public health, safety and general welfare by preventing or reducing traffic congestion and/or changes in the public streets; maintaining the function of arterial highways, primary highways, and secondary collector roads to encourage the most desirable development and use of land in accordance with the Comprehensive Plan, to improve pedestrian and vehicular circulation, to encourage architectural designs which result in functional and attractive relationships between buildings, the street system, and the surrounding areas.

XX.2 District Boundaries

1. The Highway Corridor District Boundaries shall be as follows: U.S. Route 221 from Route 621 to Route 663.
2. In lieu of a metes and bounds description, the District boundaries shall be described by fixing the point of beginning to the centerline of the highway and the point of ending shall be one-thousand (1000) feet from the centerline of the nearest two lanes.

XX.3 Establishment of Districts
The Highway Corridor Overlay District shall be in addition to and shall overlay all other zoning districts where it is applied so that any parcel of land lying in whole or part in the Highway Corridor Overlay District shall also lie within one of more of the other zoning districts provided by this ordinance. The effect shall be the creation of new zoning districts consisting of the regulations and requirements of both the underlying district(s) and the Highway Corridor Overlay District.

XX.4 Administration
The administration of the section shall be through site plan requirements and through sections of the Subdivision Ordinance.

XX.5 Permitted Uses
All uses permitted by right or by special exception/use in the underlying zoning district(s).

XX.6 Lot Area and Other Dimensional Requirements
The lot dimensions and other dimensional requirements shall be the same as those requirements set forth in the underlying zoning district(s) except that the minimum front setback shall be sixty-five (65) feet from the centerline of the nearest two lanes unless a greater setback is required by the underlying zoning district.

XX.7 Design Requirements
All uses shall be subject to the limitations and development standards set forth in the underlying zoning district(s) and shall be subject to the following limitations:

1. Such uses shall have access designed so as not to impede traffic on Route 221, which is intended to carry through traffic. To such end, access via the following means may be given favorable consideration:
   a. By the provision of shared entrances, inter-parcel travel-ways or on-site service drives connecting adjacent properties or through access points and existing and future transportation improvements as shown in Route 221 Corridor Management Plan, as incorporated into the Comprehensive Plan;
   b. By access from a public highway other than that on which the property is fronted;
   c. By the internal streets of a commercial, office, or industrial complex.

2. One point of access shall be permitted for each lot with a minimum of 850 feet of frontage. One additional entrance or road may be permitted for each additional 1,250 feet if approved by the Planning Commission. The form of this access will be determined by the Planning Commission; this access shall be as defined in the Route 221 Corridor Management Plan, as incorporated into the Comprehensive Plan. The Planning Commission may modify this requirement if it finds that it best accomplishes the purposes of Section XX.1.

   Existing parcels of land shall not be denied access to a public highway if no reasonable joint or cooperative access is possible, at the time of development.

3. A bonus shall be given for combining access points when two adjacent property owners agree. The total lot size and road frontage normally required will be reduced by 15 percent for both landowners. In addition, the required number of parking spaces will be reduced by 15 percent for each development. Site circulation and safety standards will still be enforced.

4. Pedestrian circulation shall be provided for and coordinated with that generated from or using adjacent properties.

5. Parking areas shall be landscaped both externally and internally.

6. A landscape plan shall be required with any site plan for commercial or industrial development or major subdivisions plat.

CULPEPER COUNTY, VIRGINIA

Water and Sewer Master Plan

June 5, 2007

Wiley & Wilson
Employee-Owned

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Comm. No. 205005.02

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1.0 EXECUTIVE SUMMARY

Culpeper County, with a land area of 389 square miles, lies in the upper Piedmont Plateau where the land is rolling and hilly. Elevations vary from an average low of about 250 feet above sea level to about 600-650 feet, although there are specific points that are lower and higher. The entire County lies within the Rappahannock River Basin and is bordered on the northeast by this river for approximately 38 miles. A primary tributary of the Rappahannock River, the Rapidan River also borders the southern part of the County for approximately 38 miles. Other primary tributaries of the Rappahannock River, within Culpeper County, are Mountain Run and Hazel River.

Culpeper County is currently experiencing a significant amount of growth. However, the County is still mainly rural in nature. Much of the growth pressure is due to the proximity of the County to the Washington, D.C. and the Northern Virginia area. In April 2004, the County of Culpeper was identified by the U.S. Census Bureau as the 87th fastest growing county in the United States and in March 2006 it was identified as the 18th fastest growing county with an estimated population of 42,530 residents and a 5.9 percent annual growth rate. With this rate of growth it is important to recognize potential growth areas and provide public facilities as needed to support growth in those areas. Construction of water and sewer facilities in coordination with zoning amendments and comprehensive planning is a means of promoting and centralizing development to certain areas of the County while retaining the rural character of the remainder.

The purpose of this Water and Sewer Master Plan was to identify water and sewer service areas and their necessary facilities to support the Village Center and Convenience Center plans identified in the 2005 County Comprehensive Plan. The Town Environs, Clevengers Corner, Stevensburg, and Brandy Station/Elkwood are listed as Village Centers, whereas, Boston and Mitchells are designated Convenience Centers.

Population projections for a 20-year time period have been developed and are consistent with the demographics presented in the 2005 Culpeper County Comprehensive Plan. Although the current annual growth rate is higher than previous years, the data presented in the 2005 County Comprehensive Plan was used as a basis for projecting the future growth. In accordance with the Plan, a 3.85 percent annual population increase has been carried through the entire 20-year period to year 2025.

Each rural service area is intended to support growth and provide the necessary services for its specific service area. Water and sewer facilities have been identified to serve the needs of each service area through the 20-year growth period. Additional system capacity was incorporated for the primary sewerage facilities to serve the ultimate land area that would be served by the new County regional wastewater treatment facility. These primary sewerage facilities were sized based on 50-year growth projections. This capacity increase was also included to accommodate a potential increase in development density and/or future expansion of the service area. This area, that would ultimately be tributary to the new regional wastewater treatment facility, is referred to as the Mountain Run Planning Area in this Master Plan.

The Culpeper County Board of Supervisors on March 07, 2006, adopted the water and sewer plan for the Clevengers Corner Village Center, which had been presented earlier as a separate study. The plan has been incorporated into this document, as adopted, with numbered headings added for consistency and clarity. The adopted plan is Chapter 7 of this report. Listed in Table 1-1 are the Service Areas' current (2005) and future (2025) populations used in this Master Plan to ascertain the size of future systems. An overview of the existing water and sewer facilities in the service areas is also provided.

Table 1-1 Village Center Population and Existing Facilities

Service Area	Population		Permitted WW Treatment (gpd)	Water Source (gpm)
	2005	2025		
Village Centers				
Clevengers Corner	932	4,020	75,000/900,000[1]	Wells – 600
Town Environs				
Southwest	1,712	3,644	Town	Town
Lovers Lane	155	329	Town	Town
McDevit Drive	52	111	Town	Town
Inlet	313	667	County/Town	County/Town
Culpeper North	858	1,826	Town	Town
Brandy Station/Elkwood	390	831	25,000/900,000[1]	Wells – 100
Stevensburg	252	537	None	None
Convenience Centers				
Boston	37	3,000	450,000[2]	Wells – 190[2]
Mitchells	80	170	20,000[3]	None

[1] Existing capacity/Permitted capacity
[2] Private system
[3] Private system with allowance for public use
gpd – gallons per day
gpm – gallons per minute

While these population estimates are useful when an area is entirely residential, it can be misleading for mixed use developments. Most service areas have mixed land uses within their boundary. For this reason, equivalent residential connections (ERCs) were assigned to differing land uses within a service area to develop a more accurate overall flow demand. A comparison of the projected population to the equivalent population derived from the projected equivalent residential connections is included in Table 1-2 below.

Table 1-2 Comparison - Population Estimate vs. Equivalent Population

Service Area	Projected Pop. 2025	Projected ERCs 2025	Equiv. Pop. 2025
Village Centers			
Clevengers Corner	4,020	1,628	4,884
Town Environs			
Southwest	3,644	2,404	7,212
Lovers Lane	329	595	1,785
McDevit Drive	111	408	1,224
Inlet	667	1,626	4,878
Culpeper North	1,826	1,510	4,530
Brandy Station/Elkwood	831	1,538	4,614
Stevensburg	537	250	750
Convenience Centers			
Boston	3,000	1,000	3,000
Mitchells	170	67	201

The proposed water and sewer facilities were sized to accommodate the projected demands for build-out of the future land use plan included in the 2005 County Comprehensive Plan. Additional system capacity was incorporated for the primary sewerage improvements that would be very costly to upgrade in the future, including primary pump stations, force mains, and interceptors. This capacity increase was included to accommodate a potential increase in development density and/or future expansion of the service areas. It was also intended to provide additional capacity beyond the 20 year planning period in accordance with the Virginia Sewerage Collection and Treatment Regulations which states, *"In general, sewer systems should be designed for the estimated ultimate tributary population with an upper limit consisting of the 50-year population growth projection, except when considering parts of the systems that can be readily increased in capacity"*. A summary of the 20-year and 50-year flow demands is included below in Tables 1-3 and 1-4 respectively. The projected demand calculations can be found in Appendix A.

Table 1-3 Summary – 20 Year Projected Flows

Service Area	Projected ERCs 2025	Projected Flow (gpd)
Village Centers		
Clevengers Corner	1,628	488,400
Town Environs		
Southwest	2,404	721,200
Lovers Lane	595	178,500
McDevit Drive	408	122,400
Inlet	1,626	487,800
Culpeper North	1,510	453,000
Brandy Station/Elkwood	1,538	461,400
Stevensburg	250	75,000
Convenience Centers		
Boston	1,000	300,000
Mitchells	67	20,100

Table 1-4 Summary – 50 Year Projected flows

Service Area	Projected ERCs 2055	Projected Flow (gpd)
Village Centers		
Clevengers Corner	1,628	488,400
Town Environs		
Southwest	5,813	1,743,900
Lovers Lane	698	209,400
McDevit Drive	544	163,200
Inlet	6,513	1,953,900
Culpeper North	1,510	453,000
Brandy Station/Elkwood	10,591	3,177,300
Stevensburg	250	75,000
Convenience Centers		
Boston	1,000	300,000
Mitchells	67	20,100

A study by Wiley & Wilson completed in 2001, entitled *Culpeper County Reservoir Study*, identified 13 potential sites for surface water impoundment as a source of water for the County. However, the capital and operating costs associated with this type of water supply may be prohibitive for the anticipated water demand for the 20 year planning period. Therefore, groundwater will be considered the source water supply for this Master Plan.

A groundwater availability assessment was performed by Emory and Garrett

Groundwater, Inc. and is summarized in a report dated August 1998, entitled *Groundwater Exploration and Development Results of Phase I Investigation*. This assessment identified favorable groundwater zones and estimated the quantity of groundwater resources that can be developed practically from each groundwater zone. An update to that report is currently being conducted by Emory and Garrett Groundwater, Inc. Information on water quality of the groundwater is not part of the Emory and Garret report. For purposes of this Master Plan, only basic treatment costs have been included in the cost of providing groundwater as a source of water.

A summary of the recommended water and sewer facilities, based on this master plan, are shown in Table 1-5 below.

Table 1-5 Estimated Costs of Proposed Water and Sewer Facilities

Service Area	Sewer	Cost (millions)	Water	Cost (millions)
Village Centers				
Clevengers Corner	Linework & treatment	onsite	Treatment, linework, tank	onsite
Town Environs				
Southwest	Line work/PS	$3.90	Linework & 0.75MG tank	$5.30
Lovers Lane	Line work	$3.30	Linework & 1.0MG tank	$4.00
McDevit Drive	Line work	$1.75	Linework	$1.15
Inlet	Line work	$6.80	Linework	$4.30
Culpeper North	Line work	$2.35	Linework & .075MG tank	$2.75
Brandy Station/Elkwood	Line work	$11.60	Linework, 0.75 & 1.0MG tank	$6.40
Stevensburg	Line work	$2.15	Linework & 0.50MG tank	$1.95
Convenience Centers				
Boston	Linework	$0.28	Linework	Onsite
Mitchells	None	None	Linework	$3.20
Wastewater Treatment	High Sch. Interim	$2.10		
	Mt. Dumpl. Interim	$2.10		
	MdBrk. Run Interim	$2.10		
	Mt. Run Regional	$25.00		

PS – pumping station
MG – million gallon
Linework – includes gravity sewers, force mains, and/or water mains
Onsite – refers to developer funded improvements on or between developed parcels

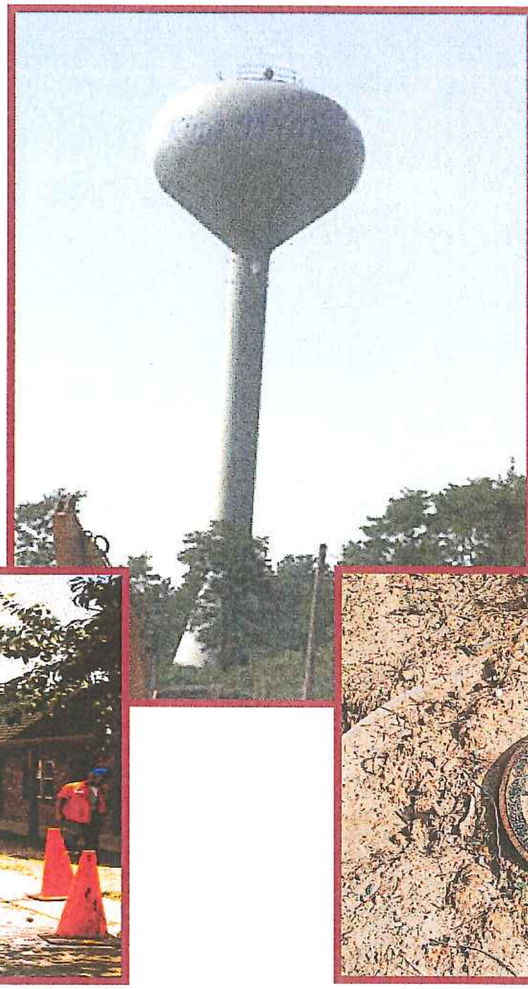
Cost data is based on October 2006 opinion of cost and includes a 25 percent markup for project related cost (survey, design, easements, construction administration, shop drawing review, County inspection, and Record Drawings) and a 15 percent project contingency cost.

The next recommended step after adoption of this Water and Sewer Master Plan by the County would be the development of a Capital Improvement Plan (CIP) in order to define the costs of individual projects and their implementation schedule. A crucial extension of the CIP process is the development of a “financing plan” to evaluate the County's financial needs and evaluate potential sources of revenue. A rate study should be performed as part of this effort to determine the monthly fee and annual escalation of costs and fees.

King William County

Master Utility Plan

January 20, 2008
Revised: May 14, 2010



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1.0 INTRODUCTION

In early 1999, the King William County Board of Supervisors created a Sewer Advisory Committee. It was the Board's desire for the development of a plan for providing potable water as well as providing wastewater collection and treatment within the County. The report and plan that was produced by that committee was implemented and created the ability for the growth that has occurred around the Central Garage area. Having been so successful in a relatively few years and with the strong demand for growth within the area, the County is once again evaluating and updating the initial report.

The original major "growth nodes" identified in the study included the following:

- Route 604, (Dabneys Mill Road)
- Manquin area,
- Central Garage area,
- Route 30 area,
- Midway area, and
- Aylett area.

In general these nodes cover the State Route 360 corridor and have not changed. However, this report will address the following that necessitate revisions to the original plan:

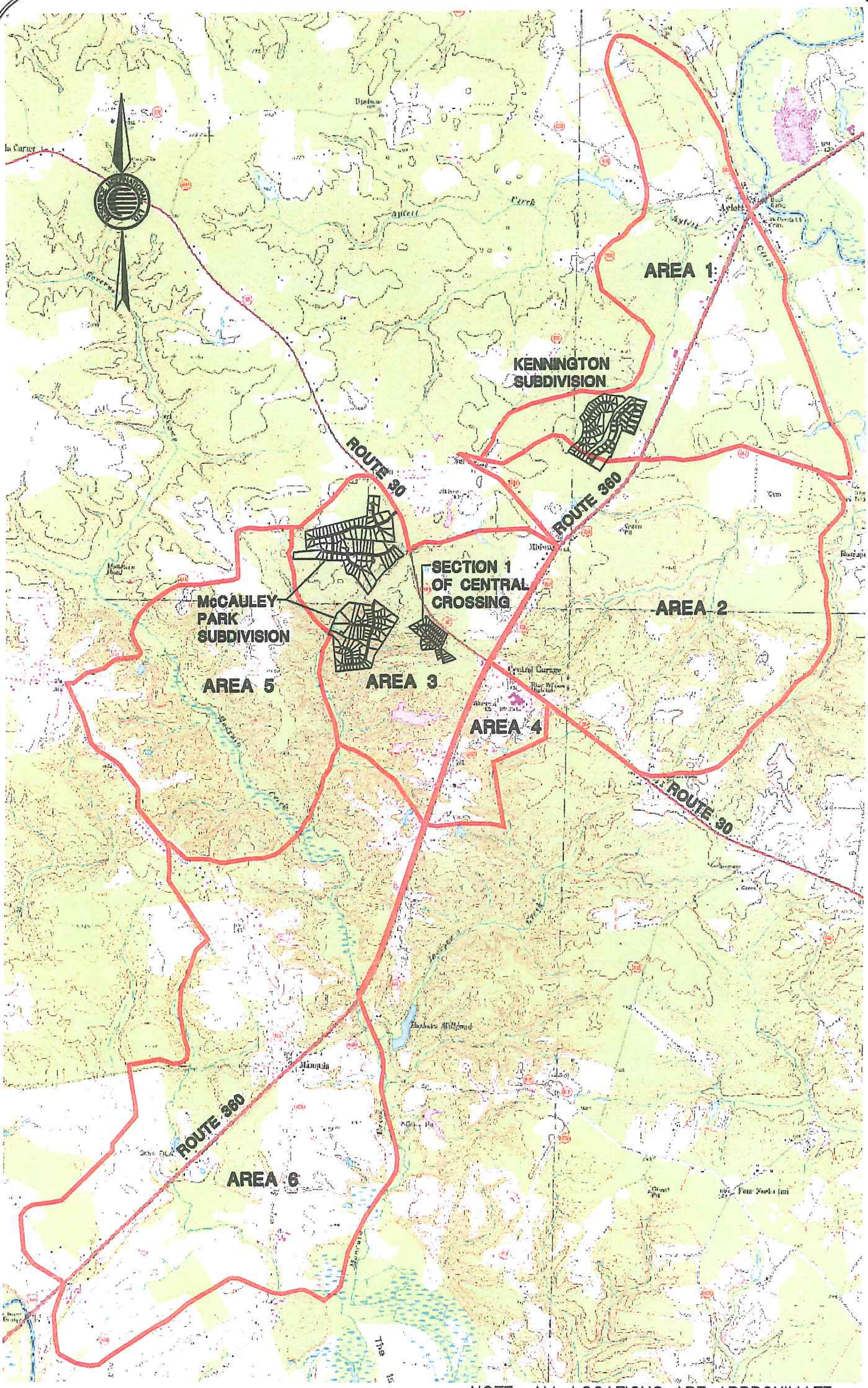
- Growth along the Route 360 corridor since the adoption of the Master Utility Plan
- Changes in the Comprehensive Plan
- Potential growth considerations
- Changes in zoning
- Other considerations desired by the County

The study area around Route 360 is identified by Figure 1 and was divided along drainage areas and major features such as roads or creeks. Therefore, there were six major subdivisions of the study area as identified in Figure 1.

1.1 Inventories of Existing Facilities

1.1.1 Wastewater

The original wastewater system that was designed and constructed in King William County served the High School and the Fontainebleau Industrial Park which included the kitty litter plant. This project included an 80 gallons per minute (gpm) pump station at the school and an 80 gpm influent pump station on Route 618 (Acquinton Church Road). The school pump station pumped into approximately 6,260 feet of 4" force main. The force main discharges into the 8" gravity system serving the Fontainebleau Industrial Park. The 8" gravity system is approximately 4,291 feet in length. The influent pump station pumps through a 4" forcemain to the waste water treatment plant. The Fontainebleau Industrial Park is served by approximately 5,247 feet of 8" gravity line that discharges into the influent pump station. The initial wastewater plant had a treatment capacity of 25,000 gallons per day (gpd). The Hampton Roads Sanitary District (HRSD) has updated the plant to 100,000 gpd.



NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 1
360 STUDY AREA
IN CENTRAL GARAGE AREA
KING WILLIAM COUNTY, VIRGINIA
NOT TO SCALE

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The second project constructed was the Central Garage system that was designed to serve the Food Lion and immediate area around Central Garage. This project consisted of approximately 2,815 feet of 8" gravity sewer and a new 80 gpm pump station. The pump station is located in the Bailey development along Route 360. The new pump station utilized the existing 4" force main and retrofitted the High School pump station to pump directly into the new pump station.

Three developer driven projects, Central Crossing, McCauley Park and Kennington, are in the process of being completed. The major infrastructure has been constructed. The major off site components have been constructed through a tap fee reimbursement agreement where the County will reimburse the developer for the over sizing on the off-site lines through tap fee credits. The following is a list of the major components and off-site lines constructed by the developer.

McCauley Park
Force main
7,600 feet of 8" gravity sewer
248 gpm wastewater pump station
45 gpm wastewater pump station
7,700 feet of 8" gravity lines within the main roads of the subdivisions

Kennington
8,600 feet of 8" gravity sewer
12,800 feet of 8" force main
14,000 feet of 10" force main
386 gpm wastewater pump station

Central Crossing
Force main
12,278 feet of 8" gravity sewer
45-80 gpm wastewater pump station (based on conditions)

Mount Olive
The County is in the process of constructing water and wastewater facilities in the Mount Olive area through a Community Development Block Grant, County contribution and a self help program. The Mount Olive project was segmented into two (2) sections that were independent from the other. Area 1 only has a wastewater system served by a treatment plant and mass drainfield. Area 2 has a water system and a wastewater system. The water is supplied by a well and storage tank. The wastewater system has a microfiltration filter plant that discharges into Mallory Creek. The following is a list of the major components.

Area 1
Five septic/pump tanks
Approximately 5,000 feet of force main
2,500 gpd wastewater treatment plant and mass drainfield

Area 2
8,000 gpd wastewater treatment plant
8,000 feet of force main line from 1-1/2" to 4" will be installed

Figure 2 shows the major wastewater components in the Route 360 corridor. Figure 3 shows the major wastewater components in the Mount Olive area.

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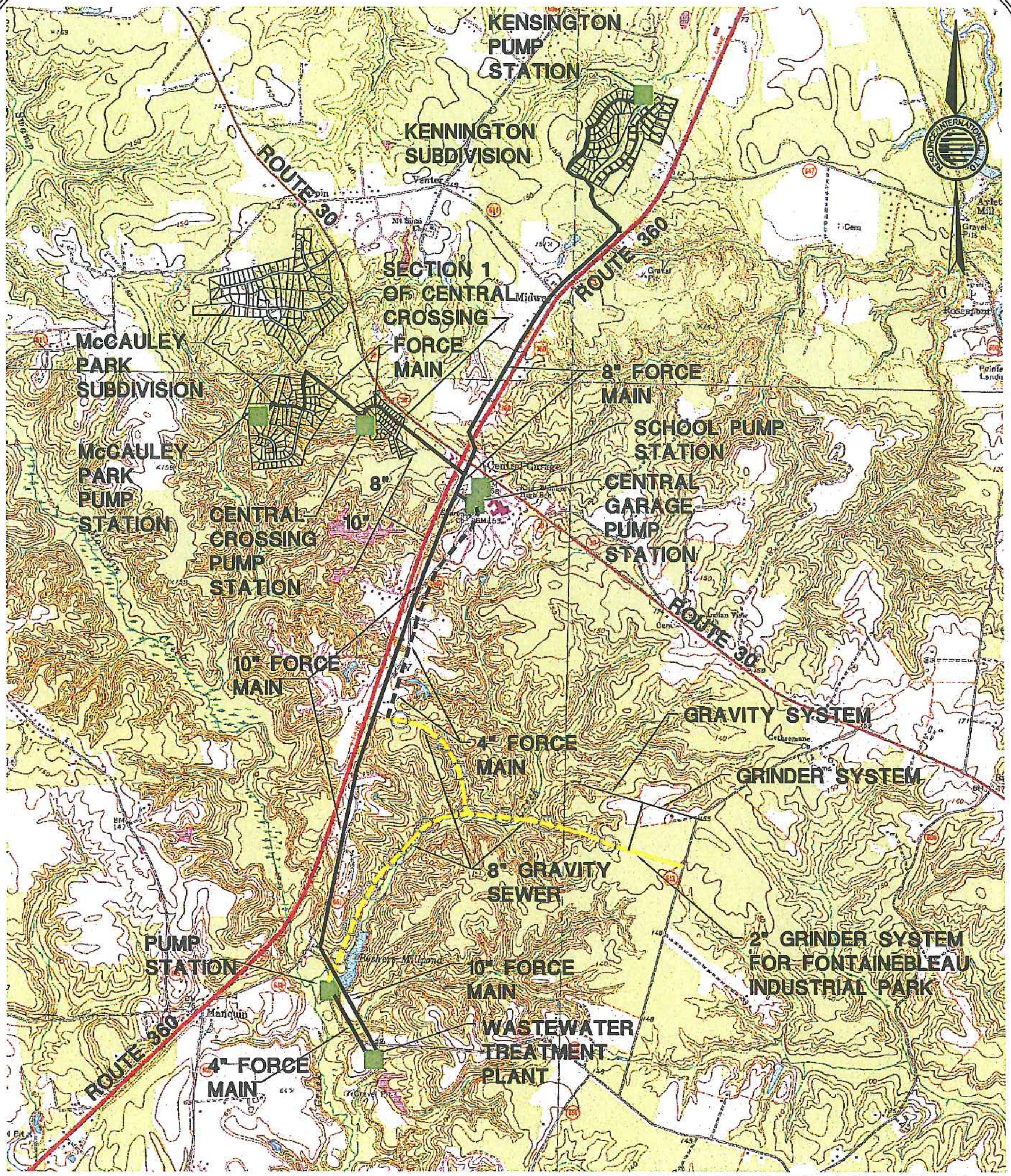

NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 2
EXISTING WASTEWATER FACILITIES
IN CENTRAL GARAGE AREA
KING WILLIAM COUNTY, VIRGINIA
NOTE: ALL LOCATIONS ARE APPROXIMATE
NOT TO SCALE

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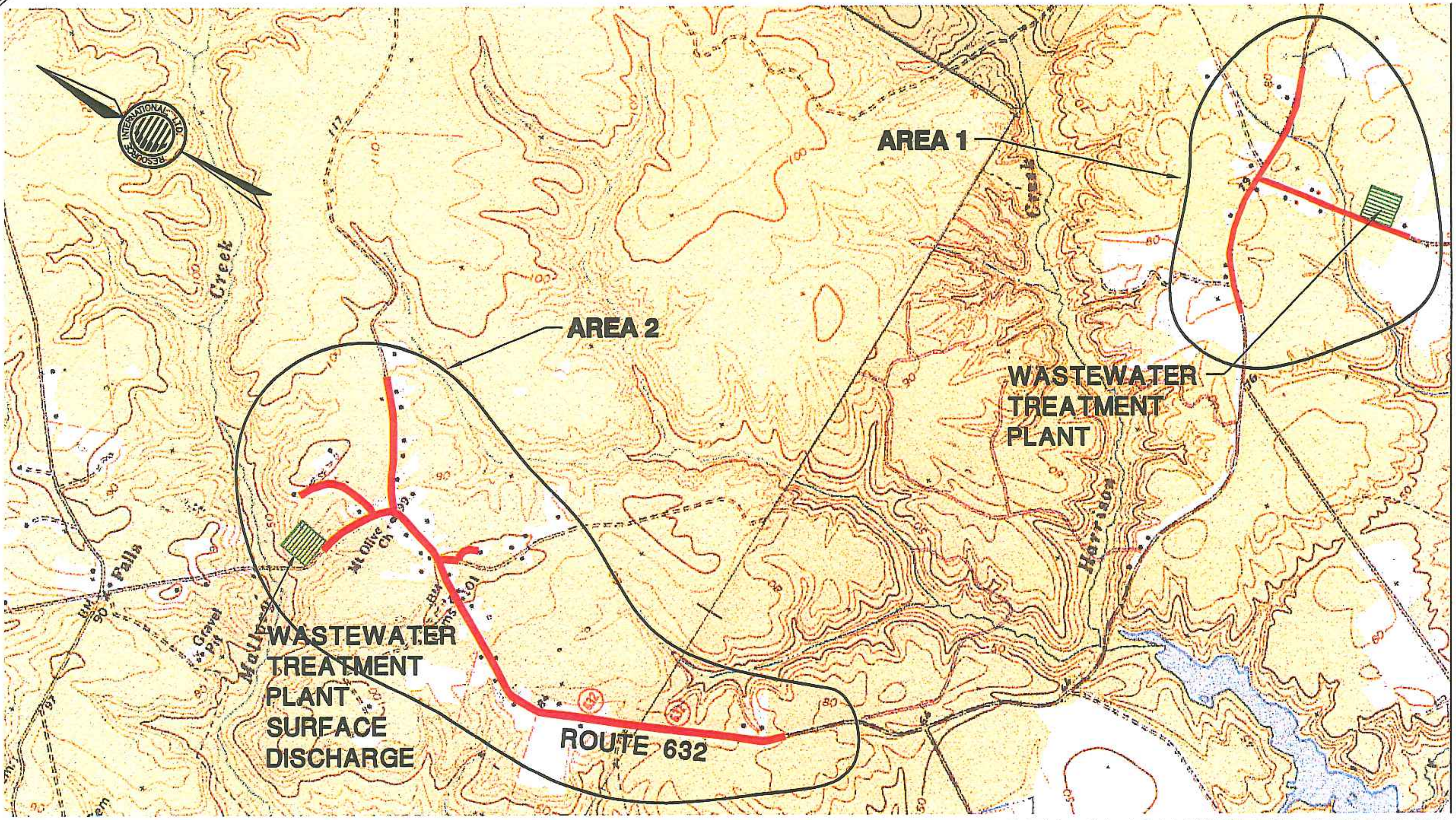

SOURCE: U.S.G.S. 7.5 MINUTE SERIES QUADRANGLES
KING WILLIAM AND TUNSTALL
SCALE: 1" = 2,000'

NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 3
MOUNT OLIVE SEWER
COLLECTION SYSTEM
KING WILLIAM COUNTY, VIRGINIA

LEGEND

PRESSURE SEWER

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1.1.2 Water

The County's first water system was constructed for the Fontainebleau Industrial Park which served only the kitty litter plant. This basically consisted of a 36 gpm well and well house.

The Central Garage water system was initially developed to serve the Food Lion, High School and area immediately around Central Garage. This initial project consisted of approximately 3,715 feet of 12" pipe; a 300,000 gallon elevated storage tank and a 120 gpm well. The well is located at the elevated storage tank.

To date, extensions of the water system have occurred through developer installed facilities that have been dedicated to the County. As with the wastewater, the major off-site components have been constructed through a tap fee reimbursement agreement where the County will reimburse the developer for the over sizing on the major distribution lines through tap fee credits. These extensions include the following:

McCauley Park Section 1
5,500 feet of 12" water line along Route 30
8,100 feet of 8" water line within the main roads of the subdivisions
2,750 feet of 6" water line along short side roads
350 feet of 4" water line at the end of cul-du-sacs

McCauley Park Section 2
5,100 feet of 8" water line within the main roads of the subdivisions
2,600 feet of 6" water line along short side roads

Kennington
8,600 feet of 8" water lines
8,400 feet of 12" water line along Route 360
480 gpm well facility

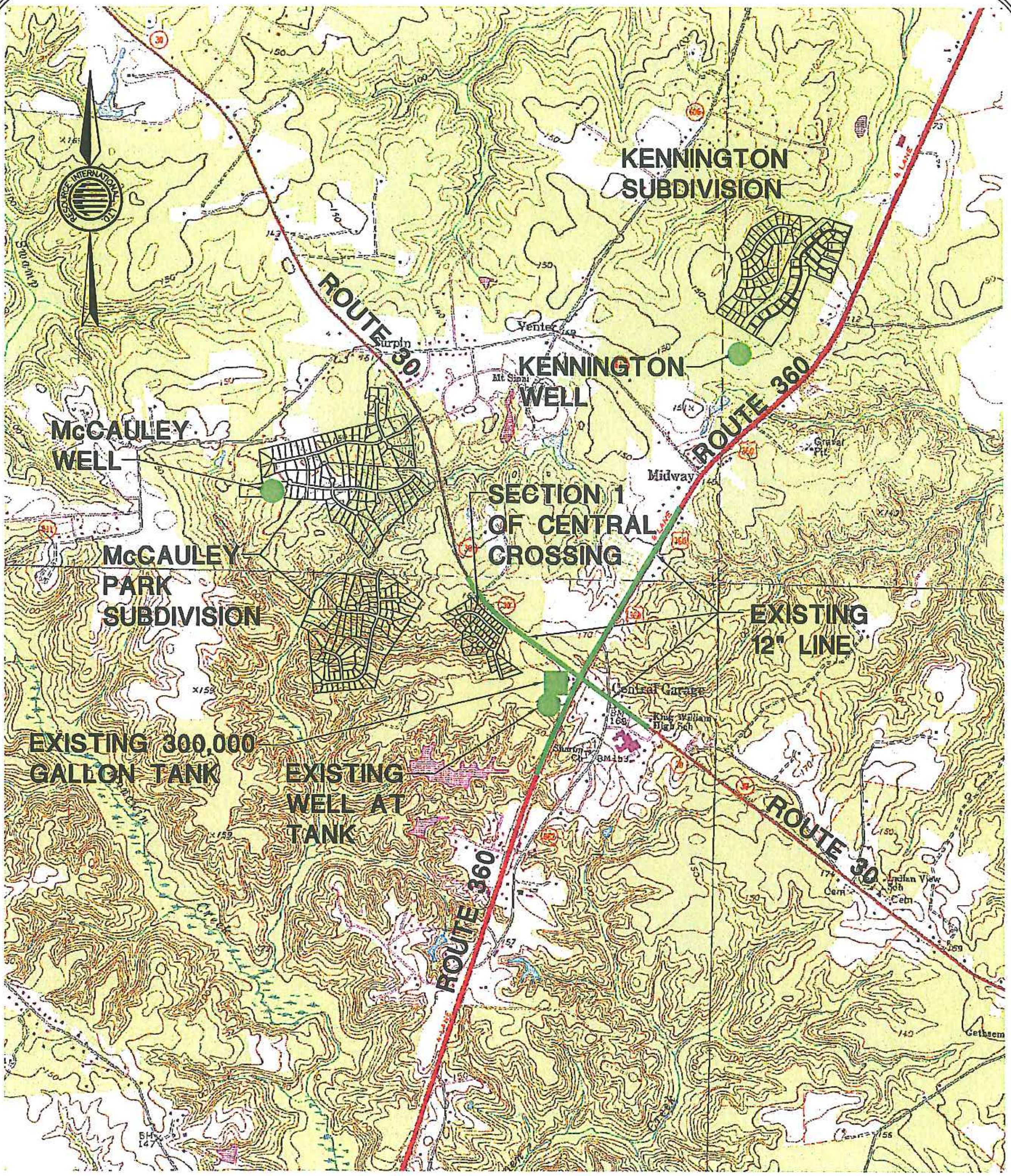
Central Crossing
10,500 feet of 8" water line within the main roads of the subdivisions
2,800 feet of 6" water line along short side roads
740 feet of 4" water line at the end of cul-du-sacs

Mount Olive
The County is in the process of constructing a water system in the Mount Olive area through a Community Development Block Grant, County contribution and a self help program Area 2 has a water system that is supplied by a well and storage tank. This system consists of the following:

Area 2

Approximately 7,000 feet of various size water lines
New well facilities

Figure 4 shows the major water components in the Route 360 corridor.
Figure 5 shows the major water components in the Mount Olive area.



NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 4
EXISTING WATER
IN CENTRAL GARAGE AREA
KING WILLIAM COUNTY, VIRGINIA
NOT TO SCALE

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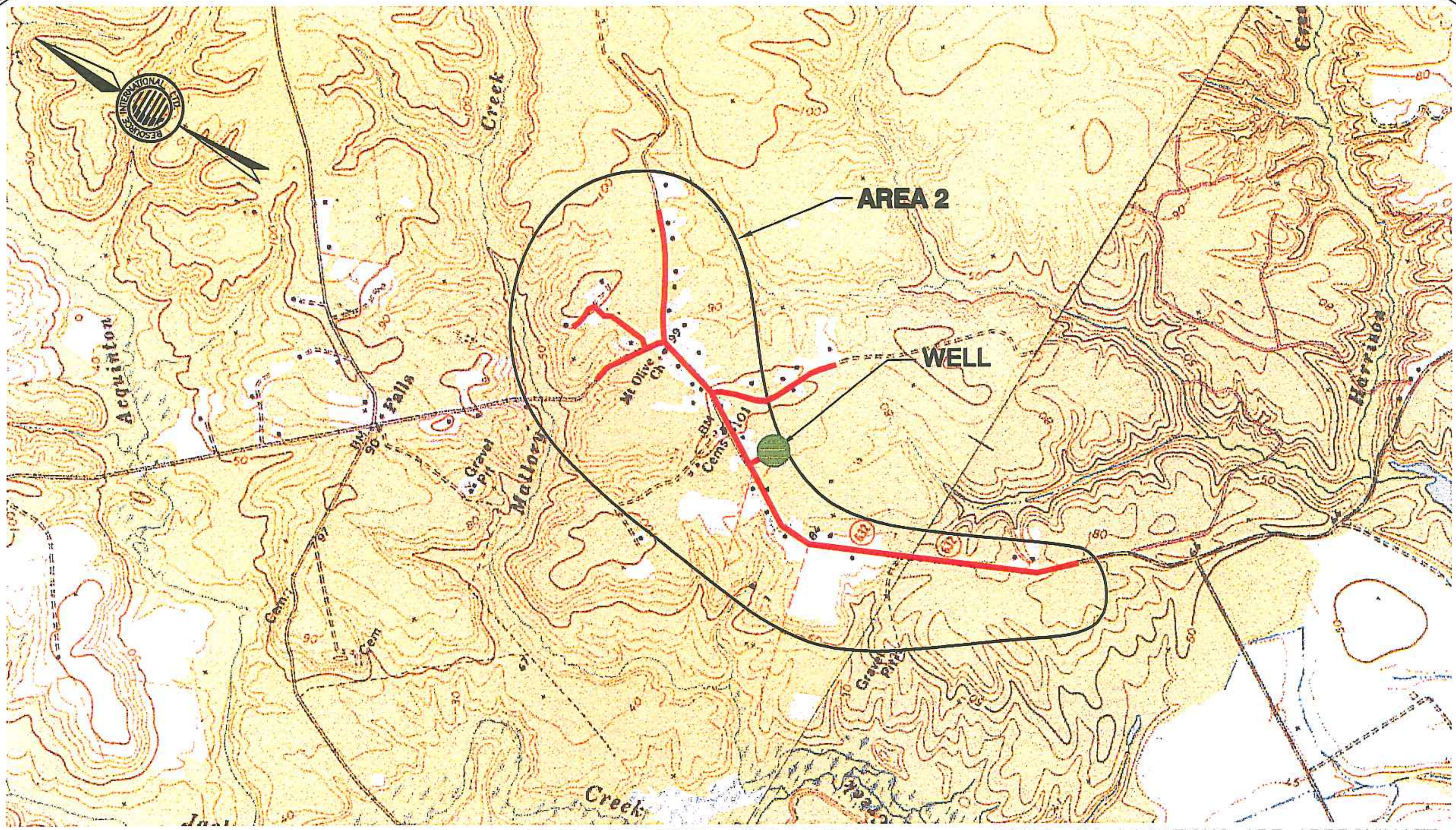

SOURCE: U.S.G.S. 7.5 MINUTE SERIES QUADRANGLES
KING WILLIAM AND TUNSTALL
SCALE: 1" = 2,000'

NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 5
MOUNT OLIVE
WATER SYSTEM
KING WILLIAM COUNTY, VIRGINIA

LEGEND

AREA WATERLINE

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1.2 Projected Water and Wastewater Demands

Information obtained in the initial portions of the study will be used to evaluate existing demands and project future usage demands. The projections will be tabulated by areas along the entire Route 360 corridor and Route 30 within two miles each way from the Central Garage area. A 20 year projection will be utilized. Therefore the planning period is through the year 2028.

Included will be alternative scenarios for projected water and wastewater demands and facilities reflecting low, medium and high growth scenarios. The projections will correlate the various utility development/extension scenarios with the County Comprehensive Plan.

In the evaluation of each area, consideration was given to wetlands and steep slopes. The buildable area was further adjusted by 40% to account for roads, stormwater basins and open space.

Understanding that each area has existing subdivisions and homes that are on individual wells or other community water systems, a conservative approach has been taken in calculating water and wastewater demands. Therefore, in general, the approach is to base potential usage on three (3) residences per acre. It is anticipated that commercial buildings may have usage equal to or less than residential uses. The Virginia Department of Health suggests 400 gallons per day (gpd) per Equivalent Dwelling Unit (EDU). However, this figure is considered extremely high and therefore, water and wastewater demands have been calculated based on 300 gpd per EDU. This figure is used for planning and does not necessarily reflect the current average usage. This approach will be used to provide estimates for planning purposes over a 20 year period and not the figure that will be used for short term evaluation of capacity.

1.2.1 Water Demand

Study Area	**Buildable Acres**	**Adjusted Acres (60% 0f buildable acres)**	**EDUs (3/adjsused acres)**	**Projected Demand (300 gpd per EDU)**
1	1,450	870	2,610	783,000
2	1,973	1,184	3,552	1,065,600
3	1,003	601	1,600*	480,000*
4	238	143	428	128,400
5	1,189	713	2,140	642,000
6	2,237	1,342	4,026	1,207,800
Totals	8,090	4,853	14,356	4,306,800

* Further adjusted for park land and known development in area

Currently there are approximately 193 EDUs connected to the system as of December 2008. There are approximately 807 additional EDUs approved to be tied into the system.

In general, it does not seem realistic that there will be 14,356 EDU's constructed over a 20 year period. Even the construction of 500 EDU's per year may be unrealistic. However, for the 20 year projection if 450 EDU's were constructed per year, the water demand would be approximately 2,800,000 gpd including existing use. For the purposes of this report 2,800,000 gpd will be the anticipated usage at the end of the 20 study period.

1.2.2 Evaluation of Existing Demands

The total water pumped in 2009 from the two operating central Garage system wells amounted to 18,198,600 gallons. By the end of 2008 there were 193 EDUs. 174 EDU's were residential and were located predominately in the Rogers Chenault projects. The peak day demand was approximately 86,420 gpd and consisted of 51,396 gpd residential and 35,024 gpd commercial/school. An evaluation was made of the existing demands and the following was reported to the County. The County currently has a groundwater withdrawal permit for an average of 467,205 gpd. The permit is based on an allocation of 220,000 gpd to the Roger Chenault projects. An evaluation of the current withdrawal is based on the following assumptions;

Permit	467,205 gpd
Rogers Chenault projects	220,000 gpd and includes the existing 51,396 residential usage.
School and commercial reserve	60,000 gpd and includes the existing 35,024 gpd of the existing commercial and school usage.

The following would be the allocation of existing withdrawal permit:

Permit	467,205 gpd
Rogers Chenault projects	(220,000) gpd
School and commercial reserve	(60,000) gpd
Current unallocated quantity	187,205 gpd

187,205/300 gpd/EDU = 624 to 750 EDUs as the maximum EDUs that can be allowed on the system outside of the Rogers Chenault projects and the amount reserved for commercial customers. However, this figure should be re-evaluated annually based on actual demands.

1.2.3 Wastewater Demand

All water provided to customers does not end up in the wastewater system. The wastewater demand is projected to be approximately two thirds (2/3) of the water demand. Therefore the wastewater treatment demand is as follows:

Based on 450 EDU's per year over 20 years the wastewater treatment demand would be 2,800,000 x 2/3 = 1,866,700 gpd. As the Hampton Roads Sanitation Authority (HRSD) is responsible for supplying the treatment for King William, this figure is an estimate for HRSD's planning purposes. HRSD completed a preliminary study and the projected flows they arrived at are very close to the projected flow in this report.

1.3 Evaluations of Water Sources, Storage and Distribution

Based on the projected demands Resource will evaluate the anticipated facilities required to meet the demands. Included in the evaluation will be the use of the County's "share" of the King William Reservoir's water supply. Resource will also consider phasing of facilities.

1.3.1 Existing Water Supply

There are currently three (3) wells owned by King William County. A fourth well is to be completed within McCauley Park and dedicated to the County. One well is located next to the elevated storage tanks and has a capacity of 120 gpm. The second well is located at Kennington and has a capacity of 480 gpm. The third well is at the Fontainebleau Industrial Park and has a current pumping capacity of 36 gpm. A second well is to be located at McCauley Park and will have a capacity of 420 gpm. Wells should be limited to approximately 12 -16 hours per day of maximum operation based on the water usage projections of the study area. Assuming the well at the tank will be classified as a standby well the other two wells could potentially produce 860,000 gallons in a 16 hour period. Therefore, the current wells by themselves are not adequate to meet the 20 year projected demands.

King William County is within a Groundwater Resource Area which requires all groundwater withdrawals over 300,000 gallons per month to be permitted by Virginia's Department of Environmental Quality (DEQ). King William currently has a Withdrawal Permit issued by DEQ for the wells. The current permit under review by DEQ is for an average use of 482,733 gpd. Therefore, it is anticipated that the current permitted allocation will not be adequate to meet future demands.

1.3.2 Alternatives to Meet Future Water Demands

Ground Water

As groundwater is a limited resource, DEQ has become more insistent that the deep aquifers be reserved for domestic use only and that the upper aquifers are used for irrigation. Therefore, DEQ has been reluctant to consider new withdrawal requests or increases in existing permits. At a minimum the permitting has become a lengthy process. With three wells in the Central garage area it appears that the best areas for wells would be in the Aylett and Manquin areas. Assuming that it would be possible to place three (3) wells in each of these areas (total of 9 wells) that produce at a rate of 260 gpm the maximum production over a 16 hour period would be 2,246,400 gpd. This is short of the projected 20 year demand of 2,800,000 gpd.

The County currently owns and operates a well at the Fontainebleau Industrial Park. This well can be brought into the Route 360 corridor; however, this will only provide 34,560 gpd supply based on a 16 hour pumping time.

Of interest is the fact that King and Queen County is not within a Groundwater Resource Area at this time. It is therefore possible that wells could be established in King and Queen County without going through the permitting process. It would be possible to meet the Area 1 and Area 2 needs by wells within the Aylett area and wells in King and Queen County. This option would require consent from King and Queen County.

Surface Water

Ponds and Lakes

Ponds and lakes can be considered as a source of drinking water. Treatment for the water would be the same as for taking water directly out of a river. However, in most cases for the type of ponds and lakes along the Route 360 corridor, there is not enough volume in the lakes or ponds to provide a safe yield. A safe yield is the required storage or flow that during drought or low flow periods there is enough water to meet the needs of the water system.

Pamunkey River

The current County Comprehensive Plan states that the rivers offer an important advantage to the County because of their possible use for supplying drinking water. The Pamunkey River is also considered to be a potential source of drinking water. King William County, along with many other localities, is looking to the Pamunkey River as a primary drinking water resource in the future.

The Pamunkey River is a prime consideration as a water source for a portion of King William County. Figure 6 shows a potential area for a river intake. There are four (4) zones on the Pamunkey River rated as follows:

Freshwater - located above the fall line, which is considered to be at the confluence of Topopotomoy Creek.

Tidal/Fresh - has some saltwater influence, but freshwater standards apply. This zone is located between the fall line and Sweet Hall landing.

Transitional - increasing salinity traveling downstream: saltwater standards apply. This zone is located between Sweet Hall Landing and the beginning of the York River.

Estuarine - saltwater anywhere after the beginning of the York River.

The proposed intake would be in the Tidal/Fresh zone and therefore, freshwater standards would apply.

Safe Yield Calculations for the Pamunkey River

Since river flow is not gaged at the location of the proposed intake, the gage closest to the intake was considered for development of historical streamflow data to be used for the evaluation. Data is recorded at the U.S. Geological Survey's Hanover gage (01673000). This data can provide the opportunity to determine the safe yield of the Pamunkey River during historical drought events of known severity. The drainage area at the proposed intake was calculated as 1,208 square miles as shown on Figure 6. The drainage area for the U.S. Geological Survey's Hanover gage is 1,078 square miles.

Streamflow data collected at the U.S. Geological Survey's Hanover gage was used. The following information was calculated using DFLOW 3.1 a windows based program using EPA methodology for stream flow modeling for 1IQ30 (1-day average flow that occurs on an average once very 30 years) as well as the 1Q29 (29 year low flow):

Jan 1972 through July 2007 (post Lake Anna)
1Q30 = 34.5 cubic feet per second (cfs)
1Q29 = 34.8 cfs

Oct 1943 through Jan 1972 (pre Lake Anna)
1Q30 = N/A cfs
1Q29 = 14.8 cfs

Oct 1943 through July 2007
1IQ30 = 20.8 cfs
1Q29 = 21.2 cfs

The Virginia Department of Environmental Quality requires Lake Anna to maintain a minimum discharge of 20 cfs (see Appendix A).

The streamflow data collected at the Hanover gage were transferred to the proposed intake using a ratio of the drainage area of the proposed intake (1,208 square miles) to the drainage area of the Hanover gage (1,078 square miles):

^{Q} intake = ^{Q}Hanover * (Intake Drainage Area/Gage Drainage Area)
^{Q} intake = 34.5 cfs * (1.12)
^{Q} intake = 38.6 cfs
Where: ^{Q} intake = Streamflow at Proposed intake
^{Q} Hanover = Streamflow at Hanover gage
Intake Drainage Area = 1,208 square miles
Gage Drainage Area = 1,078 square miles

The ratio of the drainage area for the Hanover gage and the proposed intake is approximately 1.12 (1,208 square miles/1,078 square miles).

The safe yield of the Pamunkey River at the proposed intake was determined by calculating the safe yield at the Hanover gage and transferring the streamflow value to the proposed intake. The Virginia Department of Health defines the safe yield of a simple river intake as the one-day 30-year (1Q30) low flow which is the minimum flow available for one day with a predicted recurrence interval of 30 years.

The streamflow data for the Hanover gage were evaluated to determine if an adjustment was needed to differentiate between natural watershed contributions and any water withdrawals or wastewater inputs located upstream of the proposed intake. Hanover County will start discharging treated wastewater from a new plant in the near future. This discharge will amount to up to 5 million gallons per day. However, for this report an adjustment of the historical streamflow records was not made.

Consequently, based on a drainage area ratio of 1.12, the safe yield or one-day 30-year low flow for the proposed intake would be equal to 38.6 cfs (24,948,528 gal/day).

The Virginia Department of Environmental Quality (DEQ) administers the Virginia Water Protection Permit (VWPP) Program. Their responsibility is to ensure adequate protection of all uses of State waters, including in stream uses and nontidal wetlands. Withdrawals from the Pamunkey River are regulated by a Virginia Department of Environmental Quality water withdrawal permit (Virginia Water Protection Permit/Section 401 Water Quality Certification).

The US Army Corps of Engineers has broad jurisdiction over activities in the waters of the U.S. through authorities granted by the Clean Water Act and the Rivers and Harbors Act. Numerous additional state and federal agencies may be involved in an advisory capacity.

A withdrawal permit granted under the VWPP program would likely restrict the proposed withdrawals from the river under low flow conditions, and the withdrawal would likely be required to enact drought conservation measures to minimize river withdrawals during periods of low flow. State and Federal permit applications needed for modification of natural stream flows through such activities as construction of an impoundment or modification of a river intake require consideration of existing in stream and off stream uses of the stream. These issues are generally addressed by evaluating streamflow thresholds required to protect stream biota and other beneficial uses. These required flow quantities are termed minimum in stream flows (MIF). The federal and state agencies providing review and oversight are particularly concerned with MIF requirements because reduced quantities of natural river flow could adversely impact downstream water quality, habitat, and other uses of the river.

In lieu of imposing restrictions on the amount of water that could be withdrawn from rivers, regulatory agencies can require water suppliers to establish voluntary and mandatory drought water conservation plans to be enacted when stream flow drops below a specified level. One key factor concerning drought conditions is the availability of ground water as a source to augment the water needs in King William County.

Safe Yield vs. Usage

The 2,800,000 gpd usage is a 20 year projection to the Year 2028. The Pamunkey Safe Yield is 24.9 million gallons; therefore there is ample water supply that can be used to serve King William County. However, in accordance with the surface water withdrawal supply planning regulations (9 VAC 25-780) and Local and Regional Water Supply Planning (adding 9 VAC 25-

780-10 through 9 VAC 25-780-190), and guidance documents King William must submit a plan by November 2, 2009 should its population be greater than 15,000 or until November 2, 2010 if its population is less than 15,000. Therefore, King William with a population of 15,315 should submit the plan by November 2009.

It must be noted that surface water will require treatment. Therefore, a water filtration plant will be needed. Of concern is the permitting required for surface water withdrawal and any impacts on wetlands that a water intake may create during construction.

The following are steps needed to obtain a Surface Water Permit:

This presents a brief outline of the steps needed to obtain a surface water withdrawal permit. Items 2 and 3 are not sequential, as some steps can occur concurrently and/or independently.

1. The withdrawal should be consistent with Local and Regional Water Supply Plans. King William County is included in a Regional Water Supply Plan prepared by/or the Middle Peninsula Planning District in 2002 and has a draft update that is currently being reviewed. That plan addresses groundwater primarily, but consistency with the plan should be addressed.

2. Two permit applications are required:

    a. Virginia Water Protection (VWP) Permit
    b. USACOE/DEQ/VMRC Joint Permit Application

    If the surface water withdrawal will utilize the distribution/storage system in place for an existing groundwater permit (e.g., Central Garage), then some form of "combined" permit would be in order. Resource understands that the pending revision of the GW Withdrawal regulation includes language addressing combination of permits. The draft regulation will not be available for public review until early June 2010, and will not become regulation until mid 2011 at the earliest.

3. Select the site for withdrawal

    a. Wetland delineation (required for permit application)
    b. Design (required for permit application)
    c. Funding
    d. Bidding/Construction
    e. Public participation.

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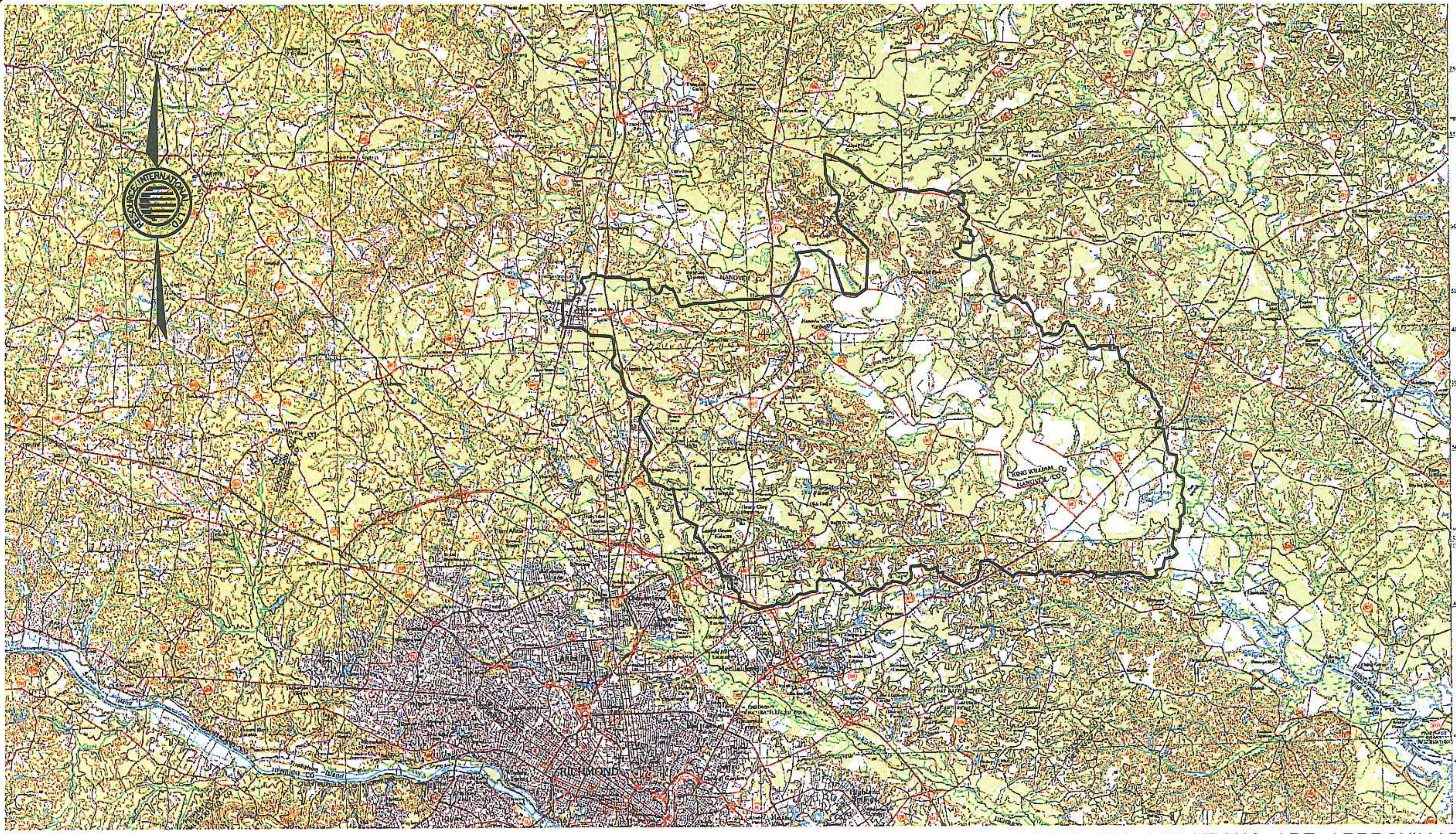

NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 6
PAMUNKEY DRAINAGE
AREA TO ROUTE 360
KING WILLIAM COUNTY, VIRGINIA
NOT TO SCALE

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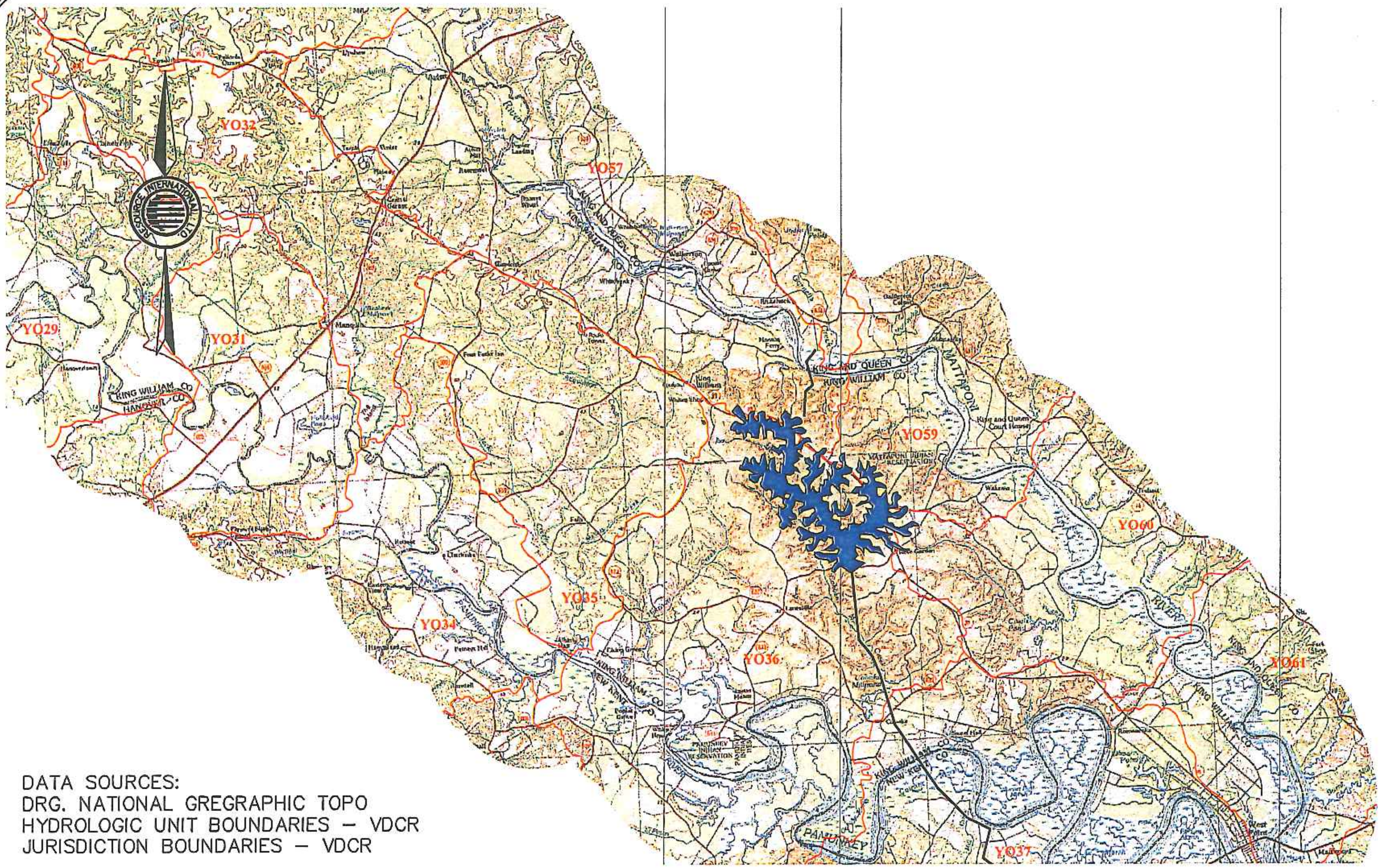
1.3.3 Newport News Reservoir

After the Draft of this report was issued the permits for the construction of the reservoir were denied. Therefore, this alternative is no longer a consideration. The evaluation of this alternative is contained in Appendix B.



DATA SOURCES:
DRG. NATIONAL GREGRAPHIC TOPO
HYDROLOGIC UNIT BOUNDARIES – VDCR
JURISDICTION BOUNDARIES – VDCR

NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 7
KING WILLIAM RESERVOIR
KING WILLIAM COUNTY, VIRGINIA
NOT TO SCALE

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1.3.4 Water Storage

The water use demands in the study area will require adequate water storage. The water system must be able to meet fire demands as well as maximum daily requirements. The criteria used to determine the proper size of storage facilities can best be understood in terms of the functions performed. These functions may be summarized as follows:

- Provide an equalizing reserve.
- Provide a fire reserve (based on the maximum fire flow requirement).
- Provide an emergency reserve

The equalizing reserve is the quantity of water needed to even out or "equalize" the system demands during a day's operation. The storage facilities allow the supply source to operate at a uniform rate because they provide this reserve. When the system demand is higher than the supply rate, water is drawn from the storage facilities. Conversely, when the system demand is below the supply rate, water is pumped into storage to ensure that an adequate quantity is available for the next period of high demand.

Fire flow storage is calculated at 2,500 gpm with 90 minute duration in order to provided protection for residential areas.

The emergency reserve is included as a precaution against disruptions in the supply source, breakage of water mains, or other unforeseen circumstances that would exert an additional demand on the storage facilities.

Potential Capacity for the Study Area

Storage Tank Calculations		
Domestic Usage	2,800,000 gpd	2,800,000 gallons
Equalizing Reserve	2,800,000 gpd x 0.2	560,000 gallons
Fire reserve	2,500 gpm x 90 min	225,000 gallons
Subtotal		3,585,000 gallons
Emergency Reserve	25%	896,250 gallons
Total Storage Required		4,481,250 gallons

This storage can be provided by multiple tanks in various areas throughout the study area. Currently the County has 300,000 gallons of storage. Tank storage should be added as development occurs. New tanks should be spread out in the service area. There tanks, one near Manquin, one near Aylett and a new one near Central Garage would be the most likely scenario.

1.3.5 Water Distribution

Currently the main distribution lines are 12" in size. Hydraulic Analysis indicates that a 12" line along Route 360 along with elevated storage tanks in the Manquin area and the Aylett area will provide adequate domestic and fire flows throughout the study area. See Figure 8.

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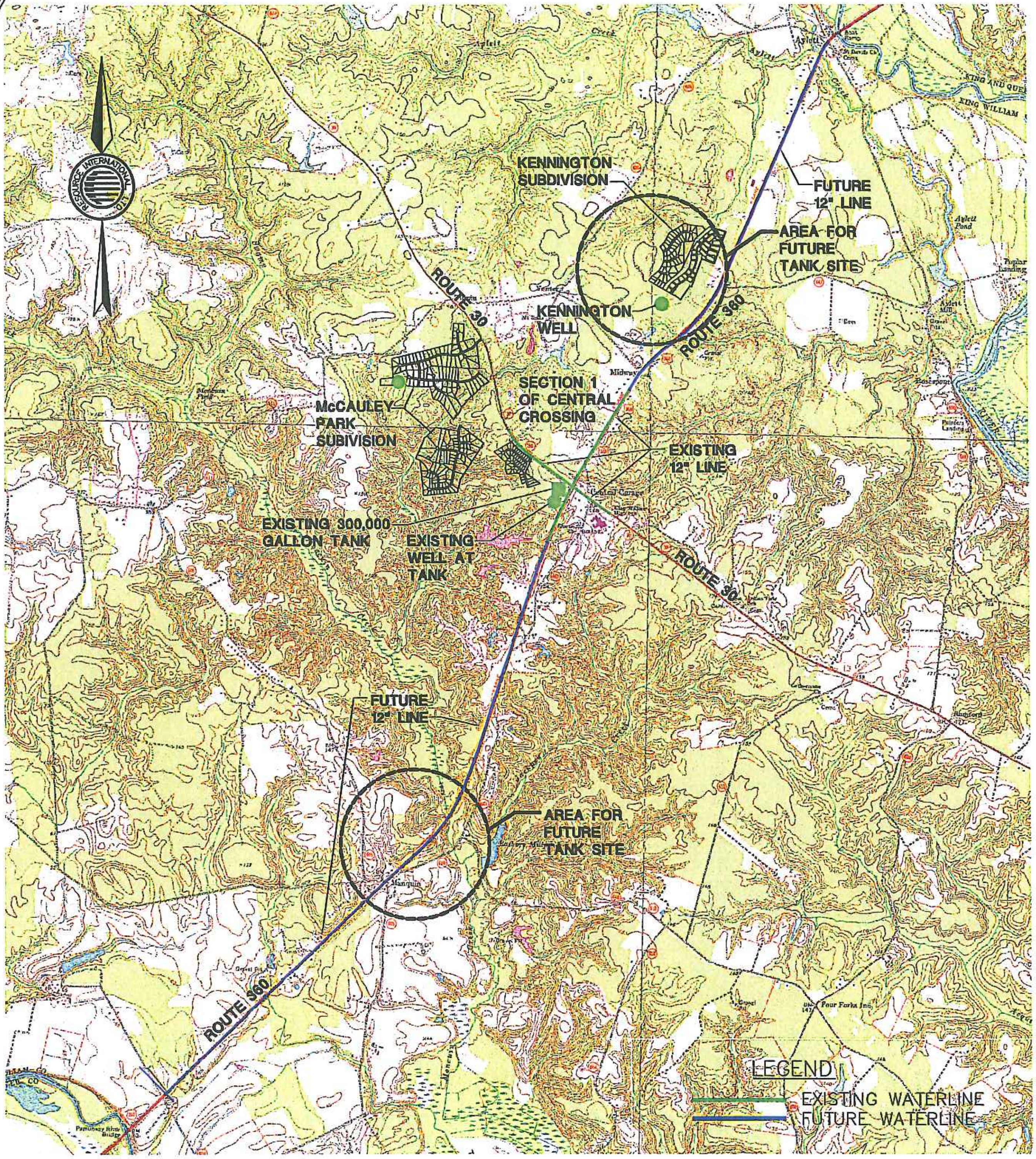

NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 8
PROPOSED FUTURE WATER
IN CENTRAL GARAGE AREA
KING WILLIAM COUNTY, VIRGINIA
NOT TO SCALE

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1.4 Evaluations of Wastewater Collection, Transportation and Wastewater Treatment

1.4.1 Wastewater Collection

With the exception of the original wastewater project serving the Kitty Litter plant where an 8" gravity system was constructed, to date wastewater collection systems have generally been installed by the developer within their respective commercial or residential developments. The developers have generally constructed pump stations to meet the needs of their development. This can create situations where the County is operating and maintaining more pump stations than is necessary within some drainage areas.

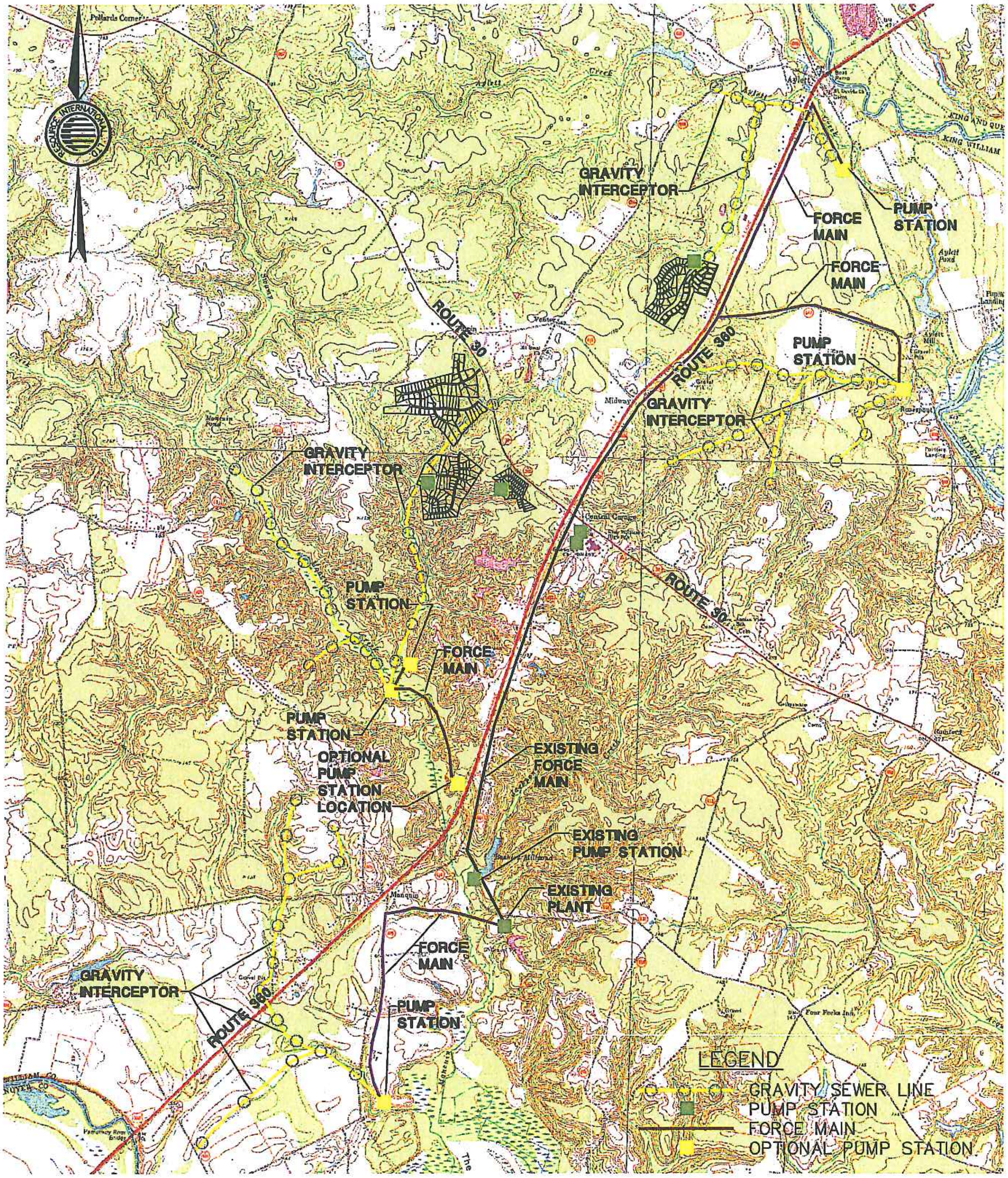
Therefore, future potential developers should be required to construct pump stations that serve the full drainage area and minimize the total number of pump stations. This can be accomplished by requiring that major interceptors could be constructed in each drainage area. Figure 9 illustrates where potential interceptors be located to collect and transport wastewater to a main pump station. Developers should be required to develop a conceptual plan with line sizing and pump station sizing to serve in general conformance with Figure 9. They should then design their respective collection system in conformance to the specific plan for the drainage basin and install the appropriate interceptors. If the full interceptor cannot be constructed due to cost or easements problems and a pump station is approved by the County, then it should be considered as temporary and designed so that when the main interceptor is constructed the pump station can be abandoned. The developer should not receive any tap fee credits for this station (if any such credits apply), due to its temporary nature.

1.4.2 Wastewater Transportation

Based on the projected demands Resource has evaluated the anticipated facilities required to meet the projected demands. There is currently a 10 inch force main along Route 360 from the entrance to Central Crossing just below Route 30 to the wastewater treatment plant. This line was constructed to serve McCauley Park, Kennington and Central Crossing. The excess capacity of this 10" line has been calculated to be 1,560,000 gpd. This portion of the line therefore, should be adequate for growth along Route 360 south of Central Garage to Manfield Road (Route 605).

There is an existing pump station at Central Garage that currently serves the shopping center and school. This pump station pumps into a 4 inch force main. This pump station and force main should have the capacity to serve commercial growth along Sharon Road as well as further development in the commercial area around Central Garage.

Area 6 from the Hanover County line to Route 605 will be required to construct a force main along Route 360 to serve any development that might occur in the area. Figure 9 shows potential future pump stations and associated force mains.



NOTE: ALL LOCATIONS ARE APPROXIMATE.

FIGURE 9
PROJECTED FIGURE
WASTEWATER FACILITIES
IN CENTRAL GARAGE AREA
KING WILLIAM COUNTY, VIRGINIA
NOT TO SCALE

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1.4.3 Wastewater Treatment

Resource conferred with HRSD on evaluation of the maximum potential for expansions at the existing plant site. HRSD has completed a study of the King William plant. The current study indicates that the existing wastewater plant could be expanded to 2 million gallons per day (mgd) if the effluent is transported directly to the Pamunkey River. The main difference in potential demands from this study and the HRSD study is that this study projects the study area has the potential to reach 1.87 mgd in 20 years, where the HRSD projects that a 2 mgd demand will be seen 30 years out. Therefore, there appears to be capacity for the planning period of 2 mgd.

Reuse Of Wastewater.

Do to the strict restrictions being placed on the discharge of wastewater into streams, reuse of wastewater is an area many localities are investigating. King William does not have a large industry that requires large quantities of water for process purposes. Other potential uses are for golf course irrigation and farm land. King William does have a substantial amount of prime farmland. Figures 10 and 11 indicate that areas 1 and 6 have significant areas that can be used for spray irrigation. Some of the considerations for spray irrigation are as follows:

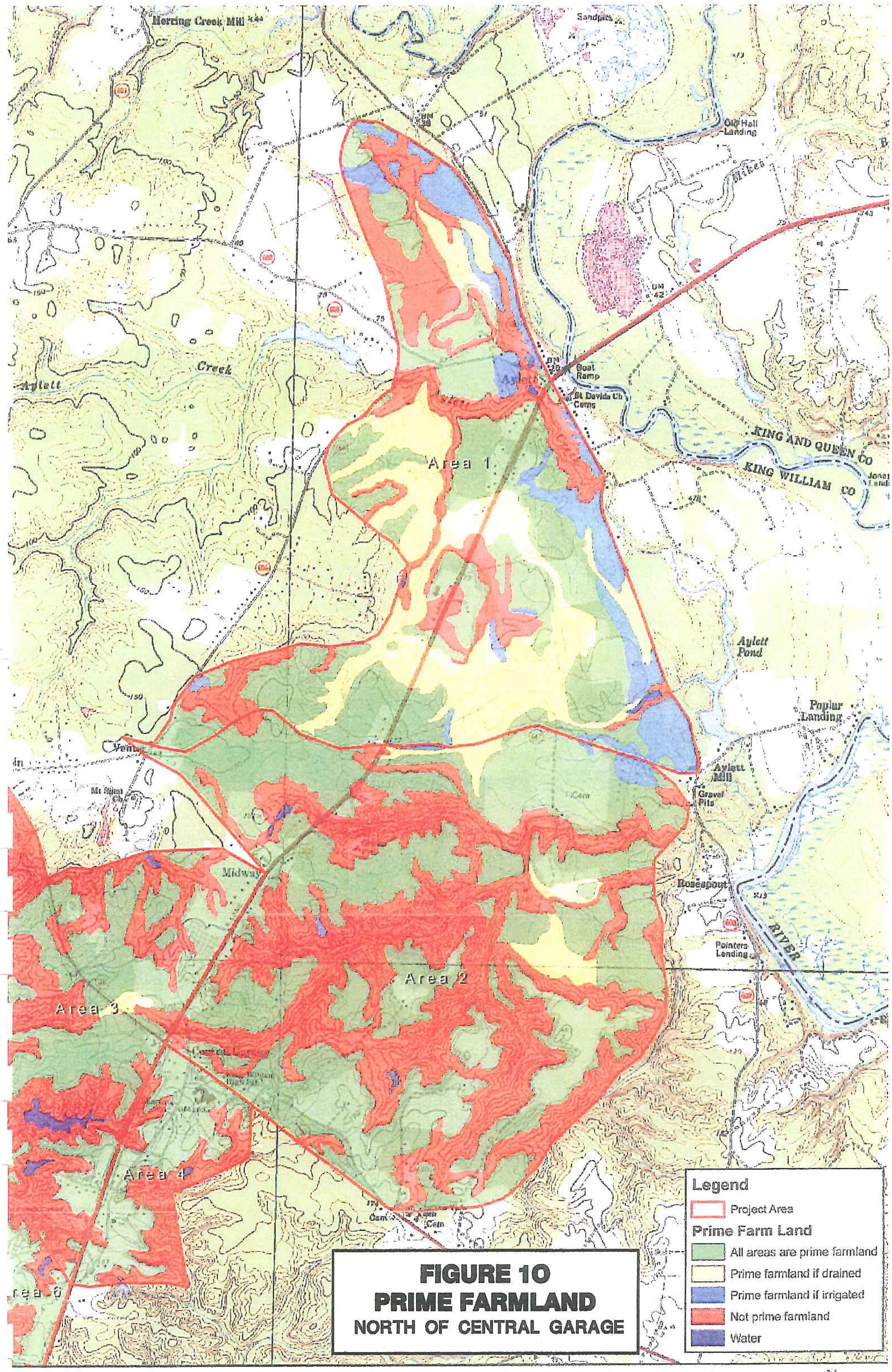
Pros

Can be sprayed on crops not used for human consumption
Provides adequate water to sustain crops even in drought conditions
Requires less stringent treatment
Maintains the rural character of the area
Keeps farmland from being developed

Cons

More manpower is required to operate when fields are being sprayed
Cannot discharge in the winter and therefore requires storage in the winter or ability to discharge into a stream
Generally requires a substantial amount of land

In general, a 200 foot buffer must be maintained around the spray irrigation fields. The amount of water that can be sprayed depends on the soils in which the crops are growing. In general, 150 acres should be able to support an average discharge of 150,000 gpd over a year's period. There is the potential that farmers in the area will give a long term lease or place their farm land in a conservation easement and allow the County to spray while they continue to farm the property. The larger the property the less the buffer takes away usable spray area.



USDA-NRCS-NCGC Digital Raster Graphic MrSID Mosaic, King William County, Virginia

Note: All locations are approximate

0 2,000 4,000 6,000 8,000

Feet

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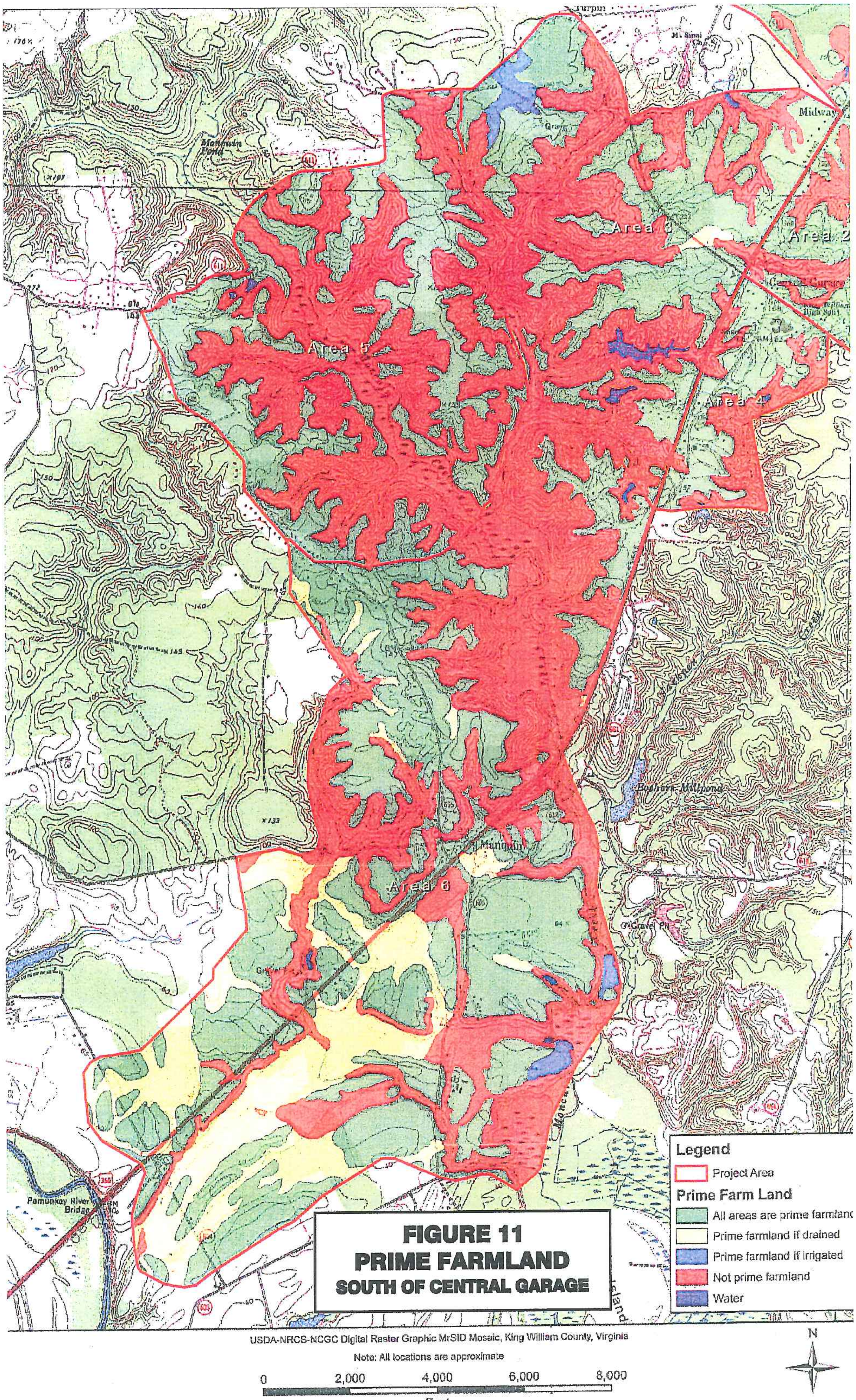

USDA-NRCS-NCGC Digital Raster Graphic MrSID Mosaic, King William County, Virginia

Note: All locations are approximate

1.4.4 Other Considerations

There will occasionally be situations where consideration must be given to evaluating potential water and wastewater treatment alternatives for major developments that are not likely to be connected to the public utility systems due to cost and/or location. These will have to be evaluated on a case by case basis. The County currently has requirements for lot sizes in its zoning ordinance that provide for lot sizes where public water and sewer is not available. To date these standards have been effective in allowing development to occur outside of the water and wastewater service area.

It is more likely that a subdivision may ask for consideration to construct a private wastewater system utilizing either spray irrigation or mass drain fields. Generally, the controlling aspect for these treatment alternatives is the receiving soils. The County would need the developer to have a significant soils study performed to prove that the soils are adequate for the proposed use as well as reserve drain fields. In each case either DEQ or the State Health Department will be required to issue a permit for the construction of any facility.

1.5 Alternatives for Financing Improvements

Currently there are very few alternatives to provide mechanisms to finance utility improvements through grant funds. The County has received some funding through programs such as Community Development Block Grant; however, there are considerable stipulations placed on the County for use of the funds and they are primarily for the benefit of low income communities. The County has also obtained loans through the Virginia Revolving Loan program that provides a 20 year loan at relatively low rates. Alternatives that are in use in Virginia communities that may be considered are proffers, developer required improvements, tap fee credits, capacity fees and prepayment of tap fees.

1.5.1 Virginia Clean Water Revolving Loan Fund

Programs Overview

The Virginia Clean Water Revolving Loan Fund (VCWRLF), previously known as the Virginia Revolving Loan Fund, was created in 1987. The Department of Environmental Quality, on behalf of the State Water Control Board (SWCB), manages the VCWRLF, administering the policy aspects of the Fund, receiving applications and providing funding recommendations to the SWCB. The Virginia Resources Authority (VRA) serves as the financial manager of the Fund.

The Virginia Clean Water Revolving Loan Fund (CWRLF) reduces interest rates for local governments for projects that improve water quality or prevent future problems. Benefits of the CWRLF include:

- Below-market interest rates
  - 1% below "AA" rates
  - 0% loans for some localities meeting eligibility criteria
- No bond issuance costs
- Payment waiver during construction

The Department of Environmental Quality administers the program and policy aspects of the fund on behalf of the SWCB. VRA serves as the financial manager of the fund: underwriting loans, issuing bonds, investing monies, closing loans, making disbursements, and maximizing economic benefits.

Wastewater Loan Program

Loans are provided to Virginia local governments to assist with wastewater treatment plant and/or collection system improvements. Localities may apply for a loan from the VCWRLF Wastewater Loan Program for any expansion, upgrade, extension, replacement, repairs, rehabilitation, and/or additions to publicly-owned wastewater collection and treatment facilities; construction of any needed new facility or new conveyance system; and any planning and/or design costs associated with the above improvements.

The VRLF is a self perpetuating loan fund which provides a low interest financing option to Virginia cities, towns and wastewater authorities for the upgrade, expansion, extension, replacement, repair, rehabilitation, and/or additions to public wastewater collection and treatment facilities.

The program has been designed so that any cost determined to be reasonable and necessary in the planning, design and/or construction of needed wastewater facilities improvements is allowed. Loan funds can be requested to cover most of the needed expenses for the County's approved wastewater system improvement program. DEQ may reduce loan eligibility and the scope and size of a project to insure the greatest financial benefit to as many counties/communities as possible.

New Collection Sewer

DEQ will evaluate loan allow ability for new collector sewers on the basis of sewer needs as they relate to the elimination of public health hazards, ground water contamination and other factors related to water quality problems that exist due to the lack of central sewerage facilities in the area. Allow ability will be limited to sewer lines including wyes and tees and line stubs for residential connections. Allow ability is limited to area determined to be maintained under municipal ownership. Service laterals from property boundary to structures remain ineligible under the program.

The purchases of land, easements and/or right-of-ways are not considered allowable costs under the Revolving Loan Program unless the land is considered an integral part of the treatment process. In addition, legal, administrative, and engineering expenses related to these purchases are also ineligible. Land purchases needed for spray irrigation, or other means of land application and disposal of wastewater and sludge would be considered an integral part of the treatment process and allowable for inclusion in the loan amount. The procurement of such land must be in conformance with the Federal Uniform Relocation and Real Property Acquisition Policies Act of 1970 (Uniform Act).

Any interest costs associated with funds borrowed for the planning, design, or construction of the project are ineligible for loan funding and will be disallowed.

1.5.2 Virginia Resources Authority

Virginia Resources Authority (VRA) provides cost-effective financial solutions to local governments and other public bodies for projects that improve the quality of life of Virginians. Created by the General Assembly in 1984, VRA supports community investments in the areas of water and wastewater. Financing solutions draw on VRA's unique ability to provide revolving fund loans to localities at below-market interest rates and to issue bonds backed by the moral obligation of the Commonwealth. The VRA staff offers extensive experience and expertise in a variety of financings and provides ongoing assistance to localities and their public projects.

This ability to maximize value for local communities with cost-effective and innovative financing options has made VRA the choice provider of infrastructure financing for Virginia communities. The VRA through its Virginia Drinking Water State Revolving Fund (DWSRF) provides low interest loans, as well as some grants, for drinking water projects to local governments and privately organized water suppliers. The fund receives U.S. EPA grants and state matching and is permanent and perpetual, similar to the Virginia Clean Water Revolving Loan Fund. Virginia Department of Health administers the program, while VRA acts as financial administrator and services the loans.

1.5.3 Department of Agriculture Rural Utilities Service

Water and Waste Disposal Programs

The Rural Utilities Service (RUS), the Rural Business-Cooperative Service, and the Rural Housing Service comprise USDA's Rural Development mission area. As the name suggests, the three agencies' programs are designed to meet the needs of people who live in rural areas – including infrastructure, housing, health and medical, education, and employment. The Rural Utilities Service's Water Programs Division has four programs which provide financial and technical assistance for development and operation of safe and affordable water supply systems and sewage and other forms of waste disposal facilities:

Water and Waste Disposal Loans and Grants
Emergency Community Water Assistance Grants
Technical Assistance and Training Grants

These programs are administered by USDA Rural Development offices. There are 47 State Offices, as well as Local or Area Offices. Brief descriptions of the programs are provided below.

Water and Waste Disposal Loans and Grants

RUS provides loans, guaranteed loans, and grants for water, sewer, storm water, and solid waste disposal facilities in cities and towns up to 10,000 people and rural areas with no population limits. Recipients must be public entities. These can include municipalities, counties, special purpose districts, Indian tribes, and corporations not operated for profit, including cooperatives. A new entity may be formed to provide the needed service if an appropriate one does not already exist. Applicants must:

- Be unable to obtain needed funds from commercial sources at reasonable rates and terms.
- Have the legal capacity to borrow and to repay loans, to pledge security for loans, and to operate and maintain the facilities.
- Propose facilities that are consistent with any development plans of the State, multi-jurisdictional area, counties, or municipalities where the project is to be located.

Loan and grant funds may be used to:

- Construct, repair, modify, expand, or otherwise improve water supply and distribution systems and waste collection and treatment systems, including storm drainage and solid waste disposal facilities. Certain other costs related to development of the facility may also be covered.
- Acquire needed land, water sources, and water rights.
- Pay costs such as legal and engineering fees when necessary to develop the facilities.

The law authorizing the program allows a maximum repayment period of 40 years. Three interest rates are used. They are set periodically based on an index of current market yields for municipal obligations. The poverty interest rate is currently 4.5 percent. The poverty rate applies when the primary purpose of the loan is to upgrade existing facilities or construct new facilities required to meet applicable health or sanitary standards; and the median household income (MHI) of the service area is below the poverty line for a family of four or below 80 percent of the Statewide Non-metropolitan MHI.

Applicants must demonstrate that a significant decline in quantity or quality of water occurred within two years of the date the application was filed with RUS. Public bodies and nonprofit corporations serving rural areas, including cities or towns whose population does not exceed 10,000 people may be eligible. Public bodies include Indian Tribes on Federal and State reservations and other federally recognized Indian Tribal groups.

Funds may be used to:

(1) Extend, repair, or perform significant maintenance on existing water systems; construct new water lines, wells or other sources of water, reservoirs, and treatment plants; replace equipment; and pay costs associated with connection or tap fees.
(2) Pay related expenses such as legal and engineering fees and environmental impact analyses, or acquire rights associated with developing sources of, treating, storing, or distributing water.
(3) Achieve compliance with the requirements of the Federal Water Pollution Control Act (33 U.S.C. 1 et seq.) or with the Safe Drinking Water Act when noncompliance is directly related to a recent decline in quality of potable water.

1.5.4 Utility Agreements with the Development Community

King William has utilized Public Utility Water and Wastewater Service Agreements based on similar agreements utilized in other jurisdictions. To date these agreements have worked successfully for a number of projects. These agreements require the developer to construct all the water and wastewater facilities at the developer's expense and dedicate the utilities to the County. The county agrees to credit to the developer a portion of the tap fees for the over sizing (excess capacity) of any offsite utility. This allows for the expansion of the water and wastewater system without the County borrowing money and the County is not paying for any interest or carrying costs of the expansion. The added advantage is that the developer is taking the risk if there are not enough lots sold to pay for the construction costs.

1.5.5 Capacity Fees

Some utilities have adopted availability fees. These fees are required over and above the tap fee. The availability fees are intended to recoup a proportional cost of the existing systems capacity that a new development will be utilizing. In general, the availability fee will be set aside to construct new facilities when needed to maintain adequate water supplies of wastewater treatment.

1.6 Management Issues

1.6.1 Acceptance of Private Utilities

To date the County has not been faced with acceptance of ownership and operation of private water and wastewater systems. When faced with a request to takeover ownership and operation of a private utility it is generally due to customer complaints due to poor service and water quality or for many small utilities it is the fact that the utility does not have the money to upgrade the system or operate the system at the required levels. If faced with the decision of accepting a private system it would be preferable that the utility system meet all the standards and criteria of the County's Utility Regulations. However, the final decision may be based on the welfare of the County citizens.

1.6.2 Operation and Maintenance of County Utilities

Staffing

Currently the public water system is operated and maintained by the County's buildings and grounds staff. Basically this is two staff members who must respond to significantly more than utility problems. Soon they will have responsibility for operating and maintaining five well facilities (three in Central Garage, one at the industrial park and one at Mount Olive), the water tank, water lines and wastewater collection system. The three systems are some distance from each other and therefore, the travel time between them must be taken into consideration. Maintenance responsibilities for the utility staff include the following:

- daily checks on the wells
- maintaining chlorination solution tanks
- reading meters
- performing water quality tests
- mark lines for Miss Utility
- perform system maintenance
- responding to various customer requests
- record keeping

Other emerging counties have discovered that eventually this type of arrangement will not work adequately and eventually form a separate utility department. The County's utility systems are growing to a point that a full time licensed (water) operator should be added to the County's staff.

Equipment

The County is responsible for maintenance of the water system and wastewater collection system. They will also be responsible for connecting new customers to the system (where not installed by the developer). The new connections will require connection to the main line, installation of service lines and meters on the water system. The wastewater system will require connection to the main line, installation of laterals and installation of cleanouts. Besides the normal hand tools required, the County will need the following:

- Backhoe
- small backhoe or "ditchwitch"
- Truck with trailer to haul equipment
- Remote meter reading equipment (this equipment can save considerable labor costs)

It should be noted that there are areas where the water lines are deep enough to require trench boxes (such as along State Route 360 where lines cross under Route 360). Repair of lines over 8 feet in depth may require special consideration.

Contract Maintenance

Considering that the system is relatively new and should have relatively few leaks, and the cost of equipment as well as the potential for dealing with deep pipe, it is be to the County's advantage to outsource the maintenance and major repair work. Currently the County has a repair and maintenance contract.

Water Conservation

The County has a water conservation plan. The plan addresses how drought situations will be handled. However, many communities are considering or have implemented requirements for low pressure irrigation systems. Some Counties are no longer allowing sprinkler systems to be installed in order to conserve the ground water resources. With the limited amount of ground water available to King William, some irrigation restrictions should be considered. These restrictions would include items such as:

1. No deduct meters allowed.
2. Only USEPIT Water Sense Certified irrigation systems may be used suggest verbiage is a follows:

   The following provisions shall apply to all residential irrigation within the Central Garage Water System.

Irrigation of homeowner lots utilizing public water sources shall require the use of low water volume systems. Any system, regardless of type, shall be equipped with devices to measure natural rainfall and meter irrigation water usage and timing, and either shut off the system or not turn it on if sufficient rainfall has been received. All irrigation systems and irrigation installers shall be USEPA Watersense certified. The County shall approve the type and installation design of any irrigation system installed on the Central Garage Water System.

King William County imposes water billing structure to discourage excess water usage by not allowing deduct meters to measure irrigation water separately. The County will encourage alternate sources of waterground for irrigation. Homes may be outfitted with rain barrel systems and cisterns. In an average rainfall year in this area a 2,000 square foot roof can shed over 70,000 gallons of water, which may in return be used for homeowner irrigation. Rain barrel/ cistern systems would not be subject to water use restrictions imposed by the County and/or Commonwealth of Virginia in the event of a declared water emergency. While low volume irrigation is encouraged in conjunction with rain barrel/cistern capture systems, it is not mandated.

Design Standards

King William has in place Utility Design Standards. These standards should be review every few years to determine if they meet current State regulations and current utility practices being used in King William County.

APPENDICES

APPENDIX A
DATA ON LAKE ANNA REQUIRED RELEASES

c. Lake Anna Releases: The Virginia Power-North Anna Nuclear Power Station operates Lake Anna, located on the North Anna River, a tributary to the Pamunkey River. The VPDES permit under which Virginia Power operated was due to expire on 2 October 2000. An application for the re-issuance of the permit was received by DEQ on 5 April 2000 and forwarded to EPA for comment. A public meeting was held on 7 June 2000, the draft Lake Level Contingency Plan (LLCP) was sent for comments on 1 August 2000, and a public hearing was held on 6 November 2000. According to a DEQ memorandum dated 17 November 2000, EPA and the Virginia Department of Health notified DEQ that they had no objections to the re-issuance of the permit.

The DEQ memorandum also stated that recent legislation required any VPDES permit issued for a surface water impoundment designed to provide cooling water to power generators must contain a Lake Level Contingency Plan (LLCP). The LLCP contains measures to minimize adverse impacts to downstream users in the event releases must be reduced during drought conditions. The LLCP provides for the operators of Lake Anna to reduce flows from 40 cfs to 20 cfs when the lake water level drops below designated levels due to drought conditions. The LLCP stipulates that flows may not be reduced below 20 cfs and that DEQ and the downstream users (Hanover County Public Utilities, Bear Island Paper Company, Engel Farms, Inc. and the Pamunkey Indian Tribal Government) must be notified 72 hours in advance. Releases from Lake Anna may not be such that established water quality standards downstream are impaired or numeric criteria for poc's violated. DEQ requires monitoring in the North Anna River when flows are reduced below 40 cfs. Furthermore, if a downstream user identifies an adverse effect and DEQ concurs, releases must be returned to 40 cfs in 5 cfs increments.

During public comment on the LLCP, DEQ addressed the potential for reduced flows from Lake Anna to affect the Totopotomoy wastewater treatment plant's compliance with its VPDES permit. In their response to comments, DEQ stated that the wastewater treatment plant's VPDES permit and its compliance with the permitted effluent limitations should not be affected.

Although DEQ was not aware that flows from Lake Anna would be reduced when the VPDES permit was issued for the Totopotomoy wastewater treatment plant, DEQ has since stated that the limits allowed under 10-10-3 protect water quality regardless of river flow or effluent discharge rate. DEQ does not believe that these flow changes would interfere with the capacity of the waterbody to assimilate and process pollutants or to maintain State-established water quality standards.

The District Engineer has concluded that DEQ appropriately considered the effect of reduced flows from Lake Anna on the effluent limits set for the Totopotomoy wastewater treatment plant. Furthermore, the District Engineer has concluded that sufficient administrative and regulatory controls are in place to ensure that water quality standards in the Pamunkey River are met downstream of Lake Anna.

d. Federal Agency Comments on Water Quality: In a letter dated 25 January 2002, commenting on application 01-V2032, the FWS expressed concern for the potential degradation of water quality and cited water quality issues that they believe should be addressed by the Corps in consultation with EPA: (1) federal listing under Section 303(d) of the Clean Water Act of the Pamunkey River as an impaired water due to violations of the dissolved oxygen (DO) water quality standard, (2) reduction in minimum releases from Lake Anna, (3) potential for impacts to anadromous fish spawning and nursery habitat from possible reduction in DO, and (4) determination that there are no anthropogenic sources causing or contributing to the dissolved oxygen deficit in the Pamunkey River. The FWS recommended that the Corps require that the EPA reevaluate this project and its effects on the water quality of the Pamunkey River.

APPENDIX B
EVALUATION OF THE RESERVIOR ALTERNATIVE

Newport News Reservoir

King William will have the ability to utilize water from the proposed Newport News Reservoir. This reservoir is located approximately 16 miles from Central Garage (see Figure 7). In order to utilize this water supply a water filtration plant will be needed. Potentially, the permitting process should be easier than trying to permit a withdrawal from the Pamunkey River. However the cost of the 16 miles of pipe line may outweigh the permitting advantages. In building the 16 miles of pipeline to serve Central Garage, there is the potential that by having potable water available, pressures may be created for residential growth along the pipeline outside of Central Garage.

Future Water Allotment

Today, King William County residents rely on groundwater wells for their drinking water. However, groundwater is a limited resource, carefully monitored and regulated by the state. At some point, the County will need additional new water supplies and will probably wish to develop a public water system. When that time comes, the County will receive an allotment of up to 3 million gallons of untreated water per day and, at the County's request, Newport News will build a water treatment plant in the County to treat that water at the cost of service.

Project Components

- Residential-styled pump station building on the Mattaponi River
- Submerged & screened intake pipes, designed & controlled to protect fish
- Pumping curtailed during droughts and spawning seasons
- Dam & road across Cohoke Creek, about 1,000 feet south of West Rose Garden Road
- 1500-acre lake with 1500 acres of protected shoreline
- Public access at five locations for fishing, swimming, non-powered boating and other activities
- 1½-mile pipeline from Mattaponi to the lake, and 12-mile pipeline to Diascund Reservoir
- Wetland & stream compensatory mitigation program
- Mattaponi River long-term ecological monitoring & research program
- Historic & archeological research & protection program
- Fish hatchery and fish passage programs in cooperation with other agencies
- No homes or tribal lands submerged by the project
- About 100 properties affected, but only a portion to be acquired in most cases
- Approximately $85 million will be invested in taxable improvements within the County

City-County Partnership

- County to acquire lake & shoreline, for lease to the City (50-year lease with automatic 25-year renewals; rent is 8% of appraised value at time of purchase; value rises with assessments)
- Net present value of rent payments for initial 50-year lease term is estimated $69 million
- 3 MGD supply of untreated water is reserved for the County on pro-rated cost basis
- City will provide treatment for County's allocation of water if requested, at cost
- County to provide recreational facilities on the lake, except the first will be constructed by City
- 185-acre Scotland Landing is owned by County and City; was bought at City's expense
- Pipeline easement from Mattaponi will be bought at City's expense, held in joint ownership
- Pipeline easement to Diascund Reservoir is City's responsibility

- County responsible for land-use controls for reservoir protection
- City pays partial taxes and payments in lieu of taxes on all capital improvements

Schedule

- All major permits have been issued
- Scotland Landing was purchased in 1996
- Property acquisitions for lake & shoreline were put on hold in 1999
- Surveys, appraisals & acquisitions were complete in 2008
- Long-term pre- and post-operational river monitoring program began in 1998
- Wetland & stream compensatory mitigation plans are to be complete by 2010
- Cultural resources work continuing through all phases of the project
- Construction of dam, pipelines, intake & pumping station is projected to take place from 2013 to 2016
- Lake filled and entire project on-line by 2020

Route 13/Wallops Island
Access Management Study

Final Report

prepared for
Virginia Department of Transportation

prepared by
Vanasse Hangen Brustlin, Inc.

Route 13/Wallops Island
Access Management Study

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May 2002

The study was completed for the Virginia Department of Transportation with the cooperation of many individuals and entities at the local, regional, state and federal levels. In particular, Vanasse Hangen Brustlin, Inc. wishes to acknowledge the dedication and guidance of the **Project Management Team** over the course of this study:

VDOT Transportation Planning Division: Harold Paxton

VDOT Accomac Residency: Will Cumming

Accomack-Northampton Planning District Commission: Jim McGowan

VDOT Traffic Engineering Division: Steve Edwards/Emmanuel Darko

VDOT Location & Design Division: Wilbert Lambert

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Executive Summary

The Virginia Department of Transportation (VDOT) identified the need to evaluate transportation deficiencies on U.S. Route 13 and portions of Route 175 on Virginia's Eastern Shore. This report documents the findings of the U.S. Route 13/Wallops Island Access Management Study and presents the final recommendations and plan of action for the corridors.

Study Goal

The goal of the study was to develop a plan that VDOT and the jurisdictions can implement to make U.S. Route 13 a safer and more efficient transportation facility for the traveling public over the next 20 years.

Existing Corridor Conditions

The evaluation of existing conditions along the U.S. Route 13 corridor examined the characteristics of the roadway and its users, addressed the seasonal variation, and identified key issues affecting travel along the corridor as summarized below.

Roadway

- U.S. Route 13 is a four-lane facility with no control of access.
- For most of its length, U.S. Route 13 has a median separating the northbound from the southbound directions of travel.
- There are several locations where the roadway is undivided with a center two-way left-turn lane. One location of particular concern is in Temperanceville where U.S. Route 13 is undivided with a three-foot flush median, curb/gutter, sidewalk, and numerous residences, driveways, and utility poles located on both sides of the road.
- The U.S. Route 13 corridor has a total of 21 traffic signals. With the exception of Exmore and Onley, signal spacing is not a concern. In these two towns, there is a concern about the addition of additional signals in the future.

Roadway Users

- The U.S. Route 13 corridor experiences a high volume of through traffic in both directions, ranging from 1,600 to 1,800 vehicles per day.
- There is a high volume of tractor-trailers, particularly in the northern portion of the U.S. Route 13 study area with poultry trucks moving to/from the Tyson's and Perdue plants to the north.
- Farm vehicles may be present on U.S. Route 13 for short stretches along most of the corridor throughout a long growing season.
- The U.S. Route 13 corridor is used by Eastern Shore residents for many different trip purposes including local trips, shopping trips, and work trips.

Safety

- Corridor crash rates are generally below the statewide average for similar primary routes, except in the towns of Exmore and Onley.
- Fatalities are a concern with a total of 24 fatalities recorded in the U.S. Route 13 corridor over the three-year analysis period (1997-1999). Of these fatalities, 40 percent occurred at night and 30 percent involved pedestrians.
- The proximity of obstructions to the roadway (i.e. utility poles, signs and structures) appears to be a contributing factor in 38 percent of these fatalities.
- Seventeen fatalities were recorded in the year 2000.
- The ability of the Virginia State Police to effectively enforce existing traffic safety laws along the U.S. Route 13 corridor, given current staffing levels, was raised as a local concern.

Traffic Operations

- Based on existing traffic volumes, U.S. Route 13 operates at a good level of service. Unsignalized access onto U.S. Route 13 is difficult at many cross streets due to geometry deficiencies.
- The unsignalized intersection of Route 175 and Route 798 near the Wallops Island mainland complex during the summer months does not function at an adequate level of service and needs to be improved.

Access

- A large number of access points (over 1,300) were identified throughout the U.S. Route 13 corridor. Many properties have multiple points of access.

Median Crossovers

- The median width in many areas does not provide adequate protection for crossroad traffic.
- Crossover spacing needs to be reviewed and the provision of left-turn lanes should be considered at all of the crossovers.
- The crossover widths of many median crossovers (measured parallel to U.S. Route 13) are not wide enough to accommodate simultaneous left-turning traffic.

Railroad

- The proximity of the Eastern Shore Railroad to U.S. Route 13, from Machipongo to Onley, impacts the safety of all crossroads connecting with U.S. Route 13 from the east.
- The upgrade of the rail line may impact these at-grade rail crossing as a result of the speeds increasing from 10 to 20 mph.

Land Use

- U.S. Route 13 is the primary access corridor for the entire Virginia Eastern Shore. The majority of daily trips require most residents to travel on U.S. Route 13 for both local and regional trip purposes.
- Active land uses along the U.S. Route 13 corridor include seasonal agriculture, and commercial/residential development in the towns and unincorporated settlements. Major commercial centers are located in Nassawadox, Exmore and Onley.
- In Accomack County, there are many schools located directly on, or close to, the U.S. Route 13 corridor. Access for school buses is a key concern.
- The Wallops Island area is a major employment center, attracting workers from both Virginia and Maryland. U.S. Route 13 is a major travel route serving this commuter population.
- The recently implemented reduced toll structure on the CBBT may have an impact on land use and development in Cape Charles and the entire southern portion of Northampton County.

Environment

Improvements in the U.S Route13 corridor could potentially impact sensitive environmental features particularly wetlands, prime farmland, and historic resources. Especially for improvements that involve roadway relocation or new alignment, additional investigations will be necessary to determine the extent and significance of such impacts.

Future Traffic Conditions

- Recent population projections show a relatively flat growth trend.
- Traffic volumes have continued to rise on U.S. Route 13. National transportation statistics support this rise in trip making activity.
- Given the potential for growth along the corridor, significant changes in land use development along U.S. Route 13 is likely to occur.
- By the year 2020, the U.S. Route 13 corridor will continue to operate at an overall good level of service.
- Side-street congestion is expected to occur at several unsignalized intersections, some of which may require signalization by 2020.
- Pockets of congestion are expected to occur at key signalized intersections, particularly at T's Corner, in Onley, and in Exmore.

Access Management Principles and Application to U.S. Route 13

Access Management for this study has been defined as applying roadway and land use techniques to preserve the safety, function, and capacity of the U.S. Route 13 corridor. Successful access management requires that: 1) the roadway be improved by VDOT in accordance with the access management plan and 2) the localities implement land use controls in accordance with the access management plan.

Roadway Techniques

Access management techniques considered for the roadway network included:

- Construction of turn lanes
- Driveway spacing and consolidation
- Adequate corner clearances and sight distances
- Crossover spacing and consolidation
- Median type, median widening and crossover width
- Signal spacing and timing
- Frontage roads/reverse frontage roads
- Inter-parcel connections

Table ES-1
Summary of Access Management Guidelines for the U.S. Route 13 Corridor

Criteria	Recommended Guidelines	Special Notes
Left-Turn Lanes	Construct at all full-access median crossovers	May not fully apply to directional crossovers
Two-Way Left-Turn Lanes	Provide 12 feet minimum, 14 feet desirable	Replace with non-traversible median when AADT exceeds 25,000 to 30,000 vehicles per day
Right-Turn Lanes	Require at all commercial entrances and side streets	Results in minimum lot frontage requirement
Shoulders	Widen/construct 10 feet wide min. outside and 3 feet min. median shoulders	Where residential driveway densities >10/mile, 12 feet min. outside shoulder
Driveway Spacing	400 feet minimum between commercial entrances	Results in minimum lot frontage requirement
Corner Clearance	U.S. Route 13 400 feet – upstream of cross street 250 feet – downstream of cross street	Vehicle storage needs may increase the 400-foot upstream requirement
	Cross Street 250 feet – upstream of U.S. Route 13 100 feet – downstream of U.S. Route 13	Use of restrictive median may reduce the 250-foot upstream requirement to 100 feet
Crossover Spacing	0.5 miles – full access 0.25 miles – directional access	Procedure needed for variances/modifications
Median Width	➤ Provide 50 feet minimum at major generators and cross streets by: ➢ Roadway widening ➢ Flare widening	Convert medians to directional access only or close median opening if median widening not feasible
	➤ Widen crossovers and lengthen left-turn lanes at locations with heavy vehicle considerations (buses, tractor trailers)	Convert medians to directional access only or close median opening if median widening not feasible
Side-Street Connections	Counties require new development to provide secondary access to side-streets where feasible VDOT to construct new local road links	
Signal Spacing	Two miles in rural areas, 0.5 miles in developing areas, 0.25 miles in developed areas	
Signal Timing	Implement signal coordination in developed areas	
Clear Zone	Establish 30 foot recovery area beyond traveled way, where practical	In areas with curbing, min. clear zone can be reduced to 6 feet

Land Use Techniques

Included in the final Access Management Plan is a model Highway Corridor Overlay District (HCOD) ordinance. The HCOD is meant to apply to all developments abutting U.S. Route 13 and requiring site plan or subdivision review. The HCOD also applies to redevelopment projects. It addresses the number of access points, minimum corner clearances, minimum sight distances, outparcels, new subdivision connections, median crossovers, shared access and reverse frontage. All developments generating more than 1,000 average daily trips covered by the HCOD shall prepare and submit a traffic impact analysis which address the following:

- Turn lane and access improvements
- Internal site circulation
- Shared access/access to adjacent sites
- Impacts to intersections and median crossovers
- Potential need for signalization
- Relationship of the proposal to the U.S. Route 13 Access Management Plan

Evaluation of Alternatives

Chapter 5 of this report presents the process used to develop and evaluate alternative improvement concepts. Access Management techniques were evaluated to address specific corridor deficiencies along with potential safety-related improvements. This study first sought to recommend the implementation of basic safety and access management solutions, where practical. In those areas where access management techniques were deemed insufficient or not practical, other solutions were evaluated including reconstruction of intersections or the construction of bypasses.

Since this is a planning level study, potential impacts are discussed in general terms and based on existing database information. Minor right-of-way takings and impacts to abutting land uses were not assessed. Furthermore, field investigations should be conducted prior to any construction activities to ensure compliance with all appropriate local, state and federal rules and regulations.

Summary of Alternatives Evaluation

Table ES-2 summarizes the alternatives considered by this study.

Table ES-2
Summary of Alternatives Evaluation

	Crossover Closure	Median Widening	Turn Lane Improve	Mainline Realign	12-Foot Shoulder	Frontage Roads	Wetland Impact	Clear Zone	Bypass Length	Cost (Millions)
Route 175										
Alt 1–Existing	N/A	6,900 ft.	6	N/A	67,200 ft.		11.3 ac			$6.1
Alt 2–New Alignment	N/A	N/A	5	N/A	None		22.1 ac		19,000 ft.	$14.5
US Route 13 Oak Hall & Temperanceville										
Oak Hall Alt 1 (Existing)	6	7,650 ft.	7	2,400 ft.	8,600 ft.					$4.5
Oak Hall Alt 2 (East Bypass)	2		2				34.4 ac		11,800 ft.	$10.2
Temperanceville Alt 1 (Existing)	5	5,600 ft.	3	4,300 ft.	8,750 ft.					$5.6
Temperanceville Alt 2 (West Bypass)	1		3				1.6 ac		9,300 ft.	$10.4
Temperanceville Alt 3 (East-South Bypass)	2		3				2.7 ac		4,600 ft.	$6.6
Combined Alternatives										
Alt 4–West Bypass of Oak Hall & Temperanceville	1		4				38.5 ac		22,000 ft.	$25.0
Alt 5–Alt 4 with Interchange	1		4				38.5 ac		22,000 ft.	$28.9
Intersection of US Route 13 and Route 175										
At-grade	1		1							
High-capacity Intersection	1		1							
Interchange	1		1							
Mappsville & Nelsonia										
Mappsville Alt 1 (Existing)	5	8,400 ft.	4	2,800 ft.	12,400 ft.					$6.4
Mappsville Alt 2 (West Bypass)	0		2				12.0 ac		8,800 ft.	$8.4
Nelsonia Alt 1 (Existing)	4	6,400 ft.	5	2,800 ft.	6,000 ft.		0.2 ac			$4.9
Nelsonia Alt 2 (East Bypass)	2		3				14.1 ac		11,600 ft.	$8.2
Mappsville & Nelsonia Alt 3 (Joint Bypass)	1		6				26.1 ac		20,400 ft.	$16.6
Mary N. Smith	1	9,600 ft.	4	9,600 ft.		2,000 ft.				$7.0
Whispering Pines	2	900 ft.	1	900 ft.				4,100 ft.		$1.1
Onley	1		5							$2.0
Melfa/Keller/Painter										
Alt 1–Shift RR within Town	4	22,000 ft.	12		11,400 ft.					$15.2
Alt 2–Shift RR outside Town	4	36,950 ft.	12		28,300 ft.		10.6 ac			$30.6
Exmore										
Alt 1–Connector Bayside Rd to Broadwater Rd	1		6							$1.8
Alt 2–Alt 1 plus Relocate Signal Shore Plaza Signal	2		7							$2.8
Nassawadox										
Alt 1–Shift RR within Town	2	6,250 ft.	3		6,250 ft.					$4.4
Alt 2–Shift RR Outside Town	2	6,250 ft.	3		6,250 ft.		1.5 ac			$7.0
Machipongo										
Alt 1–Route 627 Consolidate Median at Clam Shack	3	3,400 ft.	4	3,400 ft.				1,400 ft.		$4.3
Alt 2–Route 627 Consolidate Median at Young St	3	3,400 ft.	3	3,400 ft.				1,200 ft.		$4.2
Alt 3–New Local Connection to Route 618	4	3,400 ft.	5	3,400 ft.				1,200 ft.		$5.0
Alt 4–Variant of Alt 3 (Young St Open)	4	3,400 ft.	5	3,400 ft.				1,200 ft.		$4.9
Alt 5–Route 627 Consolidate Median near Chevon	3	3,400 ft.	3	3,400 ft.				1,400 ft.		$4.5
Martin Siding										
Alt 1–Frontage & Reverse Frontage Roads	2		3			1,000 ft.				$2.0
Alt 2–Realign US Route 13 & Construct Frontage Rds	2	1,200 ft.	3	1,200 ft.		1,100 ft.				$1.1
Route 184 Intersection										
Alt 1–Interchange & Grade Separation of RR	5		5	4,500 ft.						$17.2
Alt 2–Intersection Improve & Grade Separation of RR	2		4	3,000 ft.						$11.1
Cape Center	5	3,100 ft.	2	3,100 ft.						$3.0
Kiptopeke Road	2	2,400 ft.	2	2,400 ft.						$3.1

Study Recommendations

The recommended actions to improve the efficiency and safety of the U.S. Route 13 corridor are presented in Chapter 6. First, this plan recommends that VDOT implement the Access Management Guidelines set forth in Chapter 4. Second, this plan recommends that each locality along the corridor adopt the Highway Corridor Overlay District also discussed in Chapter 4. Finally, a series of roadway and safety improvements are recommended based on the alternatives analysis and public input process described in Chapter 5. The improvements are summarized as follows:

Corridor-wide Actions

Policy Actions

- Adoption of U.S. Route 13 Access Management Guidelines by VDOT
- Adoption of Highway Corridor Overlay District Ordinance by Localities
- Adoption of Recommended Concept Plan to guide future access decisions

Physical Improvements

- 10-foot outside shoulders on U.S. Route 13 as a minimum
- Rumble strips – outside and inside shoulders
- Raised pavement markers – center line only at 80-foot spacing
- Milepost markers – every mile
- Relocation or Removal of Hazards in Clear Zone
- Drainage Grate Reconstruction in Median – 202 total structures
- Move/consolidate crossovers – 70 locations
- Turn lane improvements at major intersections

Location and Study Recommendations

Maryland State Line to Route 175

- Clear vegetation in clear zone north of Route 710, near Welcome Center
- Provide 12-foot shoulder on southbound U.S. Route 13 through New Church
- Localized median widening – U.S. Route 13 at Route 710 in New Church
- Realign Route 704 (east) intersection with U.S. Route 13
- Localized median widening – U.S. Route 13 at Route 704

Route 175 to Route 692
(Oak Hall and Temperanceville)

- Construct improved intersection on U.S. Route 13 at Route 175
- Construct four-lane, divided bypass between Route 175 and Route 692
- Realign Route 702 intersection with U.S. Route 13
- Clear vegetation in clear zone north of Route 692

Route 692 to Route 729
(Mappsville)

- Provide 12-foot shoulders on northbound U.S. Route 13 between Route 692 and Route 691
- Localized median widening – U.S. Route 13 at Route 691
- Construct median through Mappsville
- Provide 12-foot shoulders on northbound and southbound U.S. Route 13 through Mappsville
- Realign Route 689 intersection with U.S. Route 13

Route 729 to Route 681 (Nelsonia)

- Provide 12-foot shoulders on northbound and southbound U.S. Route 13 through Nelsonia
- Construct medial through Nelsonia
- Realign Route 681 intersection with U.S. Route 13

Route 681 to Route 679

- Localized median widening – U.S. Route 13 at Route 680
- Localized median widening – U.S. Route 13 at Route 738
- Construct reverse frontage road – northbound at Route 738

Route 679 to Route Business 13/
Route 663 (Mary N. Smith Area)

- Realign Route 679 intersection with U.S. Route 13
- Construct median in North Accomac area, between Route 661 and Route 663
- Improve roadway alignment and widen median from Route 661 to Route 663
- Construct one-way frontage roadson southbound U.S. Route 13 at two locations

Business 13/Route 663 to
Route 639 (Accomac and Onley)

- Clear vegetation in clear zone between Route 662 and Business 13
- Realign Business Route 13 and Route 659 at Whispering Pines
- Construct reverse frontage road – northbound at Route 648

- Construct access road between Route 179 and Chesapeake Square Shopping Center
- Construct two-way frontage road – northbound at Route 1616
- Localized median widening – U.S. Route 13 at Route 680 (Nandua HS)
- Provide 12-foot shoulders on southbound U.S. Route 13 north of Route 639

Route 639 to Route 607 (Melfa, Keller, Painter)

- Relocate railroad right-of-way in Melfa, Keller and Painter to the east to allow for roadway widening
- Construct 16-foot-wide median through Melfa, Keller and Painter
- Localized median widening – U.S. Route 13 north and south of Melfa
- Construct directional median access at community college
- Realign Route 734 (east) to intersect with industrial park access
- Localized median widening – U.S. Route 13 north and south of Keller
- Localized median widening – U.S. Route 13 at Central Middle School

Route 607 to Route 618 (Exmore)

- Localized median widening – U.S. Route 13 at Bundick's Kuzzen's
- Provide 12-foot shoulder on southbound U.S. Route 13 north of Route 181
- Construct access road to serve Food City plaza and Trawler restaurant
- Construct local road connection between Route 618 and Route 652
- Future relocation of existing traffic signal

Route 618 to Route 617 (Nassawadox)

- Provide 12-foot shoulder on southbound U.S. Route 13 through Nassawadox
- Relocate railroad right-of-way in Nassawadox to the east to allow for roadway widening
- Localized median widening – U.S. Route 13 through Nassawadox

Route 617 to Route 628 (Treherneville and Machipongo

- Construct one-way frontage road on southbound U.S. Route 13 in Weirwood
- Clear vegetation in clear zone between Route 617 and Route 620
- Construct one-way frontage road on southbound U.S. Route 13 in Treherneville
- Construct access road between Route 622 and Route 625
- Provide 12-foot shoulder on southbound U.S. Route 13 south of Route 622
- Localized median widening – U.S. Route 13 at Route 627
- Realignment of Young Street (Route 627)

Route 628 to 630 (Martin Siding)

- Construct one-way frontage road on southbound U.S. Route 13 in Martins Siding
- Construct one-way frontage road on northbound U.S. Route 13 in Martins Siding
- Localized median widening – U.S. Route 13 at Route 1701
- Clear vegetation in clear zone between Route 1703 and Route 630
- Localized median widening – U.S. Route 13 at Route 630

Route 630 to Route 642 (Cape Charles)

- Construct interchange on U.S. Route 13 at Route 184
- Construct access road between Route 642 at Food Lion Shopping Center

Route 642 to Route 624 (Cape Center)

- Localized median widening – U.S. Route 13 at Route 684 (Kiptopeke ES)
- Construct one-way frontage road on northbound U.S. Route 13 between Route 643 and Route 644
- Construct one-way frontage road on southbound U.S. Route 13 between Route 643 and Route 644
- Localized median widening – U.S. Route 13 at Cape Center
- Construct reverse frontage road – northbound at Cape Center

Route 624 to Route 600 (Kiptopeke)

- Clear vegetation in clear zone between Route 624 and Route 646
- Provide 12-foot shoulder on southbound U.S. Route 13 north of Route 646
- Localized median widening – U.S. Route 13 at Route 645
- Close Route 704 access onto U.S. Route 13
- Construct access road improvements on Route 645

Route 175 from U.S. Route 13 to Mosquito Creek

- Provide left-turn lanes as needed between U.S. Route 13 at Route 798
- Provide 12-foot shoulder on eastbound and westbound Route 175

The study recommendations are projected to cost a total of **$139.3 million** (current dollars), with approximately 60 percent of the improvements occurring in Accomack County and the remaining 40 percent occurring in Northampton County.

Action Plan

Along with the recommendations previously summarized, an "Action Plan" for implementation of a short-term improvement program was developed. Short-term improvements have been identified that address existing safety concerns and/or begin to implement the access management guidelines.

Table ES-3
Summary of Short-term Recommendations

Recommended Action	Milepost Location	Cost by County: Accomack	Cost by County: Northampton
Corridor-wide Actions			
Adoption of Access Management Guidelines	NA	NA	NA
Adoption of Highway Corridor Overlay District Ordinances by localities	NA	NA	NA
Adoption of Recommended Concept Plan	NA	NA	NA
Install rumble strips in outside shoulders	NA	$74,000	$64,000
Install raised pavement markers in center dashed line only at 80 feet spacing	NA	$242,000	$208,000
Install milepost markers – every mile	NA	$8,000	$7,000
Drainage grate reconstruction in median at 120 Accomack and 82 Northampton locations	NA	$562,000	$226,000
Headwalls – 50-Accomack and 10-Northampton	NA	$70,000	$14,000
Turn-Lane Improvements	NA	$500,000	$500,000
Site-specific Actions – Accomack County			
Clear vegetation within clear zone			
— North of Route 710 near the Welcome Center	138-136	$26,500	
— North of Route 692	129	$6,500	
— Between Route 662 and Business 13/Route 659	117-115	$31,500	
Intersection improvement – Route 175 at Route 679		$300,000	
Intersection improvement – Route 175 at Route 798		$300,000	
Localized median widening – U.S Route 13 at Route 738		$750,000	
Construct of reverse frontage road – Route 738		$250,000	
Site-specific Actions – Northampton County			
Clear vegetation within clear zone			
— Between Route 617 and Route 620	94-92		$10,500
— Between Route 703 and Route 630	88-87		$18,800
— Between Route 624 and Route 646	75-73		$18,000
Construct one-way frontage road – south of Route 628	89-88		$575,000
Localized median widening – U.S. Route 13 at Route 684	78		$2,250,000
Total Short-term Improvements Cost		**$3,120,500**	**$3,891,300**

1
Introduction

The Virginia Department of Transportation (VDOT) identified the need to evaluate transportation deficiencies on U.S. Route 13 and portions of Route 175 on Virginia's Eastern Shore. Based on the study that is described in this report, an Access Management Plan was developed to address these deficiencies. This report documents the findings of the study and presents the following: summary of existing conditions; future conditions analyses; development and analysis of various alternatives considered; and the final recommendations and plan of action for the corridors.

1.1 Study Area

The study area extended along the U.S. Route 13 corridor from the Virginia – Maryland state line to Route 600 just north of the Chesapeake Bay Bridge-Tunnel toll facility, a distance of approximately 69 miles. In addition, Route 175 serving the NASA facility at Wallops Island was also a part of the study. Figure 1-1 depicts the study area as defined for development of this plan.

Regionally, U.S. Route 13 is the principal north-south corridor linking the Eastern Shore of Virginia with the mainland of Virginia to the south and to the northeast through the State of Maryland. In Virginia, the U.S. Route 13 corridor traverses both Northampton and Accomack Counties in their entirety.

For many on Virginia's Eastern Shore, U.S. Route 13 is considered the "main street" and economic lifeline. Not only does it serve the incorporated communities of Accomac, Onley, Melfa, Keller, Painter, Exmore, Nassawadox, Eastville, and Cheriton but also the unincorporated communities of New Church, Oak Hall, Temperanceville, Mappsville, Nelsonia, Weirwood, Birdsnest, and Treherneville.

Within the study area, U.S. Route 13 is currently an uncontrolled access, four-lane highway that has a variable width median separating northbound and southbound traffic throughout most of the corridor.

1.2 Study Team and Coordination

The "Project Team" involved in this study consisted of staff from the Virginia Department of Transportation (VDOT) and the Vanasse Hangen Brustlin, Inc. (VHB) consultant team. Other members of the consultant team included Travesky and Associates, Fitzgerald and Halliday, Transfomation Systems and 3Di, Inc. Key project staff included:

- Mr. Harold Paxton – VDOT Project Manager, Transportation Planning Division
- Mr. Will Cumming – VDOT Accomac Resident Engineer
- Mr. Richard Lockwood – VHB Project Manager
- Mr. Stephen Aldrich – VHB Transportation/Traffic Task Manager
- Ms. Karin Ertl – VHB Public Involvement Task Manager
- Mr. Mitchell Johnson – VHB Engineering Task Manager
- Mr. Chris DeWitt – VHB Land Use Task Manager
- Ms. Marie Travesky – Travesky and Associates, Public Involvement
- Ms. Denise Nugent – Travesky and Associates, Facilitator

Part of the initial stages of this project involved the establishment of a VDOT Project Management Team. This Management Team was comprised of representatives from VDOT's Transportation Planning, Traffic Engineering, and Location and Design Divisions, the Hampton Roads District and Accomac Residency, along with the Department of Rail & Public Transportation, Virginia Division of the Federal Highway Administration, and the Accomack-Northampton Planning District Commission. The purpose of the Project Management Team was to guide the consultant team through the duration of the study, review all technical documents, and provide direct input on alternatives. The Project Management Team met at critical decision points, meeting on average once a month.


Chesapeake Bay
Atlantic Ocean
NORTHAMPTON
Belle Haven
Exmore
Nassawadox
Weirwood
Birdsnest
Treherneville
Machipongo
Eastville
Cheriton
Cape Charles
Cape Center
Kiptopeke State Park
Chesapeake Bay Bridge Tunnel
MP 100
MP 95
MP 90
MP 85
MP 80
MP 75
MP 70
MP 65
178
182
183
600
618
13
609
617
622
625
628
630
634
636
639
680
184
643
624
646
Legend
MP Milepost
Route 13/Wallops Island
Access Management Study
Figure 1-1
Sheet 1 of 2
Northampton County
Study Area
1 0 1 2 Miles

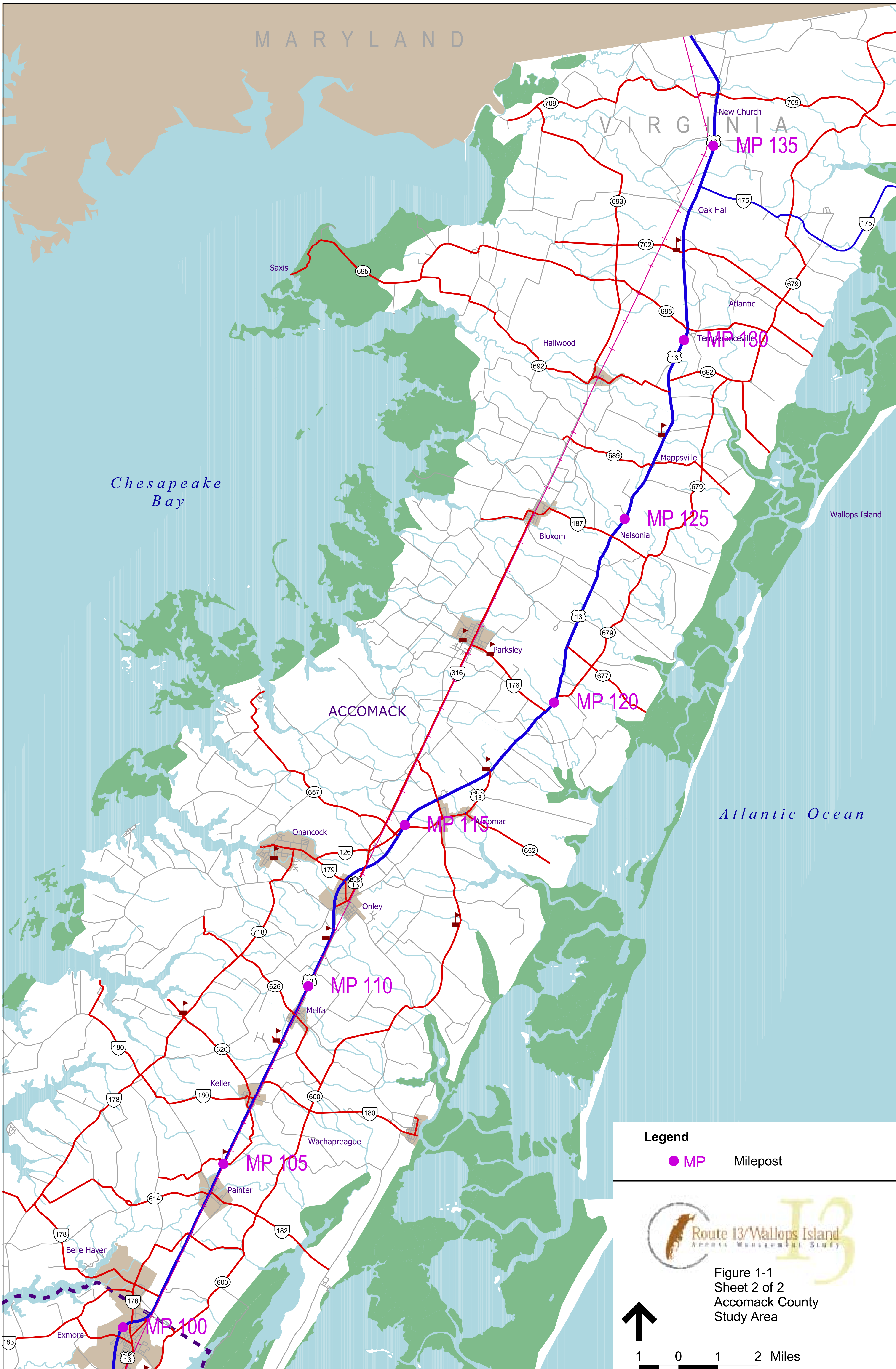


Figure 1-1
Sheet 2 of 2
Accomack County
Study Area

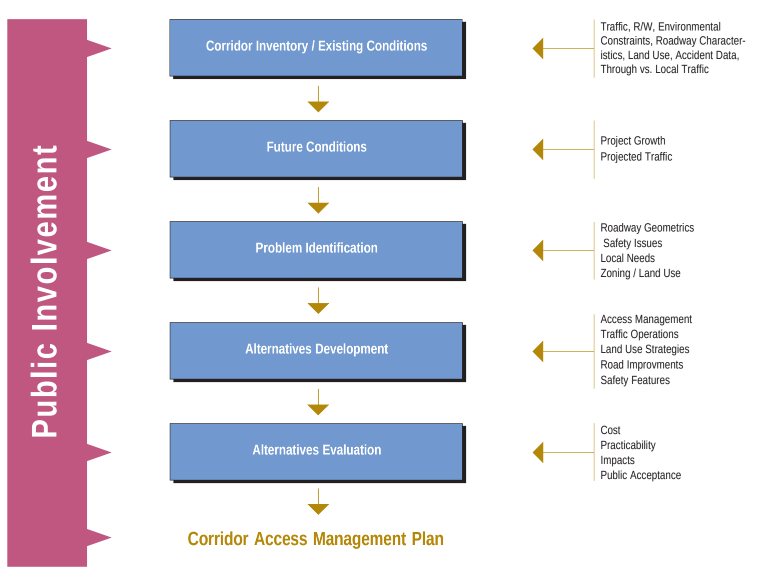
1.3 Study Process

1.3.1 Technical Tasks

Similar to most engineering and planning studies, a structure or "process" for the study was established at the outset. The study process consisted of a series of technical tasks that built upon one another in a logical sequence. Interjected into the technical tasks was a comprehensive public involvement program that allowed for meaningful public input throughout the process and the incorporation of input into the technical analyses. The various technical tasks within the study process are identified below and depicted in Figure 1-2, which provides a general overview of the project sequence and deliverables. These technical tasks were generally as follows:

- Task 1 – Corridor Inventory and Analysis of Existing Conditions
- Task 2 – Analysis of Future Conditions
- Task 3 – Problem Identification/Transportation Deficiencies
- Task 4 – Development of Alternatives
- Task 5 – Analysis of Alternatives
- Task 6 – Development of Corridor Access Management Plan/Recommendations
- Task 7 – Final Report

Figure 1-2
Study Process



These tasks were completed through a combination of: 1) utilization of existing information/databases from a variety of sources, 2) collection of additional information as needed, and 3) input received through the public involvement program described below.

1.3.2 Public Involvement

In addition to the technical tasks noted above, a major component of this project was public involvement. Key components of the Public Involvement Program were:

- Initial Scoping Meetings
- Coordination with Elected Officials
- Citizen Advisory Committee Meetings
- Technical Advisory Committee Meetings
- Community Meetings
- Public Information Meetings/Workshops
- Miscellaneous Outreach Meetings
- Briefings to Local Boards/Commissions

Public involvement began at the very beginning of the study process through a series of initial scoping meetings and continued throughout the entire study. The purpose of the scoping meetings was to identify transportation-related issues in the corridor and to solicit input on potential representatives for a Citizens Advisory Committee.

Based on this scoping process, a Citizens Advisory Committee (CAC) was formed for the purpose of serving as a sounding board for the study team - to insure that the study process was grounded and addressed the issues and concerns of the "people" of the Eastern Shore. Six CAC meetings were held over the course of the study.

In addition, a total of four public information meetings were held, two in each county. The purpose of these meetings was to obtain public comments at the initiation of alternatives identification and at the draft recommendation stages.

During the development of alternatives, a series of five "Town" meetings were held to obtain input regarding alternative options within the following communities: 1) Nelsonia/Mappsville, 2) Temperanceville/Oak Hall, 3) communities along Route 175, 4) Melfa/Keller/Painter, and 5) Machipongo/Nassawadox.

Coordination with elected officials was considered essential to insure that the leadership of the Eastern Shore was kept informed and had a means to provide input during the study process. The study team met individually with officials throughout the study.

1.4 Study Goals and Objectives

In order to keep the study focused, specific goals and objectives were developed at the outset based on field reviews of the corridor, information received during the initial scoping process, and input from the first Citizen Advisory Committee meeting. The overall study goal and related transportation objectives are described briefly below.

1.4.1 Study Goal

The goal of the study was "to develop a plan that VDOT and the jurisdictions can implement to make U.S. Route 13 a safer and more efficient transportation facility for the traveling public over the next 20 years."

1.4.2 Objectives

The following nine objectives were identified as the most important in terms of achieving the study goal.

1. Improve Intersections
   - Add, lengthen, and/or improve deceleration lanes
2. Improve Entranceways/Exits To and From Existing and Future Businesses Along U.S. Route 13
   - Consolidate curb cuts
   - Enhance local zoning
   - Move, eliminate and/or consolidate crossover locations
3. Improve Roadway Geometrics
   - Provide additional travel lanes
   - Widen shoulders
   - Improve median width/crossover locations
4. Provide Additional Safety Features
   - Add signage
   - Increase distance of fixed objects from roadway (i.e., utility poles)
   - Add rumble strips to shoulder pavement
5. Better Accommodate Farm Vehicles/Equipment and School Buses

6. Better Accommodate Local with Through Vehicles

   - Control truck traffic volumes and speed
   - Regulate speed of other through vehicles
   - Construct frontage roads (where appropriate)
   - Construct bypasses (where appropriate)

7. Better Accommodate Bicycles and Pedestrians on and across U.S. Route 13

8. Increase Capacity

   - Increase capacity to accommodate growth
   - Evaluate impact of toll change

9. Enforcement of Traffic Laws

2

Existing Conditions

A thorough understanding of the U.S. Route 13 corridor on Virginia's Eastern Shore required that the early stages of this study include both field observations and detailed physical and operational data collection. This chapter describes the examination of the roadway facility, the surrounding environment, and its users. Facility inventories determined roadway and intersection geometry, adjacent land uses, locations of driveways and median crossovers, posted speed limits, and width of travel lanes and shoulders. User analyses determined seasonal travel patterns and variations, origin and destination patterns within the study area, the types of vehicles using the roadway corridor, and the operational function of the roadway facility (the ability of the roadway corridor to accommodate the existing users' demands). Surrounding environment inventories included land use patterns, historical growth trends, and environmental resources.

2.1 Traffic Characteristics

A detailed data collection program was conducted that involved field observations, roadway inventories, daily machine counts, peak period intersection turning movement counts, and origin/destination license plate surveys. In addition, the study team utilized extensive historical traffic data obtained primarily from records of VDOT and the Chesapeake Bay Bridge and Tunnel District (CBBTD). The following sections present the significant findings from these work efforts.

2.1.1 Daily Volumes/Vehicle Mix

Daily traffic volumes were reviewed and tabulated to understand traffic demands at various locations along the corridor. An analysis of seasonal, daily and hourly variations was also completed in order to understand and characterize daily volumes at different times. The volume data came from several sources:

- Automatic Traffic Recorder (ATR) counts collected by VHB
- Revenue data from the Chesapeake Bay Bridge-Tunnel (CBBT)
- ATR counts collected by VDOT

Figure 2-1 summarizes daily traffic volumes and heavy vehicle percentages as recorded along the U.S. Route 13 corridor during the spring (May) and summer (July) of 2000. During May, daily traffic volumes were lowest at the southern end of the corridor - approximately 8,200 vehicles per day (vpd) at the Chesapeake Bay Bridge-Tunnel (CBBT). Proceeding north, volumes gradually increased with a peak in the vicinity of Onley of 18,000 vpd. From Onley to the Maryland State Line, traffic volumes ranged from 15,000 to 17,000 vpd. During July, overall daily volumes on U.S. Route 13 were higher than during the month of May with a low of 12,000 vph at the Chesapeake Bay Bridge – Tunnel and 21,500 vpd at the northern end of the corridor.

U.S. Route 13 experiences significant heavy vehicle use throughout the corridor. (Heavy vehicles are defined as vehicles having six tires or more). Heavy vehicles generally comprised 12 to 21 percent of May daily traffic volumes and from 10 to 18 percent of July daily traffic volumes. The largest percent of heavy truck traffic was recorded at the southern end of the corridor for both months.

Seasonal Variation

To understand seasonal variation in daily traffic, monthly volumes from 1998, 1999, and 2000 were examined and averaged. Table 2-1 presents a summary of seasonal variation at the VDOT permanent count station located approximately ¼ mile north of Route 180 in the vicinity of Keller. Table 2-2 presents a summary of the seasonal variation of traffic at the Chesapeake Bay Bridge-Tunnel (CBBT).

The following observations can be made by examining Tables 2-1 and 2-2:

- Traffic volumes are highest in July (almost 21,000 vpd north of Route 180 and over 11,500 vpd at the CBBT).
- The second and third highest traffic volume months are August and June, respectively.
- The lowest daily traffic volumes occur in January (12,800 vpd north of Route 180 and 4,800 vpd at the CBBT).
- In both locations, April traffic volumes best represented the average annual daily volume.
- Traffic (AADT) seasonal variations are much greater at the Chesapeake Bay Bridge-Tunnel.

Figure 2-1
Sheet 1 of 2
Northampton County
2000 Average Daily Traffic (ADT) Volumes
and Percent Heavy Vehicles (HV)

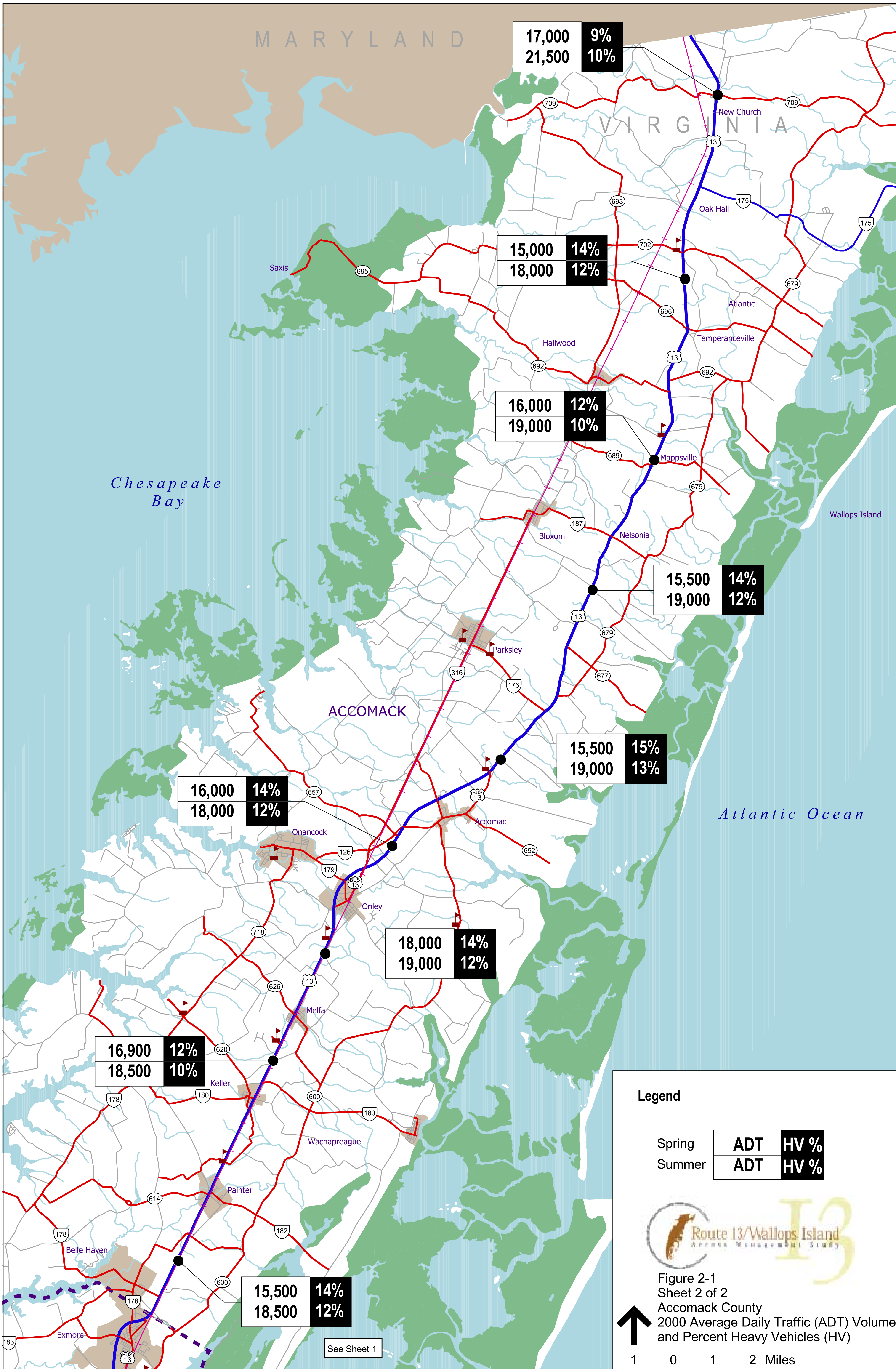


Figure 2-1
Sheet 2 of 2
Accomack County
2000 Average Daily Traffic (ADT) Volumes and Percent Heavy Vehicles (HV)

Table 2-1
Seasonal Variation of U.S. Route 13 Daily Traffic Volumes
1/4 Mile North of Route 180, near Keller

Month	1998 (vpd)	1999 (vpd)	2000 (vpd)	Average (vpd)	Seasonal Adjustment Factor*
January	----	13,149	12,458	12,804	1.299
February	----	14,064	14,512	14,288	1.164
March	----	14,622	15,209	14,916	1.115
April	16,841	17,360	16,017	16,739	0.993
May	16,782	17,201	17,208	17,064	0.975
June	17,909	18,149	18,918	18,325	0.907
July	20,623	21,309	----	20,966	0.793
August	----	19,790	----	19,790	0.840
September	17,542	16,491	----	17,017	0.977
October	16,261	----		16,261	1.023
November	15,912	16,388	----	16,150	1.030
December	15,060	15,401	----	15,231	1.092

* Seasonal adjustment factor represents the typical deviation of the month's average daily traffic volumes from the average annual daily traffic volume.

Table 2-2
Seasonal Variation of U.S. Route 13 Daily Traffic Volumes
Chesapeake Bay Bridge-Tunnel

Month	1995 (vpd)	1996 (vpd)	1997 (vpd)	1998 (vpd)	1999 (vpd)	Average (vpd)	Seasonal Adjustment Factor*
January	4,744	4,197	4,831	5,091	5,162	4,805	1.606
February	4,941	4,602	5,135	5,150	5,587	5,083	1.518
March	5,690	5,785	6,322	5,840	6,021	5,932	1.301
April	7,789	7,348	7,016	7,743	8,103	7,600	1.016
May	7,924	7,933	8,176	8,320	8,514	8,173	0.944
June	8,861	8,966	8,911	9,068	9,388	9,039	0.854
July	11,626	10,679	11,193	11,769	12,371	11,527	0.670
August	10,540	11,623	12,096	11,284	11,431	11,395	0.677
September	8,580	7,697	7,821	8,606	7,641	8,069	0.956
October	7,101	6,889	7,163	7,552	7,757	7,292	1.058
November	6,907	6,673	6,961	7,481	7,875	7,179	1.075
December	6,148	6,652	6,399	6,430	6,962	6,518	1.184
Total	**90,850**	**89,044**	**92,025**	**94,335**	**96,813**	**92,613**	

* Seasonal adjustment factor represents the typical deviation of the month's average daily traffic volumes from the average annual daily traffic volume.

Daily Variation

The study team further examined traffic volumes by day of the week to better understand the weekly traffic demands along the corridor. Figure 2-2 summarizes daily variation at the VDOT permanent count station, again approximately one-quarter mile north of Route 180 in the vicinity of Keller. Figure 2-3 summarizes daily variation at the CBBT.

The following observations can be made:

- Summer daily volumes are consistently higher than spring volumes.
- Weekday volumes (excluding Friday) are relatively consistent, ranging from roughly 16,000 vpd to 18,000 vpd near Route 180.
- U. S. Route 13 traffic in the central part of the corridor peaks on Friday at 22,000 vpd, with the second highest travel day being Saturday (20,000 vpd).
- Summer traffic volumes at the CBBT are highest on Saturday (almost 18,000 vpd) and Sunday (almost 16,000 vpd), indicating a strong recreational/weekend demand.

Figure 2-2
Existing Daily Variation of U.S. Route 13 Traffic Volumes
One-quarter Mile North of Route 180

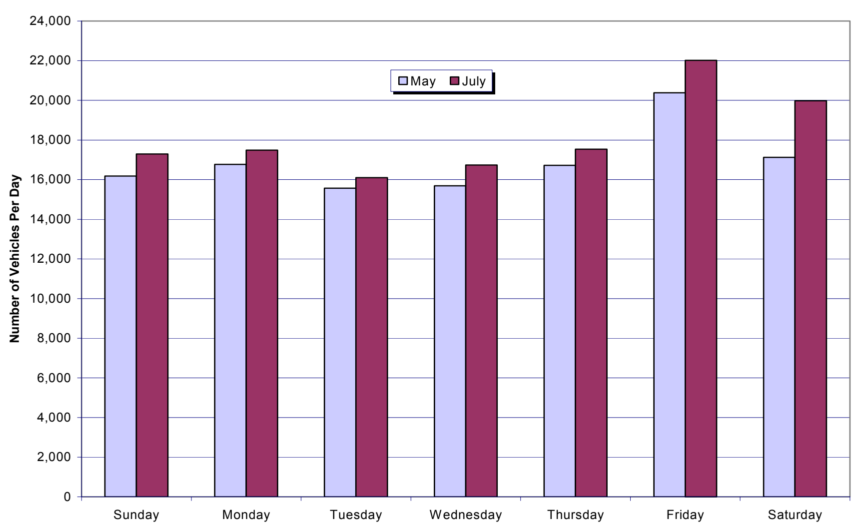
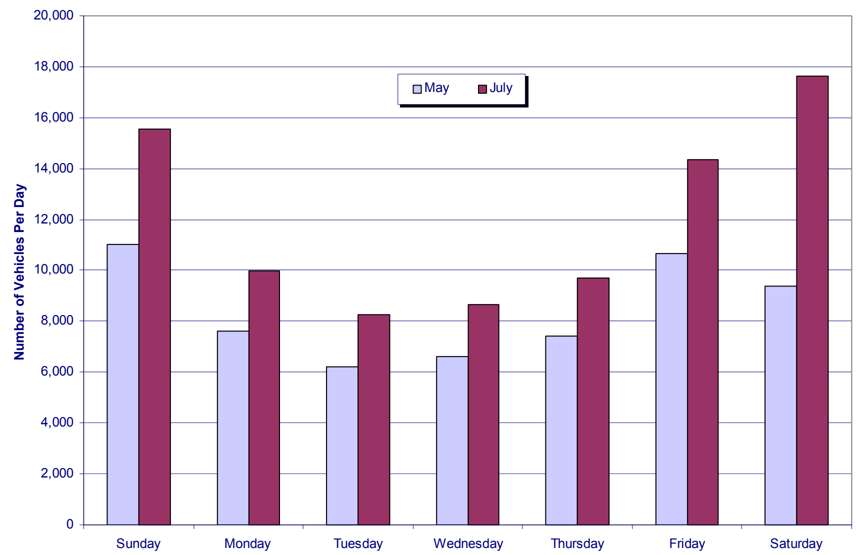


Figure 2-3
Existing Daily Variation of U.S. Route 13 Traffic Volumes
Chesapeake Bay Bridge-Tunnel



Hourly Variation

Analysis of weekday and weekend (Saturday) hourly traffic volumes allowed the study team to understand how traffic demand varies over the course of the day. Hourly fluctuations in daily volumes help identify the degree to which commuting traffic and recreational traffic utilize the highway. Such fluctuations also highlight periods of peak usage of U.S. Route 13. Traffic volumes on a weekday and a Saturday in July 2000 were examined at the permanent count station north of Route 180 (Figure 2-4) and at the Chesapeake Bay Bridge-Tunnel (Figure 2-5).

At the U.S. Route 13 location near Keller, the following observations can be made with respect to hourly traffic volume variation:

- Weekday traffic volumes represent a relatively "typical" peaking pattern with both a morning and evening peak period.
- The weekday evening peak hour volume is noticeably higher than the morning peak hour volume with almost 1,300 vehicles per hour (vph) as compared to 1,000 vph.
- Weekday traffic volumes drop rapidly after 6:00 PM.
- Weekend daily traffic patterns are significantly different from weekday patterns, with a steady increase in traffic demand from 5:00 AM to midday and a more gradual, but steady, decline in traffic demand throughout the afternoon and into the evening.

Figure 2-4
Hourly Variation of U.S. Route 13 Weekday & Saturday Traffic Volumes
1/4 Mile North of Route 180 near Keller (July 2000)

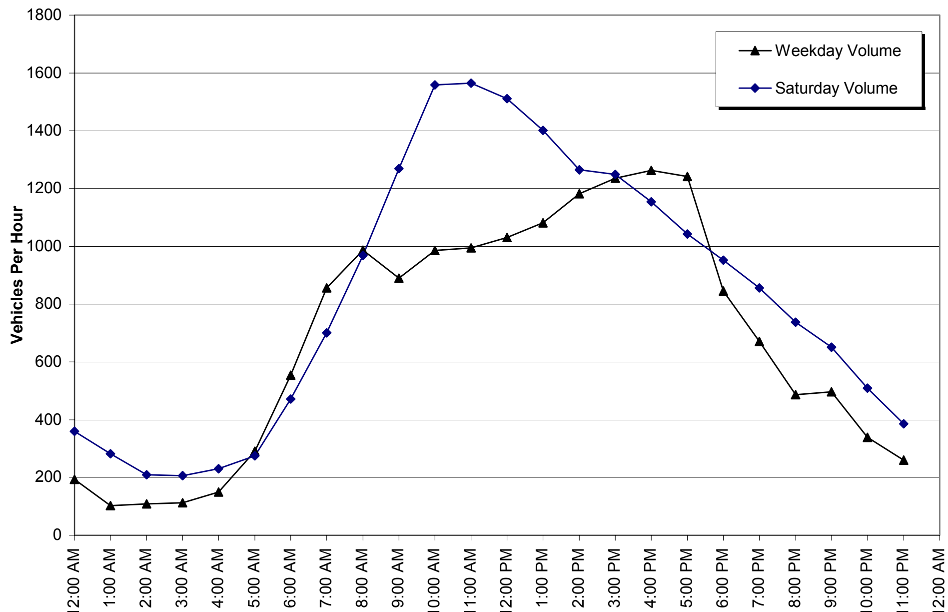
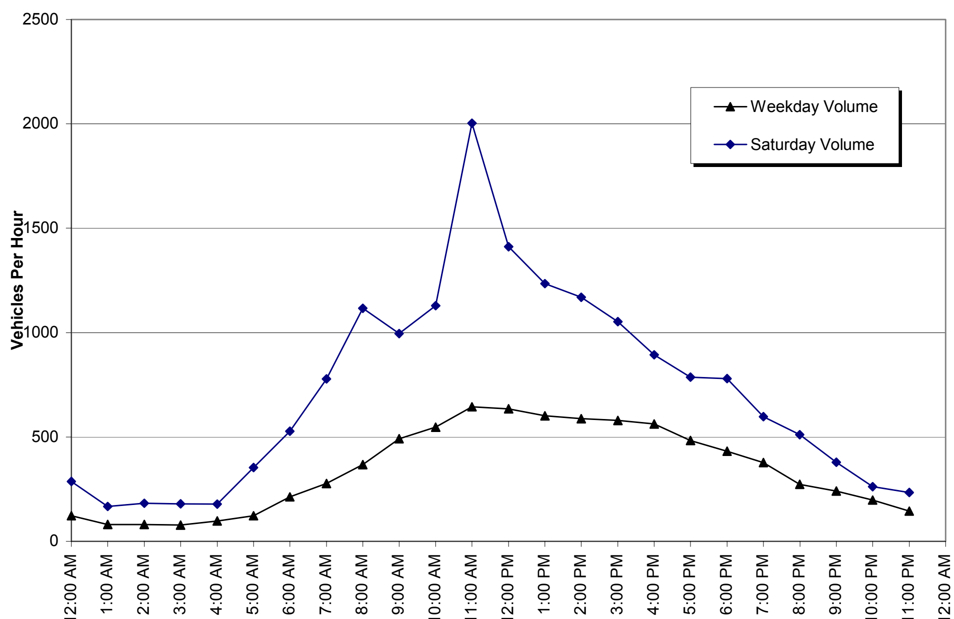


Figure 2-5
Hourly Variation of U.S. Route 13 Weekday & Saturday Traffic Volumes
Chesapeake Bay Bridge-Tunnel (July 2000)



At the Chesapeake Bay Bridge-Tunnel, weekday and weekend traffic patterns are more similar to each other and reflect recreational demands. The following observations were made:

- Weekday traffic patterns do not reflect the traditional peak period commuter patterns that were observed further north along U.S. Route 13.

- Weekday patterns show a steady increase in volume from 5:00 AM to 11:00 AM followed by a more gradual decline in volume throughout the afternoon and into the evening.

- Weekend patterns also reflect this midday peaking characteristic, with a much higher volume and the midday peak (11:00 AM) is much sharper and more defined than the weekday midday peak.

2.1.2 Peak Hour Volumes

In order to understand the operational characteristics of the roadway and key intersections along the corridor, an extensive peak hour traffic volume data collection effort was undertaken. Weekday peak hour turning movement counts were conducted at 16 locations in May, 2000 and 27 locations in July, 2000. Figures 2-6 and 2-7 summarize two-way traffic volumes on U.S. Route 13 during the morning and afternoon peak hours as recorded in both May and July.

The figures show that during each of the peak hours, traffic volumes are lowest at the southern end of the corridor, and increase heading north to Route 183 at Exmore. Between Exmore and Route 175, intersection volumes are relatively constant, and from Route 175 decrease slightly heading north to the Maryland State Line.

Afternoon peak hour volumes are generally 30-50 percent higher than morning peak hour, and summer volumes are higher than spring. Also, during the summer afternoon peak hour, considerable intersection traffic demands occur at the three shopping plaza intersections: Chesapeake Square, 4 Corner Plaza and Shore Plaza.

Figure 2-6
Existing Morning Peak Hour Corridor Two-Way Traffic Volumes

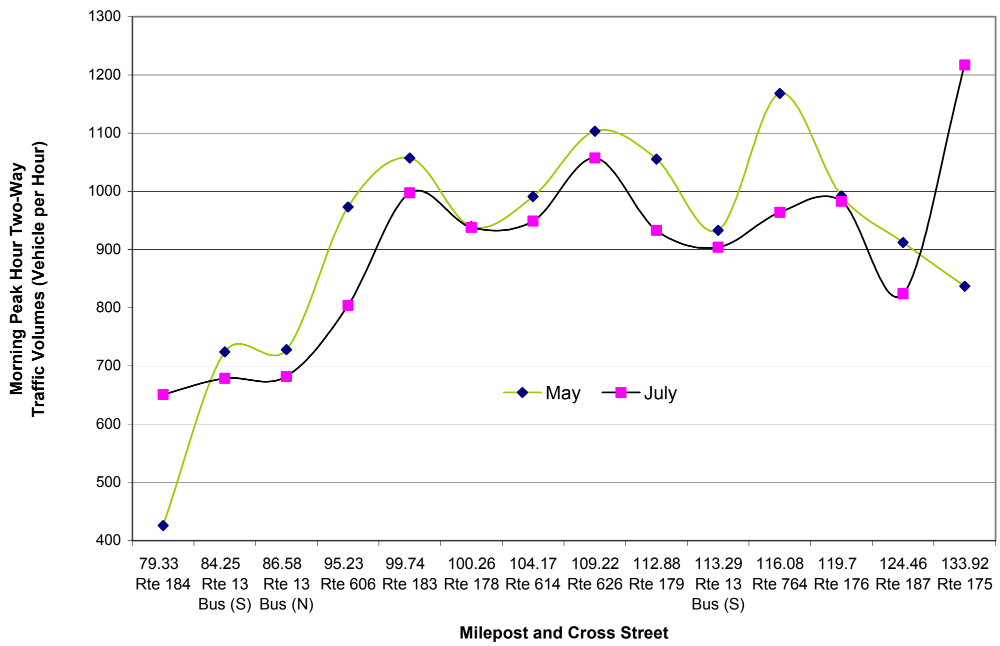
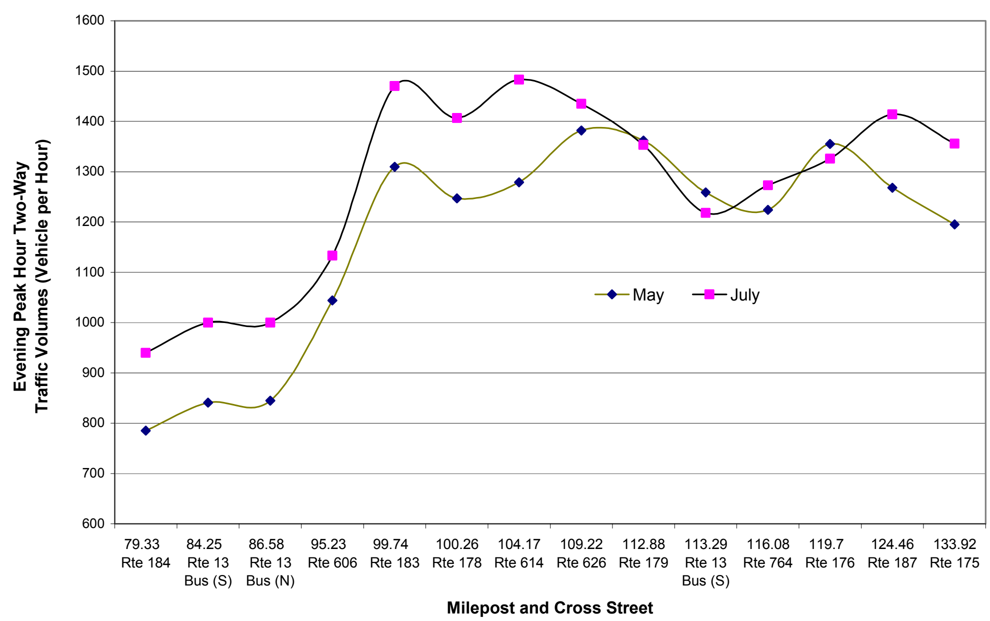


Figure 2-7
Existing Evening Peak Hour Corridor Two-Way Traffic Volumes



2.1.3 Corridor Origin-Destination Patterns

In order to better understand the travel patterns of existing users of U.S. Route 13, a video license plate survey was conducted on Tuesday, July 18, 2000 between 7:00 AM and 7:00 PM. Video cameras were used to record individual license plate numbers of vehicles at the following three locations:

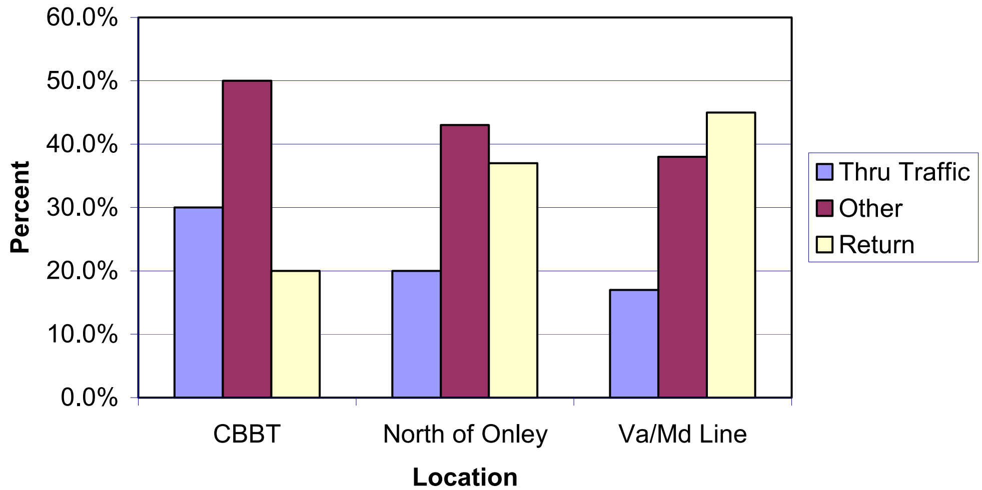
- U.S. Route 13 just north of the CBBT toll plaza
- U.S. Route 13 between Route 648 and Route 650 (north of Onley)
- U.S. Route 13 between Route 175 and the Maryland State Line

Video images of the rear license plates of vehicles passing in both directions and in all four travel lanes were recorded on U.S. Route 13. A typical camera setup is shown in Figure 2-8.

Figure 2-8
Typical Camera Setup for U.S. Route 13 License Plate O/D Survey

A total of 27,393 license plate records were collected, representing approximately 86 percent of the total volume (31,788 vehicles) passing the survey stations during the 12-hour period. A graphic showing some of the results of the survey are shown in Figure 2-9. In this graphic, three trip types are shown: through traffic, return traffic and other traffic. Through traffic was defined as traffic that both entered and exited the study area at the two end points (CBBT and Maryland State Line). Return traffic was defined as vehicles that crossed the survey station in both directions during the survey period. Other traffic was defined as traffic that crossed a survey station in only one direction and was not through traffic. Key findings are discussed below.

Figure 2-9
U.S. Route 13 Origin/Destination Survey Summary



Through Traffic

Through traffic was defined as traffic going from the Chesapeake Bay Bridge-Tunnel through Northampton and Accomack Counties into Maryland (or the reverse). Overall, summer weekday through traffic on U.S. Route 13 was 3,600 vehicles per day. This comprises 17 percent of vehicles measured at the Maryland State Line, 20 percent of traffic measured at the mid-point station and 30 percent of vehicles measured just north of the CBBT toll plaza.

Return Trips

A significant number of return trips occurred during the morning and evening commuting times and these patterns were evident at both the southern and northern ends of the study area. On the northern end, approximately 45 percent of vehicles measured at the Maryland State line were recorded crossing the state line twice in one day (either trips from Virginia to Maryland or the reverse). On the southern end, the commuting patterns were evenly split with 10 percent traveling southbound in the morning (across the CBBT) and returning to the Eastern Shore in the evening and 10 percent in the reverse commuting pattern. The data also clearly shows very low matches between either of the two end points of the study area and the mid-shore location (roughly between Onley and Accomac). This means there is low commuting activity from either end of the corridor to the mid-shore area.

Other Trips

As previously stated, other trips are defined as traffic crossing a survey station in one direction that were not through trips. A major portion of other trips can also be defined as external to internal trips. Twenty-five percent of all southbound vehicles entering the survey area from the north at the Maryland State Line were found passing the mid-point station (north of Onley). In the northbound direction, 45 percent of all vehicles entering the survey area from the CBBT were found passing the mid-point station. In both cases, vehicles did not exit the corridor at either end during the 12-hour period. This population could be comprised of different trip activities, including travelers stopping at a hotel or arriving at an Eastern Shore destination. It could also include commuting trips on the northern end from Maryland that used U.S. Route 13 in the morning and returned using a secondary road in the Wallops Island area back into Maryland.

■

2.1.4 Corridor Travel Speeds

To determine the prevailing vehicle speeds through various segments of U.S. Route 13, 24-hour spot speed data was collected using automatic traffic counters in July 2000. From the raw speed data collected, both average and 85th percentile travel speeds were derived. Table 2-3 shows both the average and 85th percentile speeds for U.S. Route 13 Business in Cheriton. It should be noted that speed data was collected at only one location in each roadway segment and the actual speed within that segment may vary.

Posted speed limits on U.S. Route 13 vary from 45 mph to 55 mph. Average travel speeds measured on U.S. Route 13 range from 34 mph in the northbound direction between Route 695 and Route 175 to 66 mph in the northbound direction between the northern ends of Business 13 in Eastville and Cheriton. In general, average and 85th percentile speeds are lower in the northbound direction than in the southbound direction, and are highest on the southern sections of U.S. Route 13. The lowest observed speeds were on the section of U.S. Route 13 between Route 179 and Route 609 in Onley.

Table 2-3
U.S. Route 13 Travel Speed Summary (July 2000)

Roadway Segments		Direction	Posted Speed Limit (mph)	Average Speed (mph)	85th Percentile Speed (mph)
Maryland State Line	Route 175	Northbound	55	56	62
		Southbound	55	58	63
Route 175	Route 692	Northbound	45	34	51
	(Temperanceville)	Southbound	45	48	56
Route 692	Route 187 (Nelsonia)	Northbound	55	44	58
(Temperanceville)		Southbound	55	46	62
Route 187 (Nelsonia)	Route 176	Northbound	55	55	68
		Southbound	55	62	68
Route 176	North end of U.S. Route 13	Northbound	55	58	64
	Business (Accomac)	Southbound	55	58	63
North end of U.S. Route 13	Route 764 (Accomac)	Northbound	55	57	63
Business (Accomac)		Southbound	55	58	64
Route 764 (Accomac)	Route 179 (Onley)	Northbound	55	40	64
		Southbound	55	59	64
Route 179 (Onley)	Route 609 (Onley)	Northbound	45	38	49
		Southbound	55	36	46
Route 609 (Onley)	Route 180/Route 696	Northbound	50	49	57
	(Keller)	Southbound	50	53	60
Route 180/Route 696	Route 182/Route 614	Northbound	55	N/A	N/A
(Keller)	(Painter)	Southbound	55	41	60
Route 182/Route 614	Route 178 (Exmore)	Northbound	55	58	65
(Painter)		Southbound	55	58	64
Route 178 (Exmore)	Route 698/U.S. Route 13	Northbound	45	48	56
	Business (Exmore)	Southbound	45	49	57
Route 698/U.S. Route 13	Route 606 (Nassawadox)	Northbound	55	59	63
Business (Exmore)		Southbound	55	56	63
Route 606 (Nassawadox)	Route 628	Northbound	55	57	62
		Southbound	55	59	65
Route 628	North end of U.S. Route 13	Northbound	55	59	65
	Business (Eastville)	Southbound	55	57	67
North end of U.S. Route 13	N End of U.S. Route 13	Northbound	55	66	69
Business (Eastville)	Business (Cheriton)	Southbound	55	63	68
North end of U.S. Route 13	Route 184 /U.S. Route 13	Northbound	55	56	63
Business (Cheriton)	Business (Cheriton)	Southbound	55	56	63

Source: Vanasse Hangen Brustlin, Inc.

2.2 Roadway and Access Inventory

An inventory of roadway and access characteristics was compiled for the U.S. Route 13 corridor and entered into a geographic information system (GIS) for purposes of data management and analysis. Existing data was geo-referenced to allow graphical presentation and analysis of existing geometric features along the corridor. Field observations were used to update current VDOT physical inventories, and these changes were integrated into the GIS environment using orthogonal aerial photography. This allowed for the use of Arcview and ArcInfo GIS software to add, revise or otherwise modify existing data records.

A summary of key roadway features is shown in Figure 2-10 for Northampton County and in Figure 2-11 for Accomack County. Each graphic displays the following information for U.S. Route 13:

- Right-of-Way
- Posted speed limit (by direction of travel)
- Median type and width
- Right shoulder width (by direction of travel)
- Driveway density (by direction of travel)
- Crossroads
- Communities
- Milepost location

More detailed discussion of these features is provided below.

■

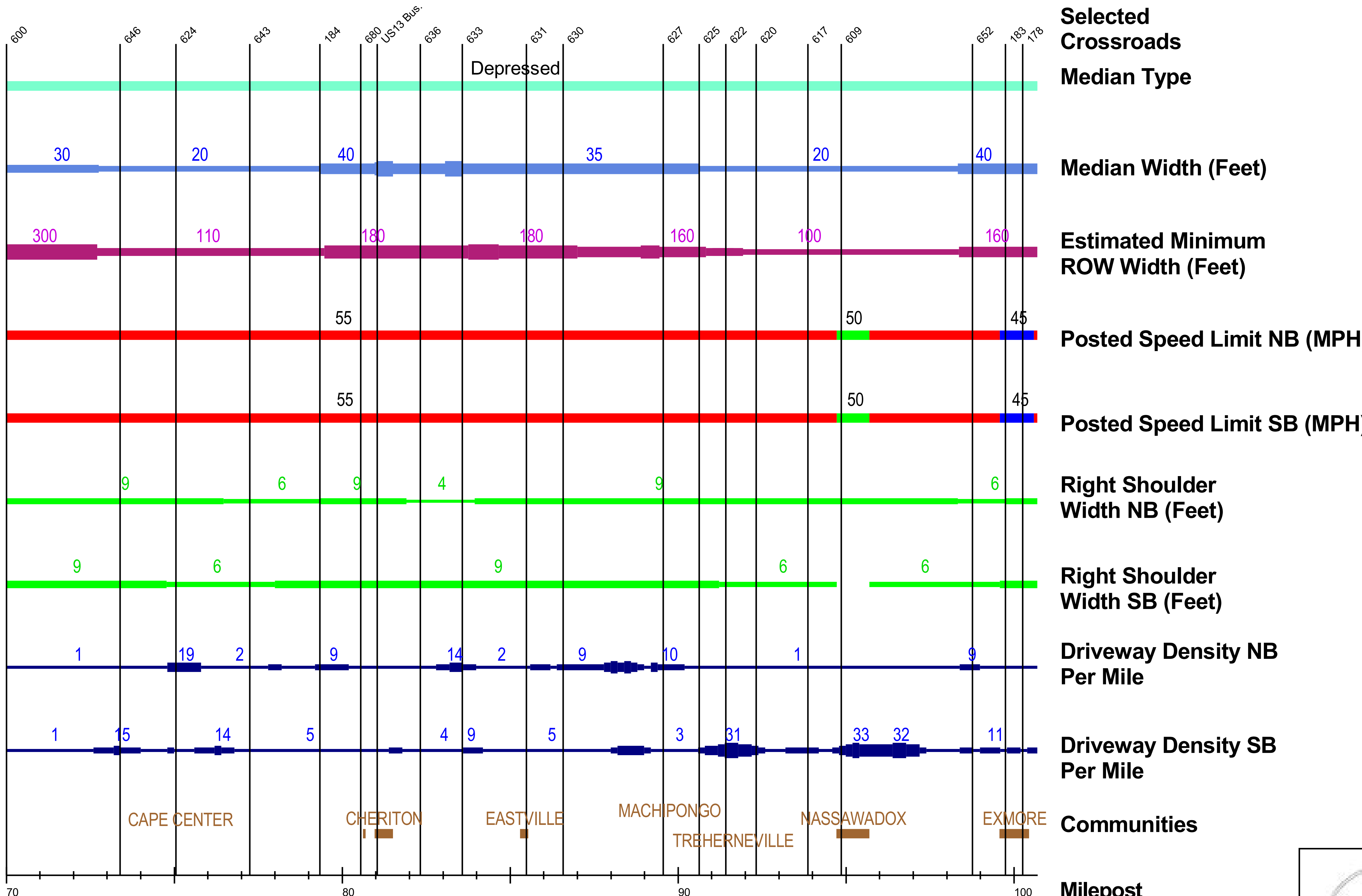
2.2.1 Roadway Infrastructure

Critical to an evaluation of the current needs of the U.S. Route 13 corridor was an understanding of the roadway geometric characteristics on the facility. Detailed field surveys were conducted by updating the existing VDOT Statewide Highway Planning System (SHPS) database. To provide more precise detail, separate tables were completed for the northbound and southbound sides of the highway. A summary of key features is provided below.

For most of its length, U.S. Route 13 is a 4-lane divided highway with a depressed median and a 55 mph speed limit. Conditions vary, however, particularly in the many settlements and incorporated communities that exist along the highway. Overall, the speed limit changes 23 times along the corridor and the median width changes 22 times.

Conditions are most consistent in the southern portion of the corridor where the speed limit remains at 55 mph for an uninterrupted stretch of approximately 25 miles. Shoulder widths are relatively consistent in this section, with a wide right shoulder of predominantly 9 feet (but ranging as low as 4 feet), and a left shoulder width between 0 feet and 2 feet. The median in the southern section generally ranges from 18 feet to 30 feet, with two small sections approaching 120 feet.

Chesapeake Bay
Atlantic Ocean
NORTHAMPTON
Belle Haven
Exmore
Nassawadox
Weirwood
Birdsnest
Treherneville
Machipongo
Eastville
Cheriton
Cape Charles
Cape Center
Kiptopeke State Park
Chesapeake Bay Bridge Tunnel
MP 100
MP 95
MP 90
MP 85
MP 80
MP 75
MP 70
MP 65
Legend
MP Milepost
U.S. Route 13
Route 13/Wallops Island
Access Management Study
Northampton County Location Map for Figure 2-10
2 0 2 4 Miles



Route 13/Wallops Island Access Management Study

Figure 2-10
Existing Roadway Features
Northampton County

At the Town of Nassawadox, roughly 25 miles north of Route 600, the speed limit drops to 50 mph, and curb and gutter delineates the southbound side of the road. From Nassawadox to the Town of Accomac, roughly 19 miles to the north, the speed limit changes every 2 to 4 miles, dropping from 55 mph to either 50 mph or 45 mph. Shoulders in this segment vary widely, with the right shoulder ranging from 0 to 10 feet, and the left from 0 to 2 feet. Depressed medians in this section range from 15 to 40 feet, and several five-lane cross sections appear, providing turning lanes where U.S. Route 13 runs through incorporated communities.

Between Accomac and the unincorporated settlement of Nelsonia, the speed limit returns to 55 mph for approximately 11 miles. Here, the right shoulder decreases from 10 feet near Accomac to 2 feet near Nelsonia, and the left shoulder varies from 0 to 2 feet. The median ranges from 20 to 30 feet, with one small section of a 12-foot flush median.

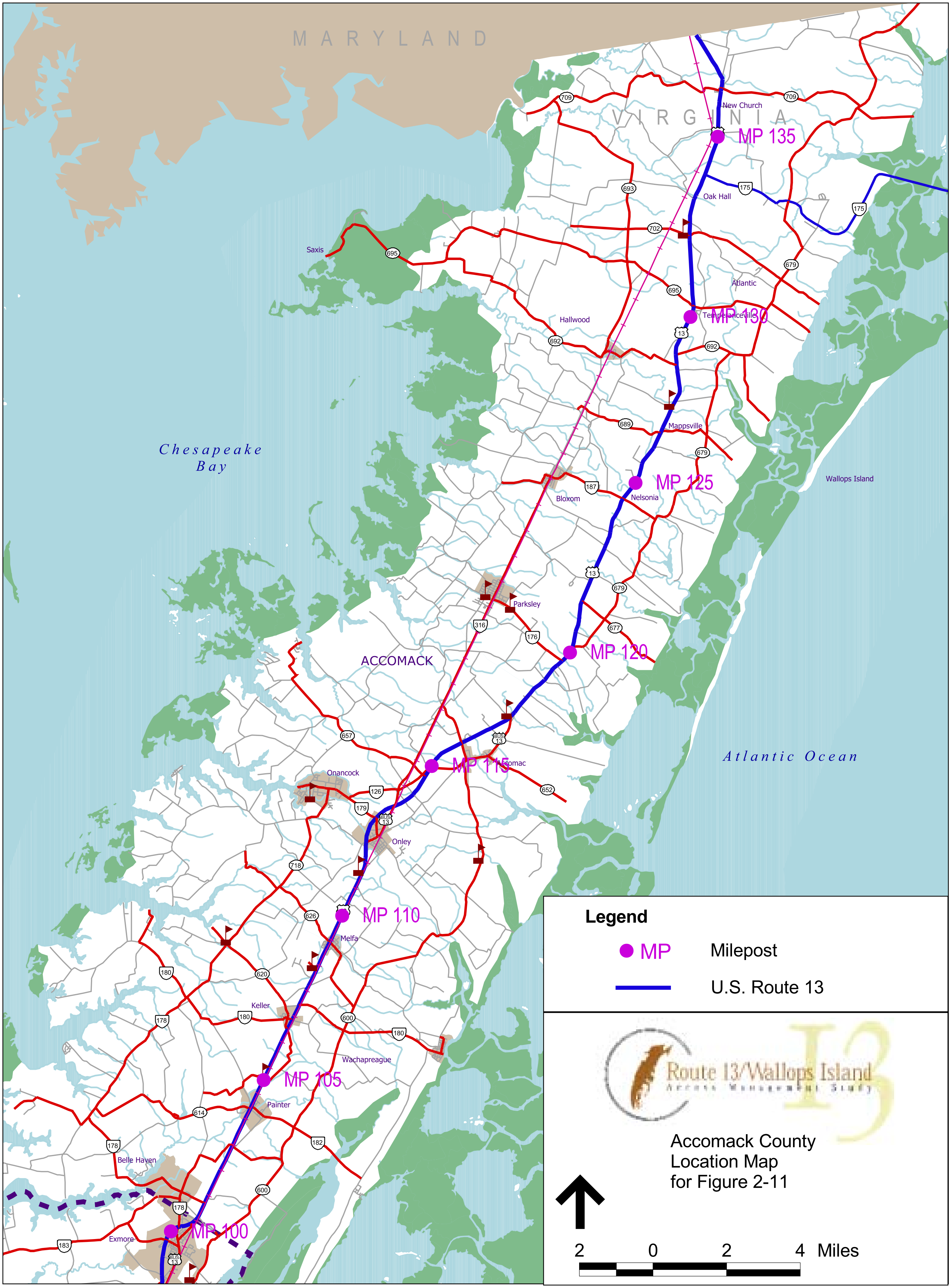
From Nelsonia to the Maryland State Line, the speed limit changes roughly every 2 miles, alternating between 55 and 45 mph as U.S. Route 13 passes through several unincorporated settlements. Shoulder and median conditions vary considerably as the roadway cross section changes several times from four-lane divided to four lanes with a flush median. One segment through Temperanceville contains a 3-foot flush median. This is the narrowest section of median in the entire corridor. Sidewalks also exist in several of the settlements.

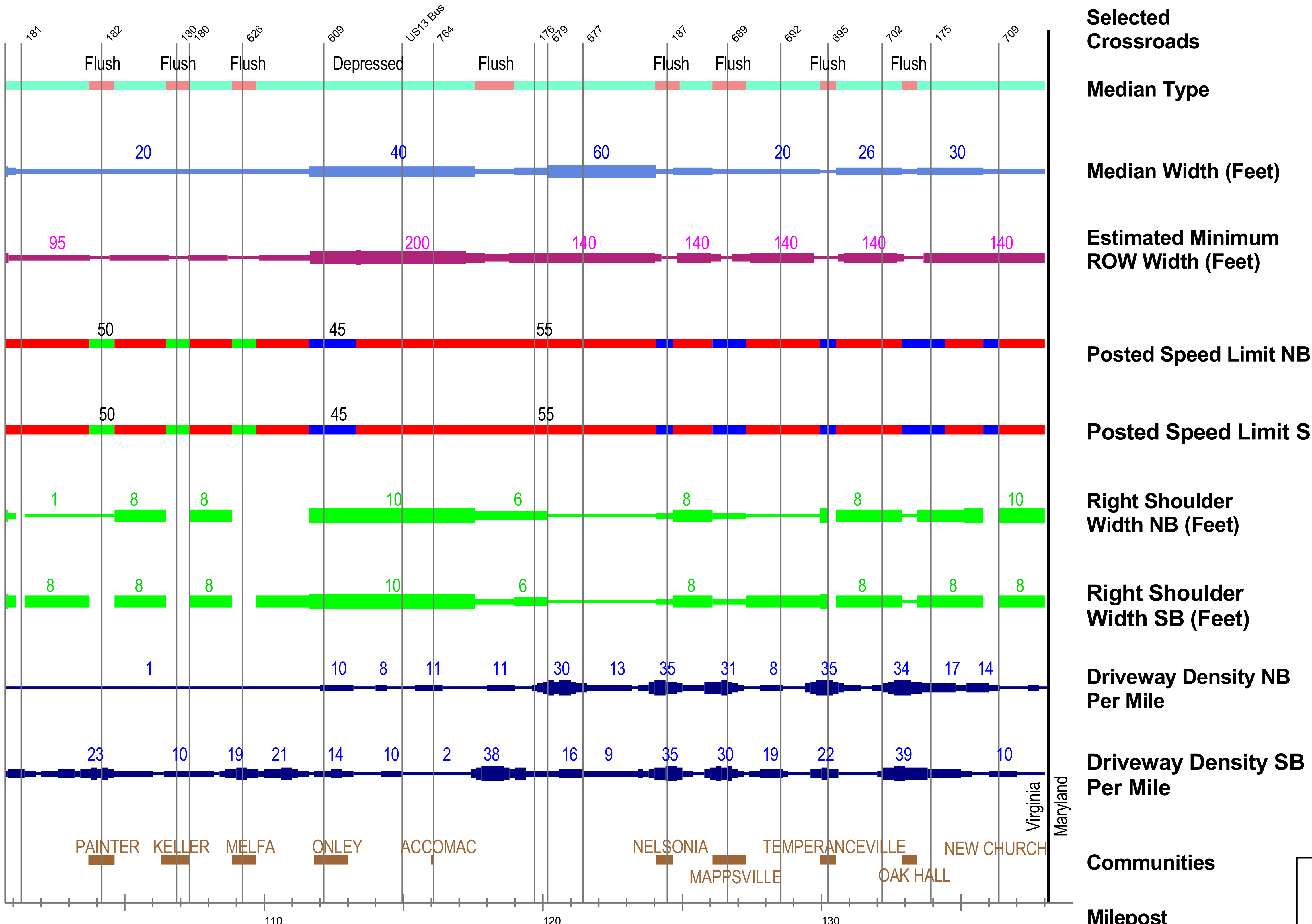
The updated SHPS database, linked into the GIS, allowed for more detailed spatial analysis of existing geometric features along the corridor. This also facilitated the analysis of potential roadway improvements. Separate databases were created for the northbound and southbound lanes so this analysis could accommodate differing conditions (such as shoulder width) on each side of the highway.

2.2.2 Right-of-Way

Along the U.S. Route 13 corridor, the existing roadway right-of-way (ROW) varies from its narrowest at 60 feet wide (a 2.5 mile stretch from MP 106.5 to MP 109) through downtown Keller to its widest at 300 feet at the southern end of the corridor. The ROW through Keller is further constrained as the Eastern Shore Railroad ROW is located immediately adjacent to U.S. Route 13 on the east side.

Almost 30 percent of the 69-mile long corridor has a minimum ROW of 100 feet or less. Thirty-eight percent of the corridor has between 101 and 140 feet of right-of-way, with the remaining 32 percent having between 141 and 300 feet.


MARYLAND
VIRGINIA
Chesapeake Bay
Atlantic Ocean
ACCOMACK
New Church
Oak Hall
Saxis
Atlantic
Hallwood
Temperanceville
Mappsville
Bloxom
Nelsonia
Wallops Island
Parksley
Accomac
Onancock
Onley
Melfa
Keller
Wachapreague
Painter
Belle Haven
Exmore
MP 135
MP 130
MP 125
MP 120
MP 115
MP 110
MP 105
MP 100
Legend
MP Milepost
U.S. Route 13
Route 13/Wallops Island Access Management Study
Accomack County Location Map for Figure 2-11
2 0 2 4 Miles



Route 13/Wallops Island Access Management Study

Figure 2-11
Existing Roadway Features
Accomack County

2.2.3 Traffic Signals

There are a total of 21 traffic signals in operation on U.S. Route 13 in the study corridor. These signals operate in a non-coordinated, actuated manner. With the possible exception of Exmore and Onley, most signals are located at isolated locations (usually the major cross street for a town or unincorporated settlement). See Figure 2-17 for the locations of these traffic signals.

2.2.4 Access

Existing driveways and median crossovers were identified along the corridor and entered into the GIS. Key features of each driveway and crossover were classified. This information is summarized in Table 2-4 for driveways and in Table 2-5 for median crossovers.

Table 2-4
Existing Roadway Access – Driveways

			By County		
Driveways	**Classification**	**Direction**	**Northampton (32 miles)**	**Accomack (37 miles)**	**Total**
	Non-Residential	Northbound	69	161	230
		Southbound	114	195	309
	Residential	Northbound	85	223	308
		Southbound	153	290	443
	Unclassified	Northbound	1	2	3
		Southbound	9	10	19
Overall		Northbound	155	386	541
		Southbound	276	495	771
		Total	**431**	**881**	**1312**

Source: Vanasse Hangen Brustlin, Inc.

Table 2-5
Existing Roadway Access – Median Crossovers

Median Crossovers		By County Northampton (32 miles)	By County Accomack (37 miles)	Total
Overall	**Total Crossovers**	**121**	**150**	**271**
Median Width (feet) at Crossover	40 +	54	17	71
	30 –39	6	67	73
	20 – 29	58	58	116
	10 – 19	3	5	8
	less than 10	0	3	3
Crossover Width (feet)	60 +	49	40	89
	50 – 59	47	35	82
	40 – 49	21	41	62
	30 – 39	4	30	34
	less than 30	0	4	4
Left-Turn Lanes	Northbound Only	22	26	48
	Southbound Only	16	14	30
	Both Directions	37	53	90
	No Left-Turn Lanes	46	57	103

Source: Vanasse Hangen Brustlin, Inc.

Driveways

- A total of 1,312 driveways were identified along the U.S. Route 13 corridor.
- 67 percent are located in Accomack County and 33 percent are located in Northampton County.
- 59 percent of all driveways are located on the west side of U.S. Route 13 (served by the southbound travel lanes).
- 58 percent of all driveways are low volume residential driveways serving mostly single-family dwellings.
- Areas with high driveway density (greater than 20 driveways per mile) are located in Treherneville, Nassawodax, the Mary N. Smith area (between Accomac and Pastoria), Nelsonia, Mappsville, Temeperanceville, and Oak Hall.

Median Crossovers

- A total of 271 median crossovers are located along the U.S Route 13 corridor.
- A majority of these crossovers (74 percent) have median widths (distance between the northbound and southbound travel lanes) of less than 40 feet.

- In Accomack County, there are 66 crossovers out of 150 total (44 percent) with a width less than 30 feet. Furthermore, 8 of these are less than 20 feet wide.

- In Northampton County, there are 61 crossovers out of 121 total (50 percent) with a width less than 30 feet. Only three of these are less than 20 feet wide.

The median width at crossover locations is a key safety concern, especially where they are utilized by larger vehicles (such as school buses or tractor trailers) on a regular basis. The narrower the median, the less room there is to safely accommodate longer vehicles.

Crossover Width

In addition to median width, crossover width can also affect the ability of vehicles to perform left turns and U-turns. Crossovers are openings in the median, and their width is measured parallel to the roadway, whereas median width is measured perpendicular to the roadway. Per AASHTO standards, this distance is dependent on the design vehicle, the median end treatment, and the width of the median. For passenger vehicles, with a 40-foot wide median, the minimum design crossover width is approximately 40 feet, although this does not apply to certain turn radii or to U-turns, in which cases the crossover width should be greater. Furthermore, for tractor-trailers, this distance can be as wide as 60 feet (even higher for medians shorter than 40 feet wide). Since median widths at the majority of crossovers in the corridor are less than 40 feet, crossover width is a key safety and operational factor. As can be seen in Table 2-5, 233 of the crossovers (86 percent) are greater than 40 feet wide. In Accomack County, however, 34 crossovers (23 percent) are less than 40 feet wide.

Turn Lanes

The provision of adequate turning lanes at median crossovers can be a very effective improvement to reduce speed differentials on U.S Route 13, as well as crash potential. In general, Northampton County has more median crossovers with left-turn lanes in both directions.

- Of the 271 median crossovers within the study area, 48 have northbound left-turn lanes, 30 have southbound left-turn lanes and 90 have both northbound and southbound left-turn lanes.

- A total of 103 crossovers (38 percent) have no left-turn lanes.

2.2.5 Pedestrian and Bicycle Infrastructure

At the time of this study, the Accomack-Northampton Planning District Commission (PDC) was in the process of developing a bicycle plan for Virginia's Eastern Shore. A formal committee was established by the PDC to oversee development of the bicycle plan, and several public workshops were held to solicit input. Although the PDC plan will cover the entire region, improvements on U.S. Route 13 resulting from this corridor study could potentially support development of the bicycle plan. Bicycle interests on the Shore include the Eastern Shore Bicycle Club and the Citizens for a Better Eastern Shore.

Currently, U.S. Route 13 is not a formally designated bicycle route and has no signed/ striped bicycle accommodation. As on other unlimited access roadways in Virginia, bicyclists are not restricted from using U.S. Route 13 and, in fact, do use the roadway and shoulders. Throughout the corridor, bicyclists and pedestrians use the roadway (including shoulder) for a variety of purposes including travel to and from work. According to personal communications from residents on the shore, seasonal agricultural workers rely heavily on U.S. Route 13 to bike or walk to/from work. Bicyclists are routinely observed incorrectly riding against the flow of vehicular traffic, posing a potential safety hazard. Recognizing the demand for bicycle travel, there is a need to accommodate these users in the safest manner possible. Furthermore, crossing the highway on a bike or on foot is an issue, particularly at areas where significant development exists. In addition to physical improvements, safety education of cyclists, pedestrians, and motorists is an important consideration, as is the need for adequate signage.

Bicyclists are generally categorized into three types:

- "A" = Advanced or experienced riders; typically comfortable riding on the roadway with motor vehicle traffic.
- "B" = Basic or less confident adult riders; prefer riding on designated facilities such as bike lanes, wide shoulder lanes, neighborhood streets, and shared use paths.
- "C" = Children

Given the high speed and percentage of heavy trucks, most sections of U.S. Route 13 are currently not recommended for the class "B" or "C" rider. The presence of wide (8- to 10-foot) right shoulders along some sections of the highway represents one opportunity for safely accommodating bicyclists, particularly for the advanced or "A" class rider.

Providing additional pavement where shoulders are narrower could expand these areas for non-motorized transportation in this high-speed corridor. Nevertheless, given the travel speeds and function of the corridor, safety issues will remain, especially for certain groups (less-than-advanced cyclists, for instance). If analysis suggests that this is a viable solution, keeping the shoulders passable and free from debris will be important. On sections of U.S. Route 13, this option might prove infeasible, given constraints such as existing development, available right-of-way, or fixed objects.

2.2.6 Public Transit

Public transit on the Eastern Shore is provided by STAR Transit (STAR stands for Shore Transit and Rideshare). The service is organized under the Accomack-Northampton Transportation District Commission (ANTDC), authorized by the Virginia General Assembly. The ANTDC provides administrative oversight to all aspects of commercial transportation on the Eastern Shore of Virginia, including

STAR Transit, the Eastern Shore Railroad, the Port of Cape Charles, and the Accomack County Airport. ANTDC Commissioners include a Virginia Department of Rail and Public Transportation (VDRPT) representative, as well as appointees of the Boards of Supervisors of each County from among their own members.

STAR Transit began service in 1996, and offers five fixed routes operating Monday through Friday, from 6 AM to 6 PM. The routes, which access sites along U.S. Route 13 as well as within Chincoteague, Onancock, Parksley, and Cape Charles, run three times a day, round trip. For a six-month trial period beginning in 1999, STAR operated a route across the Chesapeake Bay Bridge-Tunnel. The route was cancelled in May 2000. STAR utilizes passenger vans, the largest of which carries 16 people; all of the vans are handicap accessible. In FY 99, ridership totaled 37,013 passengers, with a peak of 3,809 in November. Funding is provided by the Federal Transit Administration, VDRPT, and local revenues including fares, which are a flat $1.

Several small private bus/van services also exist, and primarily serve specific programs and locations such as senior centers.

2.2.7 Rail

The Eastern Shore Railroad (ESRR) operates freight service out of Cape Charles. For much of its length, the rail parallels U.S. Route 13 at a close distance from the highway. From Cape Charles, the line runs east until it crosses U.S. Route 13, then runs north approximately 0.4 miles east of the highway. At Machipongo, the rail line comes in close proximity to the highway, and the two facilities run adjacent to each other before separating at Exmore where the rail runs through town. North of Exmore, the two run close together again until Onley. Here, the highway crosses the rail line via an overpass, and from Onley north to Oak Hall, the rail runs roughly 2 miles to the west of the highway. Near Oak Hall, the two facilities again come into close proximity.

The service operates over the former Penn Central line from Pocomoke City, Maryland, to Norfolk, and consists of 70 miles of mainline and a 26-mile car-float operation from Cape Charles to Little Creek. The ESRR interchanges with Norfolk Southern Corporation at Pocomoke City and Norfolk. The rail also interchanges with CSX Railroad and the Norfolk-Portsmouth Belt Line in Norfolk. The ESRR bypasses the congested northeast corridor and its restricted clearances. It reduces travel time to the northeast by three to four days as compared to the routing through the Hagerstown Gateway.

The railroad moves 6,500 annual carloads, consisting of stone and coal, as well as feed products for the Perdue poultry processing plant. Having recently moved from a Class I to a Class II facility, the rail operates trains up to 20 mph (Class II permits speeds up to 25 mph).

2.2.8 Land Use and Zoning

In the context of this analysis, land use becomes an important consideration to the extent that it impacts access management and highway corridor preservation. Certain land use trends, such as strip commercial development, could adversely impact the highway. Conversely, land use practices that encourage nodal development, thereby facilitating appropriate access planning, could support the goals of this effort. In conjunction with recommended roadway improvements, efficient land use patterns can help maintain highway function. This section seeks to identify the opportunities and constraints of existing development, and assess the access management implications of current land use plans and development review processes.

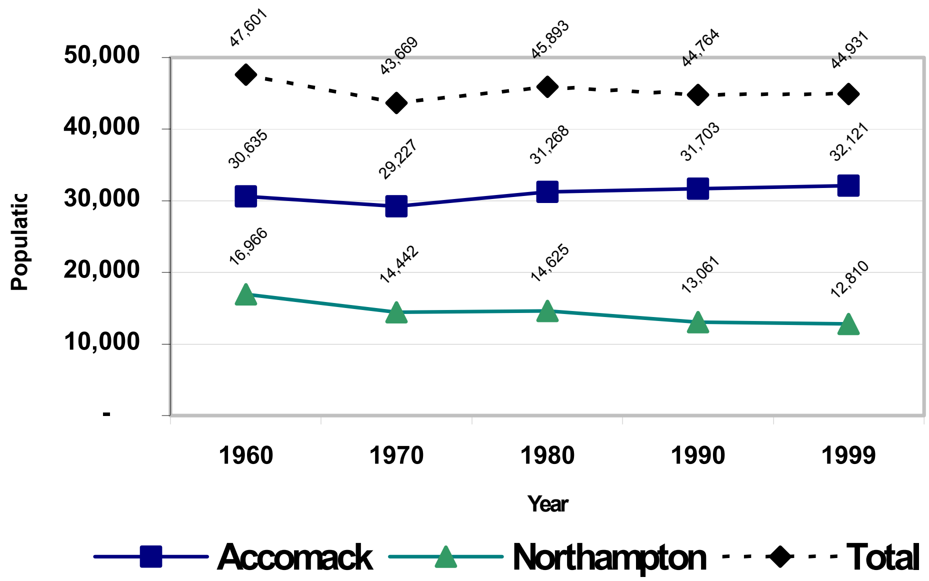
It is worth noting that both Northampton and Accomack Counties are currently revising their zoning ordinances in ways that could affect access management. Accomack is considering changes to its zoning map that would encourage infill commercial development, while discouraging further strip development in rural areas. Accomack is also considering amendments to the zoning text that would improve the county's commercial entrance requirements. Both of these measures have been recommended by the Planning Commission to the Board of Supervisors. The county plans to revisit its residential zoning districts in an attempt to discourage direct driveway access to U.S. Route 13. Amendments recently approved in Northampton County would also cluster new development in existing towns and villages, and discourage further "stripping" of the highway where isolated businesses currently exist.

Each of the incorporated towns also has its own comprehensive plan and zoning ordinance. In Northampton, town ordinances are administered by the County, while in Accomack they are administered by the towns. Furthermore, the Accomack-Northampton PDC regularly assists the towns in updating their plans and ordinances. These dynamics indicate that land use-based access management practices will require coordination among the counties, towns, and the PDC.

Study Area Demographics

As shown in Figure 2-12, the region's rate of population growth has remained relatively stable over the past several decades. Records indicate a slight reduction in population between 1960 and 1999 from 47,600 to 44,930. In general, the population in Accomack County shows a slight growth trend while Northampton County is declining. For example during that period, Accomack County has increased in population from 30,635 to 32,120, while Northampton County has decreased from 16,965 to 12,810. The ongoing Baycreek resort/retirement development in the Cape Charles area might reverse the downward trend in Northampton.

Figure 2-12
Historical Population Growth Trends on the Eastern Shore



Source: Accomack County population - The Accomack County Comprehensive Plan August 4, 1997 and the Weldon Cooper Center for Public Service, 2000. Northampton County population - the Weldon Cooper Center for Public Service, 2000.

The Eastern Shore of Virginia Comprehensive Economic Development Strategy (CEDS) states that recent trends show a relatively stable level of employment over the past ten years. The CEDS describes food processing, aerospace, tourism, agriculture/ horticulture, seafood/aquaculture, and studio businesses as existing industry clusters, and cites sustainable technology and boat building as emerging clusters. This reflects the presence of large poultry operations in Accomac and Temperanceville, the NASA Wallops Flight Facility, the Cape Charles Sustainable Technology Park, and the Airport Industrial Park at Melfa. Future development at all of these facilities could impact traffic volumes in the corridor.

Another factor that could affect the timing and pattern of demographic change on the Eastern Shore is the reduction in the toll for crossing the CBBT. The current two-way rate of $20 for passenger cars changed effective March 1, 2002 to $14 if the return trip is made within 24 hours of the initial trip. A June, 2000 study conducted by VDOT indicates that toll reduction has the potential to bring the Eastern Shore into the growth zone of Hampton Roads more quickly than might otherwise happen. The study finds that the current toll is not a significant deterrent to growth, and that spillover from Hampton Roads can be expected at some point in the future. However, the study suggests that toll reduction could speed this phenomenon, placing within the area of growth pressure, areas of Northampton County that otherwise might not experience such pressure until after 2018.

Existing Land Use

Land uses in the U.S. Route 13 corridor are primarily rural and agricultural (especially in the southern half of the study area) with long stretches of farm fields and forests separating towns, settlements, and commercial areas. Each county's comprehensive plan indicates that development comprises roughly 2 percent of the total area within each jurisdiction; much of that, however, is clustered along the highway. To relate existing land use to access management, the study team field verified the location and nature of driveway access throughout the corridor.

In the rural areas of the corridor, there are few land use impediments to effective access management. However, individual driveway access to homes and farms means that slower moving vehicles must enter and exit the high-speed free-flowing lanes without adequate deceleration and acceleration lanes. These areas offer an opportunity to recommend specific improvements at identified problem sites, and to implement driveway spacing, reverse frontage, and other access management techniques to prevent degradation of the highway caused by future development. A potential threat exists in the form of isolated rezonings and special use authorizations. Although the land use plans for both counties generally seek to maintain the rural nature of these segments, individual actions could create situations at odds with the overall goal. In Accomack County, for instance, commercial uses are allowed by special use permit in the rural areas. Frequent approval of such uses has the potential to result in strip development throughout the corridor, a possibility that could severely limit the highway's function as an arterial for carrying traffic at relatively high speeds for long distances.
Incorporated communities and unincorporated settlements throughout the corridor exhibit mixed land use patterns that include residential, commercial, and industrial. A common feature to all forms of development in these areas is direct driveway access lacking adequate auxiliary lanes. Development intensity has resulted in speed limit reductions and, in some cases, traffic lights. In two major segments of the highway (from Nassawadox to Accomac, and from Nelsonia to the Maryland State Line) the speed limit changes every two to four miles. The primary access management constraint in these areas is existing development, which may make improvements difficult because of intensity or proximity to the highway. However, potential opportunities exist for access management techniques such as consolidating entrances and improving corner clearance.

Large commercial areas exist at Exmore and Onley consisting of strip development in the form of retail shopping, fast food, hotels, and banks. Development in each of these areas has necessitated installation of multiple traffic signals. In addition to the constraints posed by the difficulty and expense of retrofitting existing development, the possibility of expansion of the strip pattern, and resulting additional traffic signals represents a potential threat to highway function.

■

2.2.9 Environmental

Comprising the southern portion of the Delmarva Peninsula, Virginia's Eastern Shore is located within the Coastal Plain physiographic province of Virginia. It is predominantly rural in character with miles of unspoiled coastline. Less than 15 miles wide in most areas, Virginia's Eastern Shore is relatively narrow and flat. Elevation ranges from sea level to 50 feet above sea level, with slopes rarely exceeding two percent. The eastern or "sea side" of the shore, facing the Atlantic Ocean, is protected by a complex system of pristine barrier islands and hundreds of acres of continuous salt marsh and beds of submerged aquatic vegetation. Along the western or "Bay side," many tidal creeks cut through the landscape and flow into the Chesapeake Bay. Surrounded by water on three sides, the Eastern Shore has an extensive coastline dominated by wetlands and beach habitat. U.S. Route 13 is generally located along a slight ridge near the center of the peninsula. Sensitive environmental features potentially within the existing U.S. Route 13 study area include wetlands, prime farmland, threatened and endangered species, historic resources, and groundwater recharge areas. Information on these resources was obtained from existing sources as noted below. No field investigations were conducted to verify the information contained herein.

Wetlands

Wetlands are regulated by a variety of local, state, and federal laws and statutes. As a result, they can pose a regulatory constraint to project development. At this early stage, information on wetlands was obtained from the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) database in order to get a rough assessment of jurisdictional wetlands on the shore. In addition, mapped hydric soils information was obtained from the Natural Resource Conservation Service (NRCS) as another indicator of potential wetland areas. As indicated by the NWI mapping shown in Figure 2-13, wetlands are a predominant feature in the area, particularly in the northern half. Large expanses of tidal marsh are located on both sides of the peninsula, with smaller areas of non-tidal wetlands scattered throughout the remainder of the area. Hydric soils data also verified this assessment. Proposed improvements to U.S. Route 13, especially any relocations or new alignments (i.e., bypasses) will require additional wetland investigations to more accurately define wetland limits and to ensure that impacts to wetlands are avoided and minimized to the maximum extent possible.

Prime Farmland

If federally funded, transportation projects must comply with Farmland Protection Policy Act requirements which seek to minimize the extent to which farmland is converted to non-agricultural uses. Digital information on prime farmland was obtained from the Accomack-Northampton Planning District Commission. As shown in Figure 2-14, most of the Eastern Shore is comprised of soils considered to be prime agricultural soils. Specific soil types in this category include the Bojac series (fine sandy loam, loamy sand, sandy loam), Dragston fine sandy loam, Munden sandy loam, and Nimmo sandy loam. Proposed improvements to U.S. Route 13 that may be federally funded and impact farmland will require coordination with the local NRCS personnel to evaluate potential impacts to prime farmland.

Threatened and Endangered Species

Plant, animal or insect species classified as "threatened" and/or "endangered" are protected at the state and federal level by various state and federal laws. In December 2000, digital information with regard to protected species on Virginia's Eastern Shore was obtained from the Virginia Department of Conservation and Recreation's Natural Heritage Program. Maintained by DCR, the Biological and Conservation Data System contains general locations of documented occurrences of rare, threatened or endangered plant and animal species. Due to the sensitivity of the resource itself, the geographic information provided by the database is intentionally not exact. While a number of threatened and endangered species are located on the shore, only three have been documented within a roughly two-mile radius of U.S. Route 13 – the northeastern beach tiger beetle (federally threatened) at the southern end of the corridor; the Delmarva Peninsula fox squirrel (federally endangered) east of Nassawadox; and the bald eagle (federally threatened/state endangered), with a number of nests located within the study area (see Figure 2-15). Depending on the improvements recommended for U.S. Route 13 and the location of those improvements, additional investigations may be necessary to determine potential impacts to these species.

Historic Resources

Significant cultural resources are protected by several laws including Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act. Significant cultural resources are defined as those that are listed or eligible for listing on the National Register of Historic Places. A cursory file review was conducted at the Virginia Department of Historic Resources to identify potentially significant architectural properties and/or historic districts previously recorded in close proximity to U.S. Route 13. At this time, archaeological sites were not evaluated due to the fact that impacts to archaeological sites are readily mitigated and rarely pose a fatal flaw to project development. Based on this file review, it appears that numerous historic properties are located along U.S. Route 13. Some of the individual historic structures that have previously been evaluated were found not eligible for listing on the National Register. Others were not evaluated for eligibility but could potentially meet National Register criteria including the Lower Northampton Baptist Church and the First Baptist Church at Capeville, both just north of Cape Center.

Several historic districts are located along or near U.S. Route 13 that are listed or were found eligible for listing on the National Register:

- Eastville and Eastville Station Historic District – a large district comprised of 150 to 200 buildings centered at the intersection of U.S. Route 13 and Route 631 in Northampton County.
- Machipongo Historic District – comprised of 15 buildings along Route 627, immediately east of U.S. Route 13.
- Accomac Historic District – large district (+130 acres) in the town of Accomac, a portion of which is just east of U.S. Route 13.

Figure 2-13
Sheet 1 of 2
Northampton County
Wetlands

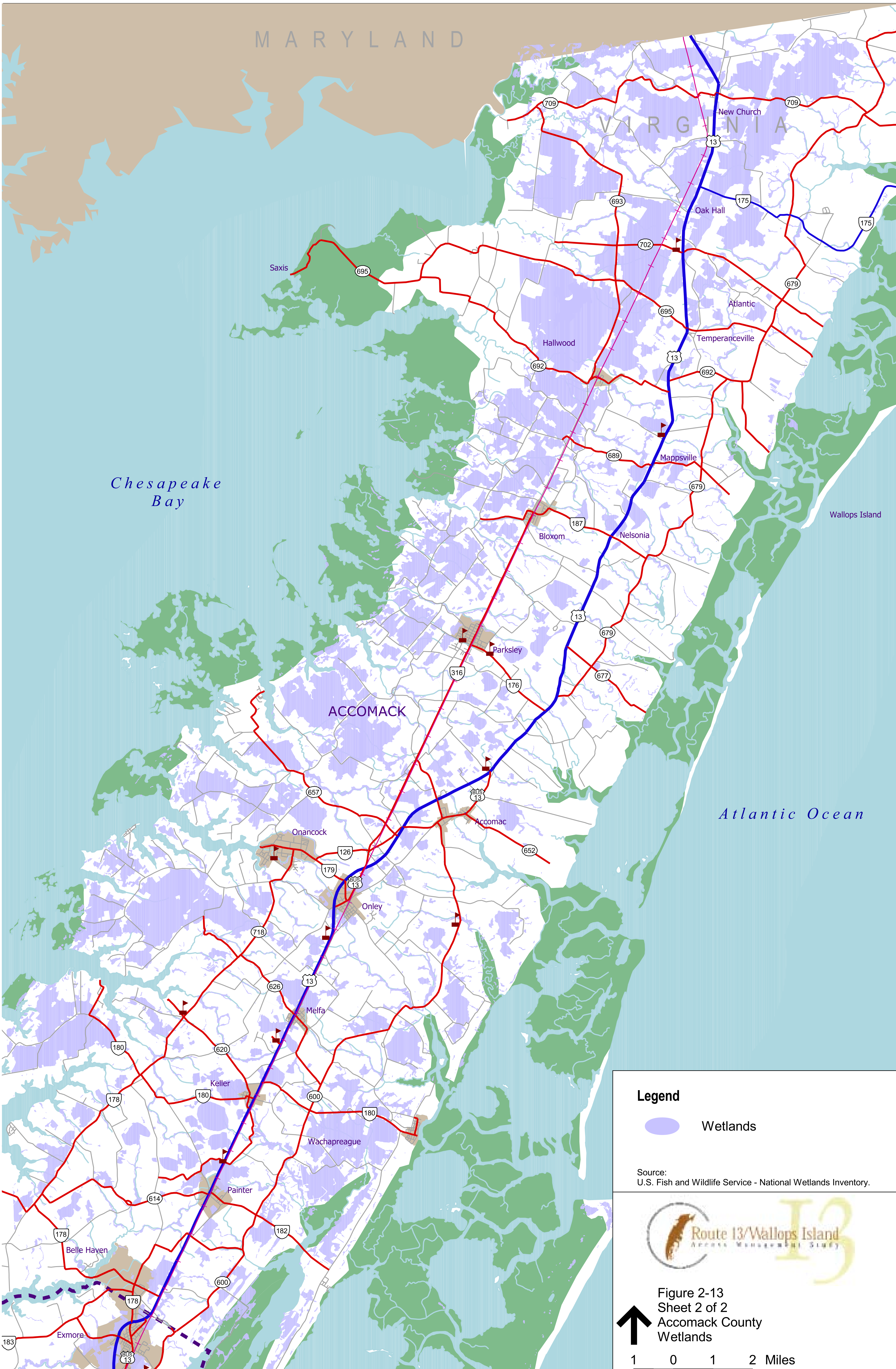


Figure 2-13
Sheet 2 of 2
Accomack County
Wetlands

Figure 2-14
Sheet 1 of 2
Northampton County
Prime Farmland

Figure 2-14
Sheet 2 of 2
Accomack County
Prime Farmland

Figure 2-15
Sheet 1 of 2
Northampton County
Threatened and Endangered Species

Figure 2-15
Sheet 2 of 2
Accomack County
Threatened and Endangered Species

During the course of project development for the final recommendations, more detailed cultural resource investigations will be necessary to determine potential impacts and identification of avoidance, minimization or mitigation efforts.

Surface and Ground Water

Numerous creeks and rivers traverse the peninsula. In general terms, areas east of U.S. Route 13 generally drain east towards the Atlantic Ocean, and areas west of U.S. Route 13 generally drain westward into the Chesapeake Bay. A large portion of freshwater in these streams is supplied from groundwater sources. Groundwater is an important resource on the shore; it is used as the primary source of drinking water and it is also used for irrigation, commercial, and industrial purposes. In 1976, the Virginia Department of Environmental Quality designated the region as a "Groundwater Management Area." Rainwater infiltration is the only source of freshwater recharge to the aquifer system. According to earlier groundwater studies, the primary source of recharge is located along a 5,000 foot "spine" that runs north/south near the center of the peninsula for its entire length. As shown in Figure 2-16, this recharge spine generally follows the U.S. Route 13 corridor. Proposed transportation plans along the U.S. Route 13 corridor will need to assess potential effects on groundwater through possible reduction of recharge areas.

2.3 Existing Traffic Operations

A detailed analysis was completed to determine existing traffic operation conditions in the study area. The analysis used the procedures documented in the *2000 Highway Capacity Manual*[1] to provide a technical assessment of the operational qualities of unsignalized intersections and roadway segments. Synchro 4 was used to analyze the signalized intersections. The input information for the analysis included the existing traffic volumes, traffic signal and control data, as well as corridor geometric design conditions.

The relationship between the supply (roadway capacity) and demand (traffic volume) on a roadway is a primary indicator of how well a transportation facility accommodates vehicular traffic. The traffic operation analysis procedures used in this study assigned a level-of-service (LOS) rating for each specific intersection or segment of roadway analyzed. LOS is a qualitative measurement of the operating conditions of a roadway facility or intersection, taking into account a number of variables such as speed, vehicle maneuverability, driver comfort, and safety. Similar to a report card, level-of-service designations are letter-based, ranging from A to F; LOS A represents the best operating condition and LOS F corresponds to conditions with demands approaching or at the available capacity.

In a rural area, LOS C is used as the acceptable threshold for design purposes. Level-of-service C is typically used, because it ensures a more acceptable quality of service to facility users. Typically, Level-of- service C conditions are equal to an average

1 Highway Capacity Manual; Transportation Research Board, National Research Council; Washington D.C. 2000.

delay at a side-street stop sign of 10 to 20 seconds and from 20 to 35 seconds at a traffic signal.

■

2.3.1 Peak Hour Intersection Operations

Signalized and unsignalized intersections were evaluated along the study corridor in 2000. A summary of conditions at these intersections is provided below. It is important to realize that LOS is a broadly applicable measurement, designed to assess traffic operations in a variety of environments.

Signalized Intersections

Twenty signalized intersections were evaluated along the U.S. Route 13 corridor within the study area. During both the morning and afternoon peak periods for spring and summer 2000 traffic volume conditions, all the intersections were operating at LOS A or B with relatively short average delays and low volume to capacity (v/c) ratios. No obvious traffic capacity deficiencies were identified at the signalized intersections as a result of this analysis.

Unsignalized Intersections

Eight unsignalized intersections within the U.S. Route 13 study area were also analyzed to determine their adequacy in handling peak hour traffic. These intersections were chosen because level of service was evaluated for each of the side-street movements as well as the left-turn movements from the street approaches. The results of the capacity analysis indicate that with the exception of the Route 175/ Route 798 intersection, all of the unsignalized intersections studied are operating within acceptable levels.

At the intersection of Route 175 and Route 798, the northbound and southbound Route 798 approaches are operating at LOS E and F, respectively, during the summer afternoon peak hour. The analysis results indicate average delays of approximately 42 seconds for the northbound approach and 86 seconds for the southbound approach during that peak hour. The low LOS for the Route 798 approaches are primarily the result of insufficient gaps in the Route 175 traffic stream. The lack of gaps in the oncoming traffic stream prevents traffic from turning left from Route 798 onto Route 175, thereby creating long delays.

Roadway Segments

A total of eleven roadway segments were assessed along the U.S. Route 13 corridor. The LOS analysis was performed for each of the peak periods during May and July traffic conditions. For all of the roadway segments studied, LOS A operating conditions were determined to occur during each of the analysis conditions.

Chesapeake Bay
Atlantic Ocean
NORTHAMPTON
Painter
Belle Haven
Exmore
Nassawadox
Weirwood
Birdsnest
Treherneville
Machipongo
Eastville
Cheriton
Cape Charles
Cape Center
Kiptopeke State Park
Legend
Recharge Spine
Groundwater Regions
Discharge Area
Transition Area
Recharge Area
Source:
Accomack - Northampton Planning District Commision.
Figure 2-16
Sheet 1 of 2
Northampton County
Groundwater
1 0 1 2 Miles

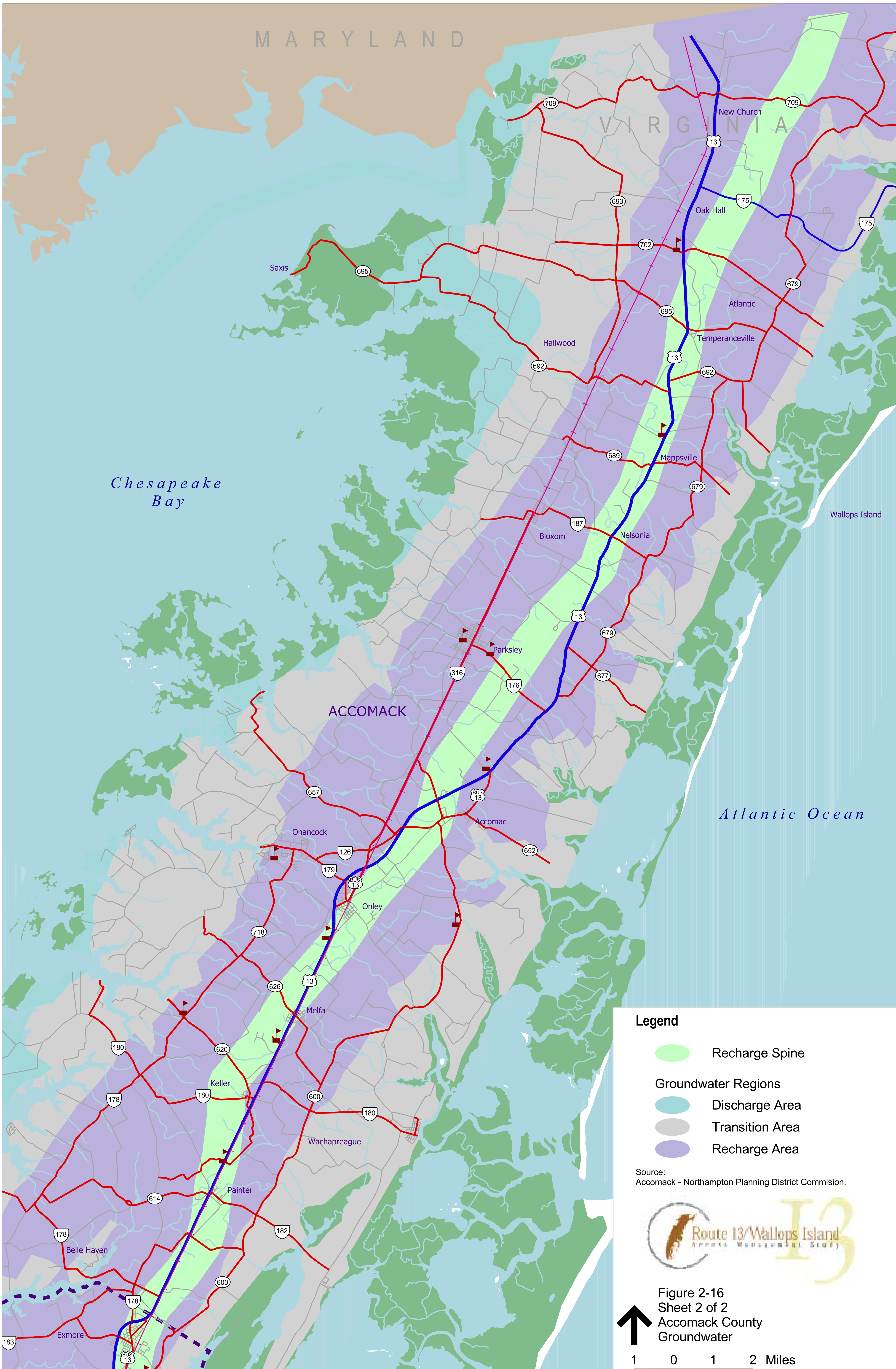


Figure 2-16
Sheet 2 of 2
Accomack County
Groundwater

2.4 Safety Conditions

Safety is of paramount concern when assessing a corridor such as U.S. Route 13. A safety analysis was conducted for the U.S. Route 13 corridor within the study area to identify safety deficiencies or safety issues. The issues and deficiencies uncovered during this analysis became top priority issues considered during the identification and evaluation of corridor improvement alternatives discussed in Chapter 5.

2.4.1 Methodology

The safety analysis was based on an examination of vehicular crash rates on the roadway and a comparison to statewide averages for similar types of facilities. Traffic crash data for U.S. Route 13 were supplied by the Virginia Department of Transportation for the period January 1997 through December 1999, which represents the most recent three-year period available. This data included all reported crashes listed by location. For each location the crash description included number of vehicles involved, lighting conditions, crash type, type of traffic control, primary cause of crash, weather conditions, roadway conditions, and types of vehicles involved. Crash rates were calculated for each intersection analyzed in the capacity analysis and for the segments between intersections. The crash rates were then compared to statewide averages for similar types of facilities, if available, to determine where safety deficiencies exist.

2.4.2 Vehicular Crash History

A summary of the crash rates by intersection and segment is presented in Table 2-6. The intersection crash rates ranged from 15 crashes per 100 million entering vehicles (100 MEV) at the intersection of U.S. Route 13 and Routes 180/696 to 136 crashes per 100 MEV at the intersection of U.S. Route 13 and Route 652. The statewide crash statistics do not summarize intersection crash rates and therefore no comparisons can be made between the intersections along U.S. Route 13 and those across the state. However, there are five intersections on U.S. Route 13 that are experiencing crash rates considerably higher than the others in the corridors:

- Route 695 @ Temperanceville (102 crashes per 100 MEV)
- Route 178 @ Exmore (86 crashes per 100 MEV)
- Route 652 @ Shore Plaza (136 crashes per 100 MEV)
- Route 606 @ Nassawadox (104 crashes per 100 MEV)
- Route 184 @ Cape Charles (87 crashes per 100 MEV).

For roadway segments, a review of Table 2-6 reveals the 0.98-mile segment between Route 183 and Route 652 experienced the highest crash rate of 171 crashes per 100 million vehicle-miles (MVM). This is well above the 1999 statewide average crash rate for similar type facilities of 120 crashes per 100 MVM. There is one other segment experiencing crash rates above this statewide average: U.S. Route 13 from Chesapeake Square to Route 179.

The five high-crash intersection locations and the two roadway segments experiencing crash rates above the statewide average were further analyzed to determine if any of the locations was experiencing an identifiable crash pattern. This data is presented in Tables 2-7 and 2-8.

As shown in Table 2-7, angle-type crashes are the leading type of crash for each of the high crash intersections. At each of these intersections, angle-type crashes account for 50 percent or more of the total number of crashes. This is followed closely by rear-end type crashes, which account for between 25 to 38 percent of the crashes.

The crash statistics also indicate that the severity of the crashes was split approximately fifty-fifty between personal injury and property damage only. There was one fatal crash at the intersection with Route 184. The major factor for the crashes evaluated was listed as inattention or error in over 68 percent of the crashes. Weather and speed were not listed as factors for the crashes evaluated. Each of the high crash locations also had crashes that involved trucks. The percentage of crashes involving trucks ranged from 11 to 25 percent. Road conditions or road geometry are not shown as contributors to the intersection crashes reviewed

A review of Table 2-8 indicates that angle-type and rear-end type crashes are the prevalent crash types on each of the high crash segments. On the section of U.S. Route 13 between Chesapeake Square and Route 179, five of the seven crashes were rear-end type crashes, and on the segment between Route 183 and Route 652, 33 percent were rear-end type crashes and 39 percent were angle-type crashes. The leading cause of crashes on each of these segments of U.S. Route 13 was driver inattention or error. A contributing factor to these crashes may be the amount of roadside development along each of these sections of roadway. The number of driveways and the associated turning maneuvers may contribute to driver confusion.

Table 2-6

U.S. Route 13 Crash Summary

Intersection	1997	1998	1999	Total	Daily Exposure	Crash Rate*
	Crashes by Year					
Route 175	6	5	5	16	22,490	65
Route 695	5	6	8	19	16,930	102
Route 187	5	4	4	13	19,400	61
Route 176	1	2	4	7	17,320	37
Route 764	1	4	3	8	16,495	44
Chesapeake Square	0	3	0	3	15,750	17
Route 179	7	2	1	10	22,210	41
U.S. Route 13 Bus.- Onley	2	9	3	14	22,830	56
Route 626	5	1	0	6	18,890	29
Route 180/696	1	1	1	3	18,200	15
Route 182/614	5	2	3	10	18,830	48
Route 178	5	6	5	16	17,080	86
Route 183	5	1	1	7	12,070	53
Route 652	4	5	6	15	10,050	136
Route 606	4	5	5	14	12,300	104
Route 631	1	5	2	8	11,330	64
Route 680	2	2	3	7	9,740	66
Route 184	7	3	2	12	12,580	87

Segment	1997	1998	1999	Total	AADT**	Crash Rate***	Length (miles)
North of Route 175	20	16	16	52	19,000	61	4.09
Route 175 - Route 695	11	18	24	53	16,000	82	3.69
Route 695 - Route 187	20	36	30	86	16,000	85	5.77
Route 187 - Route 176	15	21	15	51	15,500	63	4.76
Route 176 - Route 764	33	16	17	66	15,000	111	3.62
Route 764 – Chesapeake Sq.	11	9	12	32	15,000	67	2.91
Ches. Sq. - Route 179 ****	4	1	2	7	15,000	147	0.29
Route 179 - U.S. Route 13 Bus	8	3	6	17	19,000	110	0.74
U.S. Route 13 Bus – Route 626	9	10	20	39	19,000	64	2.92
Route 626 - Route 180/696	7	13	6	26	17,000	59	2.37
Route 180/696 - Route 614	8	10	10	28	15,000	64	2.68
Route 614 - Route 178	13	13	11	37	9,700	89	3.91
Route 178 - Route 183	1	1	1	3	9,800	54	0.52
Route 183 - Route 652 ****	2	10	6	18	9,800	171	0.98
Route 652 - Route 606	11	11	21	43	9,700	115	3.53
Route 606 - Route 631	27	31	38	96	10,000	90	9.75
Route 631 - Route 680	7	14	17	38	9,600	73	4.93
Route 680 - Route 184	6	5	2	13	9,600	101	1.22
South of Route 184	15	26	38	79	9,600	80	9.34

* Crash rate for intersections is expressed in crashes per 100 million entering vehicles (MEV).
** AADT Annual Average Daily Traffic
*** Crash rate for roadway segments is expressed in crashes per 100 million vehicle miles.
**** Above State Average
Source: VDOT HTRIS data files

Table 2-7
U.S. Route 13 High Crash Intersection Summary

	U.S. Route 13 at				
	Route 695	Route 178	Route 652	Route 606	Route 184
Year					
1997	5	5	4	4	7
1998	6	6	5	5	3
1999	8	5	6	5	2
Total	19	16	15	14	12
Crash Type					
Rear-end	5	6	5	4	3
Angle	11	8	8	7	7
Head-on	0	0	0	0	0
Sideswipe (same direction)	0	2	1	1	0
Sideswipe (opposite direction)	0	0	0	0	1
Fixed object in road	0	0	0	0	0
Train	0	0	0	0	0
Non-collision	1	0	1	0	0
Fixed object off road	2	0	0	0	1
Deer	0	0	0	0	0
Other animal	0	0	0	1	0
Pedestrian	0	0	0	1	0
Backed into	0	0	0	0	0
Miscellaneous	0	0	0	0	0
Total	19	16	15	14	12
Severity					
Fatal	0	0	0	0	1
Injury	7	7	9	7	6
Property damage only	12	9	6	7	5
Total	19	16	15	14	12
Major Factor					
Miscellaneous	2	1	1	1	0
Handicap	0	0	1	0	1
Under influence	3	1	2	0	1
Speeding	0	0	0	0	0
Inattention or error	13	13	11	12	10
Vehicle defective	0	1	0	0	0
Weather or visibility condition	0	0	0	1	0
Road defective	0	0	0	0	0
Road slick	1	0	0	0	0
Not stated	0	0	0	0	0
Total	19	16	15	14	12
Vehicle Type					
Bus	0	0	0	0	0
Truck	2	4	2	3	2
Recreational vehicle	0	0	0	0	0
Emergency vehicle	0	0	0	0	0
Other heavy vehicle	0	0	0	0	0
No heavy vehicle involved	17	12	13	11	10
Total	19	16	15	14	12

Sources: VDOT HTRIS data files

Table 2-8
U.S. Route 13 Roadway Segment Crash Summary

From:	Chesapeake Square	Route 183
To:	Route 179	Route 652
Segment Length:	0.29 mile	0.98 mile
Year		
1997	4	2
1998	1	10
1999	2	6
Total	7	18
Crash Type		
Rear-end	5	6
Angle	1	7
Head-on	0	0
Sideswipe (same direction)	1	1
Sideswipe (opposite direction)	0	1
Fixed object in road	0	0
Train	0	0
Non-collision	0	0
Fixed object off road	0	2
Deer	0	0
Other animal	0	0
Pedestrian	0	1
Backed into	0	0
Miscellaneous	0	0
Total	7	18
Severity		
Fatal	0	0
Injury	4	12
Property damage only	3	6
Total	7	18
Major Factor		
Miscellaneous	0	0
Handicap	0	0
Under influence	0	1
Speeding	0	0
Inattention or error	6	15
Vehicle defective	0	0
Weather or visibility condition	0	0
Road defective	0	0
Road slick	0	2
Not stated	1	0
Total	7	18
Vehicle Type		
Bus	0	0
Truck	0	0
Recreational vehicle	0	0
Emergency vehicle	0	0
Other heavy vehicle	0	0
No heavy vehicle involved	7	18
Total	7	18

Sources: VDOT HTRIS data files

2.4.3 Fatalities

A total of 37 fatalities were recorded in 1,087 crashes on the state accident database over a three-year period from 1997 to 1999 on the U.S. Route 13 corridor. The location of 24 of these fatalities (22 crashes) could be located based on the detail contained in the accident reports. Table 2-9 summarizes this information.

Table 2-9
U.S. Route 13 Fatality Summary

Milepost	Location Description	Number Killed	Year of Fatality
79.33	Route 13 at Route 184/US 13 Business	1	1997
83.57	Route 13 at Route 633	1	1999
87.58	Route 13 between Route 674 and Route 1703	1	1997
89.66	Route 13 at Route 627	1	1997
91.42	Route 13 at Route 622	1	1998
94.76	Route 13 between Routes 617 and 609	2	1999
99.75	Route 13 at Route 183	1	1997
101.35	Route 13 between Routes 181 and 603	1	1997
102.04	Route 13 between Routes 603 and 607	1	1998
103.13	Route 13 between Routes 607 and 614	1	1997
109.01	Route 13 between Routes 1113 and 1115	1	1997
112.72	Route 13 at Bank Street	1	1998
117.82	Route 13 between 13 business and Route 744	1	1999
117.91	Route 13 between 13 business and Route 744	1	1999
122.78	Route 13 between Routes 676 and 680	2	1999
123.08	Route 13 at Route 680	1	1998
124.16	Route 13 between Routes 681 and 187	1	1998
126.1	Route 13 at Route 769	1	1999
126.45	Route 13 between Routes 769 and 689	1	1998
129.57	Route 13 at Route 757	1	1997
132.17	Route 13 at Route 702	1	1999
137.65	Route 13 between New Church and the MD State Line	1	1998
Total		24	

Source: VDOT HTRIS data files

2.4.4 Enforcement of Traffic Laws

Early in this study, the Citizens Advisory Committee (CAC) identified enforcement of traffic laws as a key goal to enhancing the safety of the corridor. One factor contributing to this goal is the staffing level of Virginia State Police assigned to the Eastern Shore. At the time of this study, 15 troopers patrolled the region. The Virginia State Police officer who participated as a member of the CAC pointed out that the demographics of the Eastern Shore justified 27 troopers.

2.5 Other Issues

Sections 2.1 through 2.4 have described many of the key roadway and traffic characteristics along the U.S. Route 13 corridor and the issues associated with those characteristics that affect development of the access management plan. In addition, there are other corridor issues that also need to be considered such as the impact of the Eastern Shore rail line, the location of schools, employment centers and recreational areas, and other tourist attractions - all of these play a factor in the operations of the U.S. Route 13 corridor and need to be considered in the development of a corridor access management plan. Figure 2-17 displays many of these issues graphically.

2.6 Summary of Existing Corridor Conditions

The evaluation of existing conditions along the U.S. Route 13 corridor presented in this chapter has examined the characteristics of the roadway and its users, addressed the seasonal variation experienced on U.S. Route 13, and has identified key issues affecting travel along the corridor. The findings are summarized below:

Roadway

- U.S. Route 13 is a four-lane facility throughout the Eastern Shore with no control of access, and for most of its length has a median separating the northbound from the southbound directions of travel. There are several locations where the roadway is undivided with a center two-way left-turn lane. One location of particular concern is located in Temperanceville where U.S. Route 13 is undivided with a three-foot flush median, curb and gutter, sidewalk, and numerous residences, driveways, and utility poles located on both sides of the road.

- The US Route 13 corridor has a total of 21 traffic signals in operation. With the exception of Exmore and Onley, signal spacing is not a concern. In these two towns, there is a concern about the addition of additional signals in the future and the effect on the overall safety and travel through the corridor. Consideration should be given to the development of coordinated signal systems in these areas to minimize delay to through traffic.

Roadway Users

- The U.S. Route 13 corridor experiences a high volume of through traffic in both directions (ranging by direction from 1,600 to 1,800 vehicles per day). There is a higher volume of tractor-trailers, particularly in the northern portion of the U.S. Route 13 study area with poultry trucks moving to/from the Tyson's and Perdue plants to the north.

- Farm vehicles may be present on U.S. Route 13 for short stretches along most of the corridor throughout a long growing season (multiple crops and harvesting periods). Given the size of some farm equipment, U.S. Route 13 is the only road wide enough to accommodate these vehicles. Also, there are many fields accessible only from U.S. Route 13.

- The U.S. Route 13 corridor is used by Eastern Shore residents for many different trip purposes, including local trips, shopping trips, and work trips.

Safety

- Corridor crash rates are generally below the statewide average for similar primary routes except in the towns of Exmore and Onley.

- Fatalities are a concern in this corridor, however, with a total of 37 fatalities recorded over the three-year analysis period (1997-1999). Of the 24 fatalities located on the corridor, 40 percent of these fatalities occurred at night and 30 percent involved pedestrians. The proximity of side street obstructions to the roadway travel lanes, such as utility poles, roadway banks, signs and structures, appears to be a contributing factor in 38 percent of these fatalities. In addition, while not specifically assessed in this study, the count for 2000 reached 17 fatalities.

- The ability of the Virginia State Police to effectively enforce existing traffic safety laws along the U.S. Route 13 corridor, given current staffing levels, has been raised as a local concern.

Traffic Operations

- Based on existing traffic volumes, U.S. Route 13 operates at a good level of service throughout the study area. Unsignalized access onto U.S. Route 13 is difficult at many cross streets within the study area; however, the primary reason for this difficulty is based on geometry, not through volume.

- The unsignalized intersection of Route 175 and Route 798 near the Wallops Island mainland complex during the summer months does not function at an adequate level of service and needs to be improved.

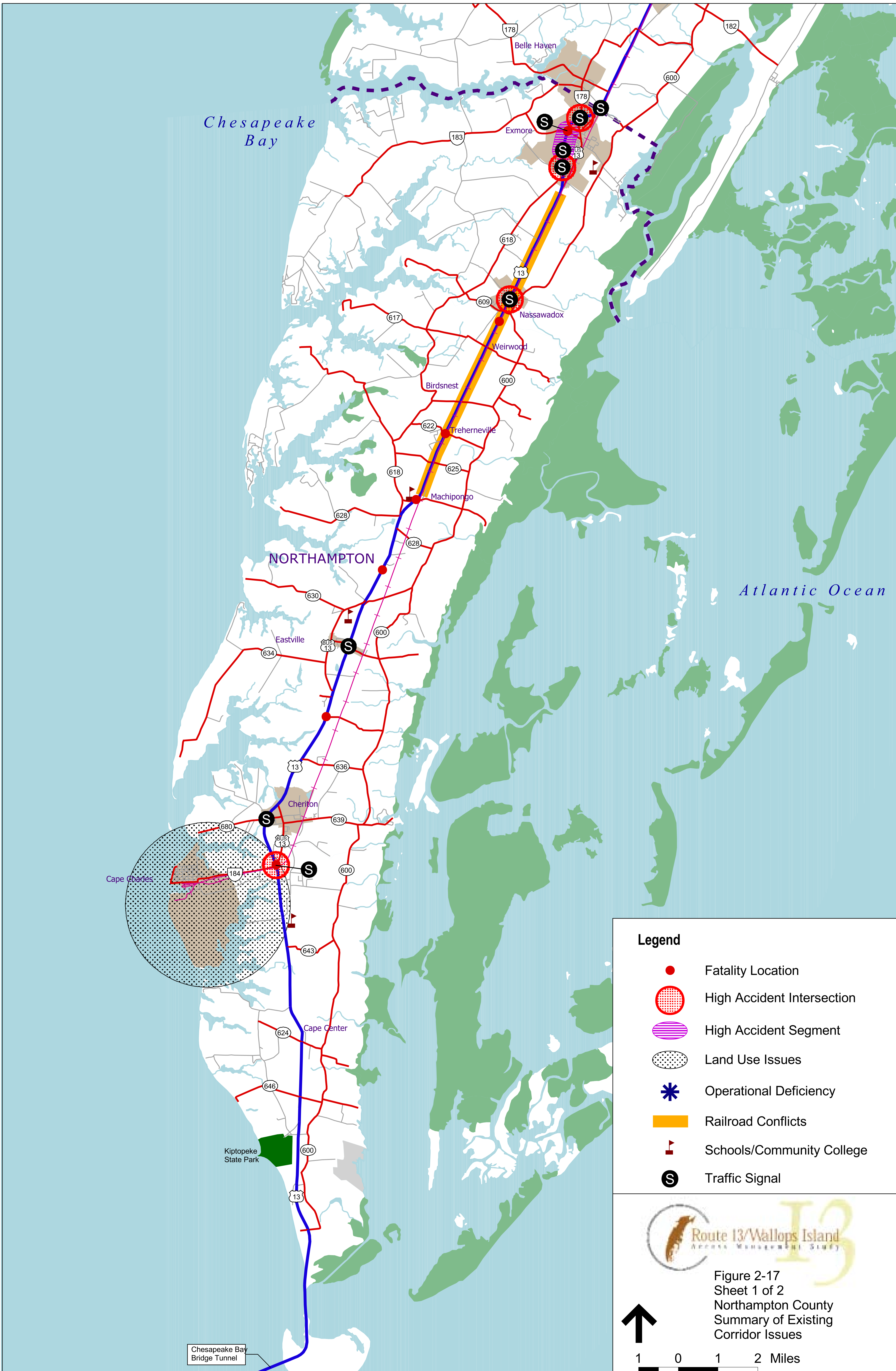


Figure 2-17
Sheet 1 of 2
Northampton County
Summary of Existing
Corridor Issues

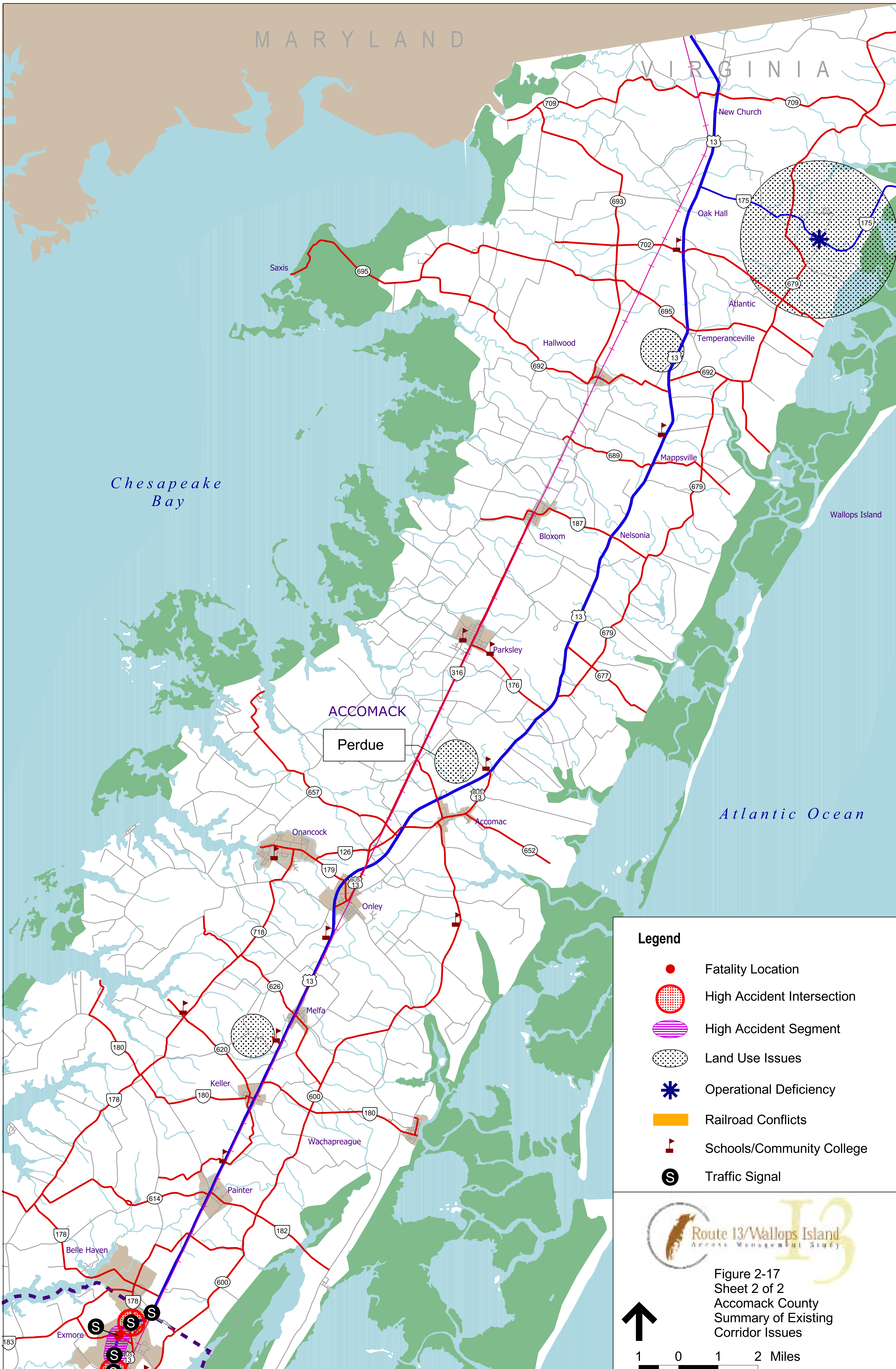


Figure 2-17
Sheet 2 of 2
Accomack County
Summary of Existing
Corridor Issues

Access

- A large number of access points (over 1,300) were identified throughout the U.S. Route 13 corridor. Many properties with multiple points of access were identified. There is a need to review access in more detail to either reduce or improve the driveway spacing.

Median Crossovers

- The median width in many areas does not provide adequate protection for crossroad traffic. Consideration is needed to evaluate either widening of the median or alternate treatments.

- Crossover spacing needs to be reviewed and the provision of left-turn lanes should be considered at all of the crossovers.

- The crossover widths of many median crossovers (measured parallel to U.S. Route 13) are not wide enough to accommodate simultaneous left-turning traffic.

Railroad

- The proximity of the Eastern Shore Railroad to U.S. Route 13, from Machipongo to Onley, impacts the safety of all crossroads connecting with U.S. Route 13 from the east. Vehicles trying to access the U.S. Route 13 corridor often back into the current at-grade rail crossings at many of the major cross streets along this section of the corridor.

- The planned upgrade of this rail line may impact these at-grade rail crossing as a result of the speeds increasing from 10 to 20 mph.

Land Use

- U.S. Route 13 is the primary access corridor for the entire Virginia Eastern Shore. The overwhelming majority of daily trips require most residents to travel on U.S. Route 13 for both local and regional trip purposes.

- Active land uses along the U.S. Route 13 corridor include seasonal agriculture through much of the study area and commercial and roadside residential development in the towns and unincorporated settlements. Major commercial centers are located in Nassawadox and Exmore in Northampton County and in Onley in Accomack County.

- In Accomack County, there are many schools located directly on, or close to, the U.S. Route 13 corridor. Access for school buses is a key concern at these locations.

- The Wallops Island area is a major employment center, attracting workers from both Virginia and Maryland. U.S. Route 13, between the Maryland state line and Route 175, is a major travel route serving this commuter population.

- Significant residential and recreational development activity is occurring in the Cape Charles area (Northampton County), located to the west of U.S. Route 13 off Route 184. The potential impact of a reduced toll structure on the CBBT, now under consideration, may have significant impacts on land use and development in Cape Charles and the entire southern portion of Northampton County.

Environment

- Improvements in the U.S. Route 13 corridor could potentially impact sensitive environmental features including wetlands, prime farmland, threatened and endangered species, historic resources and groundwater recharge areas. Particularly for improvements that involve roadway relocation or new alignment, additional investigations may be necessary to determine the extent and significance of such impacts.

3

Future Traffic Conditions

This chapter presents information on the anticipated future conditions along U.S. Route 13. Included in the discussion are the economic outlook for the Eastern Shore of Virginia, the historical traffic growth, the expected growth rate, forecasts by others, and estimated future traffic operations for the study area. It is important to note that these projected data and analyses are absent any strategies to reduce or manage future traffic demands along the corridor. These types of actions and their effectiveness in accommodating overall corridor travel demand will be discussed in Chapter 5.

3.1 Forecast Year

The first task of a future conditions analysis involves the selection of a planning horizon year, or forecast year. It is common practice to design transportation infrastructure for traffic demands anticipated at some time in the future. This level of planning helps prevent a facility from operating at capacity shortly after construction is completed. AASHTO[2] eferences designing to accommodate highway traffic projections of a 20-year period. Federal Planning Regulations[3] which guide the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) require a minimum horizon of 20 years for statewide planning. ITE[4] also acknowledges the usefulness of forecasting traffic to accommodate 20-year demands.

The selection of a 20-year planning horizon will allow for projections that give an appropriate indication of the long-term needs along the corridor. Therefore, the year 2020 was established as the horizon year for this study that was initiated in the year 2000.

3.2 Review of Recent Studies

A review of recent transportation studies can be extremely useful in the development of future traffic growth forecasts. For the U.S. Route 13 Corridor, there are several studies that have been completed within the past five years. These include:

- *U.S.Route 13 Corridor Plan – Eastern Shore of Virginia*, Accomack-Northampton Planning District Commission (A-NPDC), July 1999.

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2 A Policy on the Geometric Design of Highways and Streets, American Association of State Highway Transportation Officials (AASHTO), 1990.
3 Code of Federal Regulations, 23 CFR 450.214(b)(2), revised as of April 1, 1995.
4 Traffic Engineering Handbook, 4th Edition, Institute of Transportation Engineers, 1992.

- *Chesapeake Bay Bridge Tunnel Traffic Evaluation Study*, Chesapeake Bay Bridge and Tunnel District, April 11, 2000.

- Potential Land Use Impacts of a Commuter Toll Reduction on the Chesapeake Bay Bridge-Tunnel, Virginia Department of Transportation, June 2000.

- Chesapeake Bay Bridge-Tunnel Toll Impact Study completed in October 2001 by the A-NPDC provides further evaluation of the impacts of a toll reduction on development in lower Northampton County.

A brief summary of the future growth estimates assumed in each study is provided below.

3.2.1 A-NPDC Study of the U.S. Route 13 Corridor

This study estimated future traffic growth in two steps. First, through traffic was identified based on interview surveys conducted at the Chesapeake Bay Bridge-Tunnel toll plaza. Through traffic is defined as the traffic observed at MD-VA border and CBBT. Through traffic growth of 2.7 percent was then forecasted based on the historical average annual growth rate experienced on the Bridge-Tunnel.

Next, the potential growth in local traffic was evaluated through the development of several future land development scenarios. These scenarios assumed a range of average annual population growth from 0.5 percent up to 1.5 percent. The specific areas along the Eastern Shore where residential, commercial and industrial growth is likely to occur were projected. An average population growth rate for the entire Eastern Shore of Virginia of one percent was selected as the maximum likely to happen. This scenario was called the "Highest Anticipated Growth Scenario."

Future Population Growth

Under the Highest Anticipated Growth Scenario, population growth would average roughly one percent per year, similar to the state average. The Eastern Shore's population would grow to 57,000 by 2020, roughly 27 percent higher than the 1995 base population of approximately 45,000. To refine the pattern of growth, the Eastern Shore was divided into nine zones, as shown in Figure 3-1. Existing population and employment were identified for each zone, and then assumptions were made about which zones would experience the most growth.

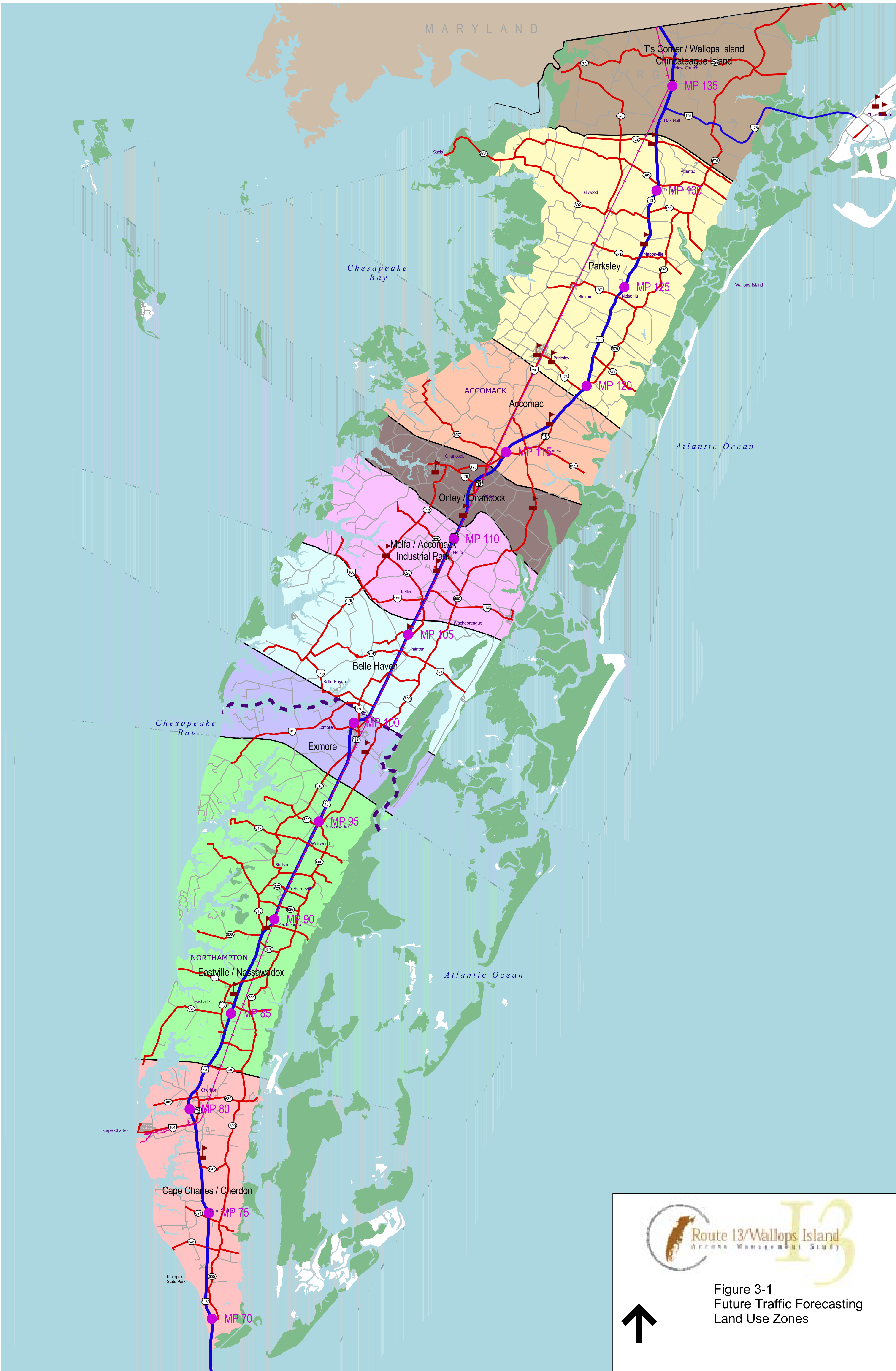


Figure 3-1
Future Traffic Forecasting
Land Use Zones

As shown in Table 3-1, the highest rates of residential growth occur at the southern and northern ends of the Eastern Shore, which would increase by average annual rates of 2.7 percent and 2.2 percent, respectively. Much of the growth in the Cape Charles area would consist of retirement population at the Bay Creek development. The remainder of the Shore would experience average annual residential growth rates at or below one percent. This growth pattern is consistent with that suggested by local and regional planners during the initial scoping interviews conducted as part of this study. The concentration of residential growth at each end of the study area emphasizes the need to analyze commuting patterns to Hampton Roads, Maryland, and to the center of the study area, where significant employment growth is projected (see below).

This growth scenario, though not a scientific projection of population, is substantiated by recent data. The 2000 census indicates that the population on the Eastern Shore for 2000 was approximately 13,100 for Northampton County and 38,300 for Accomack County. The County of Accomack estimates that their population number should be closer to 34,100. Accepting Accomack's numbers, the population on the Eastern Shore for 2000 is 47,200. This correlates to a growth rate of 1.0 percent per year from 1995 to 2000, which is consistent with the Highest Anticipated Growth Senario average annual growth percentage per year.

Table 3-1
Population Growth Scenario – Highest Anticipated

Land Use Zone	1995 Population*	2020 Forecast*	Average Annual Growth (%/yr.)
1 – Cape Charles/Cheriton	3,855	7,500	2.7
2 – Eastville/Nassawadox	4,535	5,100	0.5
3 – Exmore	4,535	5,100	0.5
4 – Belle Haven	4,535	5,400	0.7
5 – Melfa/Accomack Airport Ind. Park	4,535	5,400	0.7
6 – Onley/Onancock	6,349	7,600	0.7
7 – Accomac	3,175	3,600	0.5
8 – Parksley	9,070	10,100	0.4
9 – T's Corner/Wallops Island/ Chincoteague Island	4,535	7,900	2.2
Total	45,124	57,700	1.0

* 1995 and 2020 population estimates provided by the Accomack-Northampton Planning District Commission.

Future Commercial Growth

As shown in Table 3-2, average annual growth in retail and commercial development is anticipated to be concentrated in the areas of Exmore (three percent per year), Onley (two percent per year), and T's Corner (three percent per year). Expanding commercial development in previously developed areas is consistent with local long-range plans, and could help preserve undeveloped sections of the corridor. However, it also highlights the need for effective access management in those areas to prevent degradation of mobility along U.S. Route 13. Also, measures to address existing problems will take on heightened importance.

Table 3-2
Commercial-Retail Growth Scenario – Highest Anticipated

Land Use Zone	1995 Square Footage*	2020 Forecast Square Footage*	Average Annual Growth (%/yr.)
1 – Cape Charles/Cheriton	225,000	270,000	0.7
2 – Eastville/Nassawadox	150,000	180,000	0.7
3 – Exmore	375,000	790,000	3.0
4 – Belle Haven	225,000	330,000	1.5
5 – Melfa/Accomack Airport Industrial Park	150,000	220,000	1.5
6 – Onley/Onancock	750,000	1,230,500	2.0
7 – Accomac	225,000	250,000	0.4
8 – Parksley	450,000	540,000	0.7
9 – T's Corner/Wallops Island/ Chincoteague Island	450,000	940,000	3.0
Total	3,000,000	4,750,500	1.9

* 1995 and 2020 commercial growth estimates provided by the Accomack-Northampton Planning District Commission.

The Highest Anticipated Growth Scenario assumes that commercial-retail growth would be at the rate of 1.9 percent annually compared to 1.0- percent average annual population rate.

Future Industrial Growth

Industrial growth, shown in Table 3-3, is anticipated to occur at a slower rate (0.6 percent average annual rate) along the Eastern Shore than commercial-retail growth, so that overall commercial-industrial growth (1.4 percent) would slightly exceed residential growth (1.0 percent). Industrial development is anticipated to be focused on the Accomack Airport Industrial Park (five percent average annual rate) in Melfa.

Table 3-3
Industrial Growth Scenario – Highest Anticipated

Land Use Zone	1995 Square Footage*	2020 Forecast Square Footage*	Average Annual Growth (%/yr.)
1 – Cape Charles/Cheriton	250,000	360,000	1.5
2 – Eastville/Nassawadox	150,000	170,000	0.5
3 – Exmore	150,000	170,000	0.5
4 – Belle Haven	50,000	60,000	0.7
5 – Melfa/Accomack Airport Ind. Park	250,000	850,000	5.0
6 – Onley/Onancock	150,000	170,000	0.5
7 – Accomac	150,000	150,000	0.0
8 – Parksley	2,600,000	2,600,000	0.0
9 – T's Corner/Wallops Island/ Chincoteague Island	1,200,000	1,250,000	0.2
Total	4,950,000	5,780,000	0.6

* 1995 and 2020 industrial growth estimates provided by the Accomack-Northampton Planning District Commission.

Summary of Demographic Projections

The higher rate of commercial-retail development is premised in part on the potential for highway tourist-oriented business such as hotels and gas stations, as a function of a strong mid-Atlantic economy. The growth is also a factor of the potential demand for an upscale retail outlet center. According to the A-NPDC report, this pattern would mimic the period from 1985 to 1995, when commercial growth exceeded residential growth. The bulk of the new development is anticipated to occur later in the planning horizon, after full absorption of the '85-'95 growth. These assumptions and growth scenarios have implications for through and local traffic growth.

It bears emphasizing that the Highest Anticipated Growth Scenario assumes no change in the toll structure at the CBBT. As stated in the Existing Conditions section of this report, decreasing or removing the toll would not significantly affect the overall long term (greater than 50 years) growth potential of the Eastern Shore. Reducing or eliminating the toll structure in the near term could effectively bring southern Northampton County into the Hampton Roads commuter shed sooner. The recent decrease in toll structure is expected to increase the growth in the general vicinity of Cape Charles by the year 2020, but not enough to change the alternatives and recommendations presented in Chapters 5 and 6.

It is recognized that all of the above forecast of growth represents a general estimate of where local growth is likely to occur, not a specific development plan.

3.2.2 Chesapeake Bay Bridge Tunnel Traffic Evaluation Study

This report evaluated the toll revenue impact associated with the implementation of various toll discount rate scenarios. A total of four fiscal years were evaluated, and for this study, an average annual growth in traffic of 1.7 percent was selected.

3.2.3 Virginia Department of Transportation Bridge-Tunnel Study

This report did not develop future traffic forecasts, however the report did examine the growth scenarios as developed by the A-NPDC. The primary focus of this study was to determine whether a change in toll structure on the Bridge-Tunnel could draw lower Northampton County into the Hampton Roads commuting market. The study concluded that a reduction of the current $10 toll to $5 could influence people to live on the Eastern Shore and commute to the Hampton Roads region by 2020. This analysis examined projected travel times from major employment centers in Hampton Roads to fringe areas, such as Isle of Wight County, and conducted a comparison of the total costs of commuting.

3.2.4 Chesapeake Bay Bridge-Tunnel Toll Impact Study

The toll impact study report was completed in October 2001 after the completion of the travel forecasting effort of this project. As a result, the traffic forecasts presented in this Chapter do not include traffic projections with the proposed commuter fare in place. This fare structure, effective March 1, 2002 lowered the round trip passenger vehicle fare from $20.00 to $14.00 for vehicles using the facility in both directions within a 24-hour period. The toll impact study estimated 2025 daily traffic volumes on U.S. Route 13 on the Eastern Shore both with and without the commuter toll reduction. A 13 percent increase in daily traffic was projected for southern Northampton County (CBBT to Cape Charles/Cheriton), as a result of the commuter toll reduction. Between Cheriton and Nassawadox, an 18 percent increase was projected, an eight percent increase through Nassawadox, and a four percent increase through Exmore. The commuter toll reduction is projected to have minimal effects on daily traffic flow (one percent growth or less) in Accomack County.

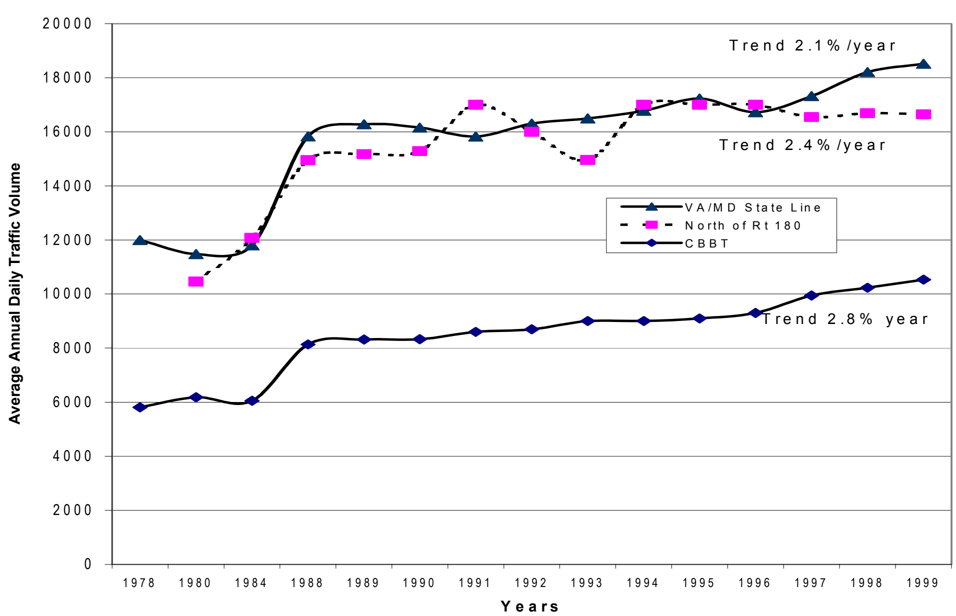
The development of study alternatives and recommendations, presented in Chapters 5 and 6, anticipated the potential for increased growth in southern Northampton County due to a change in the toll structure. The improvements developed in those Chapters are consistent with and sufficient to accommodate the increased traffic projections and still maintain acceptable traffic operations on U.S. Route 13. A review of the toll impact study does not change any of the findings and recommendations presented later in this report in Chapters 5 and 6.

3.3 Historical Traffic Growth

A review of historical traffic growth trends was conducted for the U.S. Route 13 corridor. Figure 3-2 presents historical average daily traffic information obtained at three locations along U.S. Route 13 at the Chesapeake Bay Bridge-Tunnel, at a VDOT permanent count station in Keller (MP 106.85) north of Route 180 and at the Virginia/Maryland State Line (provided by the Maryland State Highway Administration). These historical data would support a growth rate in the 2.1 to 2.8 percent ranges. It is important to note that growth trends along U.S. Route 13 vary from south to north with the southern end experiencing the highest growth rate and the northern end with the lowest growth rate.

Traffic volumes on the U.S. Route 13 corridor experienced significant increases between 1984 and 1988, coinciding with one of the most prosperous growth periods within the past 20 years. Between 1996 and today, a significant upturn in traffic growth has occurred on the U.S. Route 13 corridor.

Figure 3-2
Historical Traffic Growth Trends on U.S. Route 13



3.4 Travel Demand Forecasting

Travel demand and patterns are a function of the location and extent of human activities. More specifically, travel demands are affected by the location and density of housing, employment, shopping opportunities, schools, services, recreational opportunities, etc. Travel demands are also affected by economic factors such as income, car ownership, number of jobs per household, etc. Growth in travel demand is generally correlated to changes in population, employment, land uses, and economic factors.

Traffic forecasts for transportation planning are done by a variety of means. Traffic volumes are commonly forecasted simply using historical traffic statistics—generally referred to as "current trends extended." They are also forecasted using statistical analysis based on projections of changes in demographics or economic conditions, either as part of a travel demand model or by regression analyses.

After reviewing recent studies, historical traffic growth, population growth and regional projections, a method to forecast 2020 traffic volumes was selected.

■

3.4.1 Projected Growth Rate Methodology

The historical traffic information shows that traffic growth has not occurred uniformly throughout the corridor. In fact, growth rarely does occur uniformly along a roadway corridor of this length. The reason for this is because the composition of the users traveling on U.S. Route 13 is also not uniform. The users of U.S. Route 13 can generally be divided into two categories: 1) non-local traffic that is traveling on U.S. Route 13 from an external origin to an external destination (Delaware to Virginia Beach, for example), and 2) local traffic, which includes all vehicles that have an origin, a destination, or both within the Eastern Shore of Virginia.

Based on the origin-destination survey conducted in July 2000 as part of the study, through traffic was estimated at 5,000 vehicles per day. (A lower estimate of 3,600 vehicles per day was developed for Spring conditions.)

Local traffic, meanwhile, is composed of short trips that are entirely local in nature, commuting traffic (to and from Maryland or using the Bridge-Tunnel), and seasonal trips that have a local origin or destination. Local traffic is, therefore, all traffic that is not considered a though trip. This volume was determined by subtracting the through traffic volume from traffic counts taken at various sections of the corridor.

The next step was to develop a methodology to forecast future growth. Through traffic was grown at the prevailing growth rate measured at the Chesapeake Bay Bridge-Tunnel (2.8 percent per year). To project local traffic, the A-NPDC demographic "Highest Anticipated Growth" scenario was used to forecast the relative change in local traffic by sub-regions. The nine sub-regions developed in the A-NPDC study were used for consistency with prior plenary efforts. The result was a different average annual growth rate in each sub-region based on the relative changes in traffic intensity.

The residential-to-work trip table, as presented in the A-NPDC study, was used to forecast the relative growth in traffic volumes along U.S. Route 13. The trip table was multiplied by a factor of two to reflect a two-way trip (from home to work and then work to home). These two-way trips were then assigned to the roadway network. This total future local traffic was then compared to the existing local traffic (excluding through traffic), and an average annual compounded growth rate was determined for each sub-region. Forecasted growth in local traffic was then added to forecasted growth in through traffic in order to determine an average change in corridor demands.

The resultant corridor growth shows a pattern consistent with recent historical traffic trends. That is, overall average annual traffic growth varies from a high of around three percent at the Bridge-Tunnel to a low near two percent at the Virginia/Maryland State Line.

3.5 Future Traffic Projected Volumes

The results of the preceding forecast analysis are shown in Tables 3-4 and 3-5 for spring and summer conditions, respectively. More detailed information on the steps used to develop the local growth estimates are provided in the Appendix. Daily traffic volumes projected for the 2020 analysis year are graphically depicted in Figure 3-3. In summary, the U.S. Route 13 corridor is projected to experience 2020 daily traffic volumes ranging from 14,000 to 26,000 vehicles per day in the spring and from 21,000 to 33,000 vehicles per day in the summer. Along the Route 175 corridor, daily traffic volumes will range from 10,000 to 14,000 vehicles per day during the spring and summer months.

3.6 Future Traffic Operations

Using the forecasted growth in U.S. Route 13 traffic, a detailed analysis was conducted to determine year 2020 future traffic operating conditions in the study area. The analysis used the procedures documented in the *1997 Highway Capacity Manual* to provide a technical assessment of the operational qualities of intersections and roadway segments. The input information for the analysis included the existing traffic volumes, traffic signal and control data, as well as corridor geometric design conditions.

For the year 2020, in addition to the existing traffic signals, the signalization of the intersection of Route 175 and Route 798 is also assumed.

■

3.6.1 Peak Hour Intersection Operations

Signalized and unsignalized intersections were evaluated along the study corridor for 2020 morning and evening peak hour traffic conditions. A summary of conditions at these intersections is provided below. It is important to realize that Level of Service (LOS) is a broadly applicable measurement, designed to assess traffic operations in a variety of environments.

Table 3-4
Year 2020 Spring Weekday Daily Traffic Volume Projections

U.S. Route 13 Corridor

Stations		2000 Existing			2020 Thru Traffic		2020 Local Traffic			Total 2020 Volumes	
From	To	Total Volume	Through Traffic	Local Traffic	Growth Rate*	2020 Through Volume	Land Use Zone**	Growth Rate***	2020 Local Volume	Unrounded 2020 Volume	Rounded 2020 Volume
Virginia/Maryland Border	Route 175 – T's Corner	17,000	3,600	13,400	2.8%	6,250	9	1.9%	19,602	25,852	26,000
Route 175 – T's Corner	Route 695 – Temperanceville	15,000	3,600	11,400	2.8%	6,250	9	0.7%	13,148	19,398	19,000
Route 695 – Temperanceville	Route 187 – Nelsonia	16,000	3,600	12,400	2.8%	6,250	8	0.7%	14,301	20,551	21,000
Route 187 – Nelsonia	Route 176 – Parksley	15,500	3,600	11,900	2.8%	6,250	8	0.7%	13,725	19,975	20,000
Route 176 – Parksley	N US 13 Bus – Accomac	15,500	3,600	11,900	2.8%	6,250	8	0.7%	13,725	19,975	20,000
N US 13 Bus – Accomac	N US 13 Bus – Onley	16,000	3,600	12,400	2.8%	6,250	7	0.8%	14,615	20,865	21,000
N US 13 Bus – Onley	Route 639 – Melfa	18,000	3,600	14,400	2.8%	6,250	6	1.0%	17,424	23,674	24,000
Route 639- Melfa	Route 180 – Keller	16,900	3,600	13,300	2.8%	6,250	5	1.3%	17,228	23,478	23,000
Route 180 – Keller	Route 181 – Belle Haven	15,500	3,600	11,900	2.8%	6,250	4	1.6%	16,318	22,568	23,000
Route 181 – Belle Haven	Route 609 – Nassawadox	15,500	3,600	11,900	2.8%	6,250	3	1.7%	16,771	23,021	23,000
Route 609 – Nassawadox	Route 628 – Machipongo	12,700	3,600	9,100	2.8%	6,250	2	2.2%	14,071	20,321	20,000
Route 628 – Machipongo	N US 13 Business – Eastville	12,200	3,600	8,600	2.8%	6,250	2	2.2%	13,298	19,548	20,000
N US 13 Business – Eastville	Route 636	8,500	3,600	4,900	2.8%	6,250	2	2.2%	7,577	13,827	14,000
Route 636	N US 13 Business - Cheriton	8,500	3,600	4,900	2.8%	6,250	1	2.7%	8,310	14,560	15,000
N US 13 Business – Cheriton	Route 184 – Cape Charles	8,500	3,600	4,900	2.8%	6,250	1	2.7%	8,310	14,560	15,000
Route 184 – Cape Charles	Route 704 – Kiptopeke	8,500	3,600	4,900	2.8%	6,250	1	2.7%	8,310	14,560	15,000
Route 704 – Kiptopeke	CBBT	8,200	3,600	4,600	2.8%	6,250	1	2.7%	7,801	14,051	14,000

* Average annual growth rate based on 20-year trend at the CBBT.
** Land Use Zones used by the Accomack-Northampton Planning District Commission to Conduct Land Use Projections.
*** Average annual growth rate based on total projected change in local traffic.

Route 175 Corridor

Stations		2000 Existing			2020 Thru Traffic		2020 Local Traffic			Total 2020 Volumes	
From	To	Total Volume	Through Traffic	Local Traffic	Growth Rate*	2020 Through Volume	Land Use Zone**	Growth Rate***	2020 Local Vol.	Unrounded 2020 Vol	Rounded 2020 Volume
U.S. Route 13 – T's Corner	Route 679 – Wattsville	7,560	0	7,560	2.8%	0	9	1.9%	11,059	11,059	11,000
Route 679 – Wattsville	Route 798 – Wallops Island	7,240	0	7,240	2.8%	0	9	1.9%	10,591	10,591	11,000
Route 798 – Wallops Island	Chincoteague Island	4,760	0	4,760	2.8%	0	9	1.9%	6,963	6,963	7,000

Table 3-5
Year 2020 Summer Weekday Daily Traffic Volume Projections

U.S. Route 13 Corridor

Stations		2000 Existing			2020 Thru Traffic		2020 Local Traffic			Total 2020 Volumes	
From	**To**	Total Volume	Thru Traffic	Local Traffic	Growth Rate*	2020 Thru Vol.	Land Use Zone**	Growth Rate***	2020 Local Vol.	Unrounded 2020 Vol	Rounded 2020 Vol.
Virginia/Maryland Border	Route 175 – T's Corner	21,500	5,000	16,500	2.8%	8,690	9	1.9%	24,136	32,826	33,000
Route 175 – T's Corner	Route 695 – Temperanceville	18,000	5,000	13,000	2.8%	8,690	9	0.7%	14,993	23,683	24,000
Route 695 – Temperanceville	Route 187 – Nelsonia	19,000	5,000	14,000	2.8%	8,690	8	0.7%	16,147	24,837	25,000
Route 187 – Nelsonia	Route 176 – Parksley	19,000	5,000	14,000	2.8%	8,690	8	0.7%	16,147	24,837	25,000
Route 176 – Parksley	N US 13 Bus – Accomac	19,000	5,000	14,000	2.8%	8,690	8	0.7%	16,147	24,837	25,000
N US 13 Bus – Accomac	N US 13 Bus – Onley	18,000	5,000	13,000	2.8%	8,690	7	0.8%	15,322	24,012	24,000
N US 13 Bus – Onley	Route 639 – Melfa	19,000	5,000	14,000	2.8%	8,690	6	1.0%	16,940	25,630	26,000
Route 639- Melfa	Route 180 – Keller	18,500	5,000	13,500	2.8%	8,690	5	1.3%	17,487	26,177	26,000
Route 180 – Keller	Route 181 – Belle Haven	18,500	5,000	13,500	2.8%	8,690	4	1.6%	18,512	27,202	27,000
Route 181 – Belle Haven	Route 609 – Nassawadox	18,500	5,000	13,500	2.8%	8,690	3	1.7%	19,025	27,715	28,000
Route 609 – Nassawadox	Route 628 – Machipongo	14,000	5,000	9,000	2.8%	8,690	2	2.2%	13,916	22,606	23,000
Route 628 – Machipongo	N US 13 Business – Eastville	13,500	5,000	8,500	2.8%	8,690	2	2.2%	13,143	21,833	22,000
N US 13 Business – Eastville	Route 636	12,500	5,000	7,500	2.8%	8,690	2	2.2%	11,597	20,287	20,000
Route 636	N US 13 Business – Cheriton	11,800	5,000	6,800	2.8%	8,690	1	2.7%	11,532	20,222	20,000
N US 13 Business – Cheriton	Route 184 – Cape Charles	12,500	5,000	7,500	2.8%	8,690	1	2.7%	12,719	21,409	21,000
Route 184 – Cape Charles	Route 704 – Kiptopeke	12,500	5,000	7,500	2.8%	8,690	1	2.7%	12,719	21,409	21,000
Route 704 – Kiptopeke	CBBT	12,000	5,000	7,000	2.8%	8,690	1	2.7%	11,871	20,561	21,000

* Average annual growth rate based on 20-year trend at the CBBT.
** Land Use Zones used by the Accomack-Northampton Planning District Commission to Conduct Land Use Projections.
*** Average annual growth rate based on total projected change in local traffic.

Route 175 Corridor

Stations		2000 Existing			2020 Thru Traffic		2020 Local Traffic			Total 2020 Volumes	
From	**To**	Total Volume	Thru Traffic	Local Traffic	Growth Rate*	2020 Thru Vol.	Land Use Zone**	Growth Rate***	2020 Local Vol.	Unrounded 2020 Vol	Rounded 2020 Vol.
U.S. Route 13 – T's Corner	Route 679 - Wattsville	9,360	0	9,360	2.8%	0	9	1.9%	13,692	13,692	14,000
Route 679 – Wattsville	Route 798 – Wallops Island	8,960	0	8,960	2.8%	0	9	1.9%	13,107	13,107	13,000
Route 798 – Wallops Island	Chincoteague Island	5,890	0	5,890	2.8%	0	9	1.9%	8,616	8,616	9,000

Figure 3-3
Sheet 1 of 2
Northampton County
2020 Projected Average Daily Traffic (ADT) Volumes and Percent Heavy Vehicles (HV)

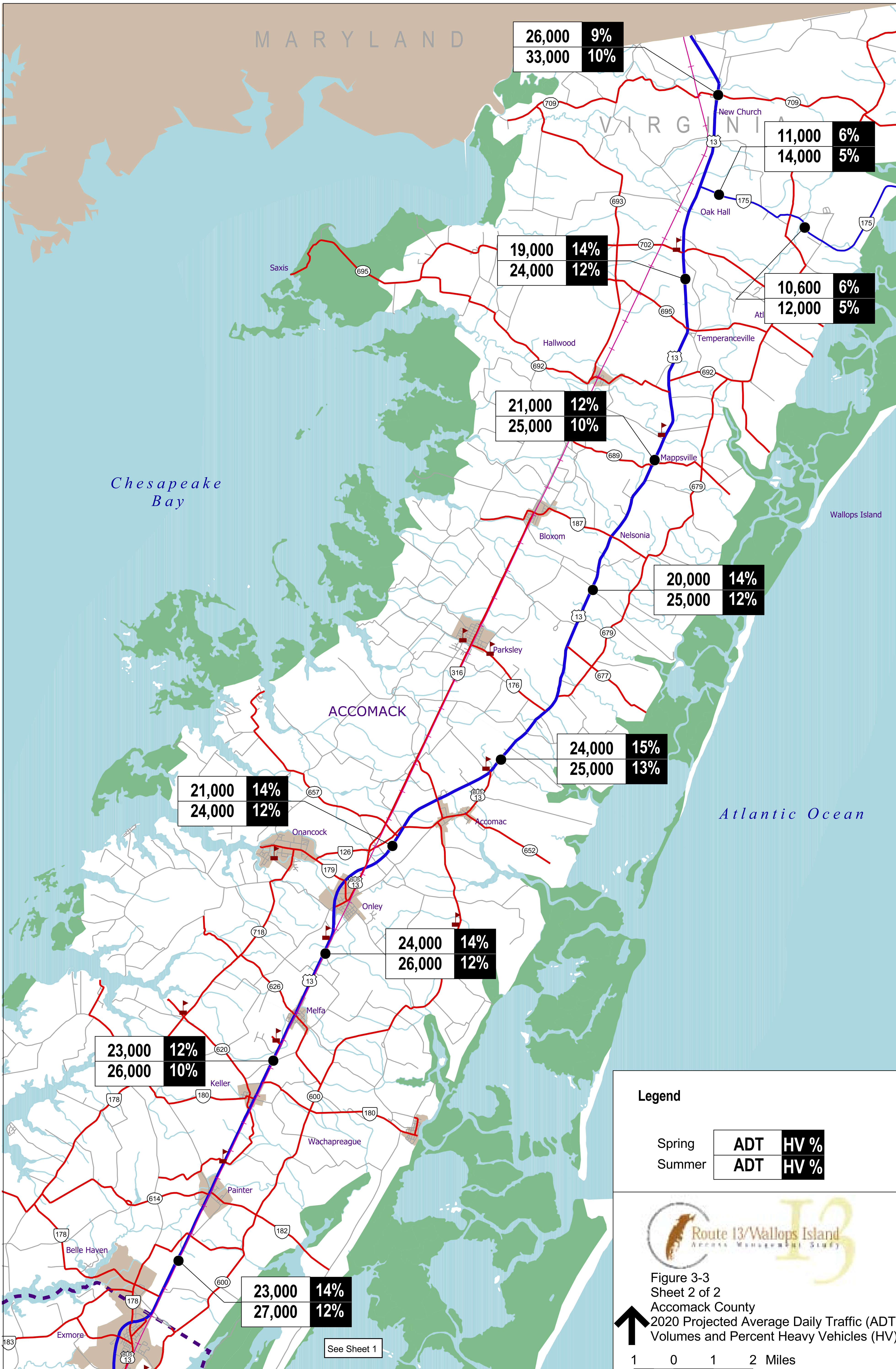


Figure 3-3
Sheet 2 of 2
Accomack County
2020 Projected Average Daily Traffic (ADT) Volumes and Percent Heavy Vehicles (HV)

Signalized Intersections

Twenty signalized intersections were evaluated along the U.S. Route 13 corridor within the study area. Level of Service (LOS) D conditions are projected to occur at the intersection of U.S. Route 13 with Route 175 during the summer evening peak hour. This congestion, however, can be easily mitigated with minor signal timing modifications. The intersections of U.S. Route 13 with Route 606 (Nassawadox), and Route 179 (Onley) are projected to operate at LOS C during both the spring and summer evening peak hours. The intersection of U.S Route 13 with Route 178 (Exmore) will operate at LOS C during the summer evening peak hour only. All other intersection locations are projected to operate at LOS A or B during the 2020 morning and evening peak hour periods.

Unsignalized Intersections

Eight unsignalized intersections within the U.S. Route 13 study area were also analyzed to determine their adequacy in handling peak hour traffic. The results of the capacity analysis indicate that by the year 2020, the following intersections are expected to operate at a Level-of-Service D or worse:

- In Eastville, the northern Route 13 Business eastbound approach to U.S. Route 13 (opposite Route 630) is projected to operate at LOS F during the summer evening peak hour, LOS E during the spring evening peak hour and at LOS D during the summer morning peak hour.

- In Exmore, the southern U.S. Route 13 Business westbound approach to U.S. Route 13 is projected to operate at LOS D during spring and summer morning and evening peak hour periods.

- In Keller, the eastbound Route 180 approach to U.S. Route 13 is projected to operate at LOS D during the spring morning peak hour and the spring and summer evening peak hours.

- In Melfa, both the Airport Industrial Park roadway and the Eastern Shore Community College driveway approaches to U.S. Route 13 are projected to operate at LOS D during the summer evening peak hour. Spring counts were not conducted at these intersections.

- In Temperanceville, the westbound Route 695 approach to U.S. Route 13 is projected to operate at LOS E during the summer evening peak hour. Spring counts were not conducted at this intersection.

Roadway Segments

A total of eleven roadway segments were assessed along the U.S. Route 13 corridor. The LOS analysis was performed for spring and summer conditions during the morning and evening peak hours. For all the roadway segments studied, LOS B operating conditions or better were determined to occur during each of the analysis conditions.

3.7 Future Traffic Conditions Summary

While recent population projections show a relatively flat growth trend on the Eastern Shore, recent U.S. Census data indicates that this trend may have already reversed itself, particularly in Accomack County. Traffic volumes have continued to rise on U.S. Route 13, sometimes in contrast to local population trends. National transportation statistics support this growth in trip making activity of a more mobile population. Given the potential for growth along the corridor, and the relatively under-served commercial market, significant changes in land use development along U.S. Route 13 and on the Eastern Shore, in general, is likely to occur. Recent growth in Accomack County and the reversal of the downward trend in Northampton County is evidence of this change. The selection of a varying growth rate appears to be the most realistic method to account for the likely change in travel activity for through and local traffic.

By the year 2020, however, the U.S. Route 13 corridor will continue to operate at overall good Levels of Service. Side-street congestion is expected to occur at several unsignalized intersections evaluated in this study, some of which may require signalization by 2020 (dependent on satisfaction of traffic signal warrants). Pockets of congestion are expected to occur at key signalized intersections, particularly at T's Corner, in Onley and in Exmore.

Traffic operations were not assessed using revised traffic forecsts in southern Northampton County, based on findings of the Chesapeake Bay Bridge-Tunnel Toll Impact Study. A review of these projections revealed that they would not significantly change the quality of traffic flow at the intersections and roadway sections evaluated.

4

Access Management Principles and Potential Application to U.S. Route 13

4.1 Introduction

This section discusses access management techniques that have potential application on U.S. Route 13, describes their current practice in other areas, and offers recommended access management guidelines for their use. Despite the limited number of capacity problems foreseen through 2020 on U.S. Route 13, evolving roadway geometry, land use issues, and highway access could seriously degrade future corridor function. In addition, certain areas need better access management to address current deficiencies.

Before addressing specific measures, however, it is important to define the term "access management." Numerous definitions exist, but all focus on the process of balancing access to property with the need to preserve roadway function. As described by a recent National Cooperative Highway Research Program (NCHRP) report, access management is "…the process that provides (or manages) access to land development, while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity and speed."[5] Simply put, access management applies roadway and land use techniques to preserve the safety, function, and capacity of transportation corridors. In so doing, it provides for reasonable driveway access, and protects public investment in highway infrastructure.

4.2 VDOT's Role in Managing Access

To be effective, access management must consider both road design principles as well as land use planning principles. As such it requires a joint effort between VDOT and the appropriate localities. While VDOT is responsible for providing a safe transportation network, local jurisdictions are responsible for orderly growth patterns that minimize the impacts of land use on the transportation system.

5 Williams, Kristine M., AICP and J. Richard Forester, Synthesis of Highway Practice 233: Land Development Regulations that Promote Access Management, National Cooperative Highway Research Program, Transportation Research Board - National Research Council, National Academy Press, Washington, D.C., 1996, p.3.

4.2.1 Minimum Entrance Standards

While VDOT has no formal statewide access management practice in place, there are several areas where VDOT has taken an active role in the management of access on roadway facilities. To that end, road design standards provide warrants for the provision of left- and right-turn lanes. VDOT developed minimum commercial entrance standards in 1946. These standards have been updated several times over the past 55 years, and while they identify specific minimum design requirements, they do not address corridor function.

The VDOT Resident Engineer is responsible for maintaining the function and operations of roadways in his/her residency. In this capacity the Resident Engineer has discretionary access permitting authority to permit or deny access if it is not designed adequately. There is much discretion in this role, with only the Minimum Entrance Standards[6] as a guide. However, in most residencies throughout the Commonwealth, Resident Engineers require design standards that exceed the minimum. For example, along the U.S. Route 13 corridor, the provision of right-turn lanes is required for all commercial developments, regardless of right-turn warrants. Also, in the VDOT Fredericksburg Construction District, a district-wide access policy has been developed that provides a more stringent access requirement than the Commercial Entrance Standards.[7] A manual, providing guidelines and easy-to-use spreadsheets, provides for different access levels depending on several factors, including roadway classification, existing traffic volume, speed limit, and the intensity of the proposed use (vehicle trips per day).

In counties or cities which have ordinances or entrance standards which equal or exceed those of VDOT, then those of the county or city shall apply.[8] These existing VDOT practices positively impact access management by requiring turn lanes, and this, in turn, impacts the spacing of driveways. However, a more effective application of access management techniques will require the development of standards that VDOT can apply in a more systematic manner.

4.2.2 Statewide Access Management Program Consideration

Toward this end, the Virginia Transportation Research Council (VTRC) completed an extensive study in 1998 examining the development of a statewide access management program. This study provided recommendations to establish:

- an access management heirarchy of all state roadways,
- an access management code (similar to Colorado and New Jersey), and
- geometric standards and implementation procedures.

6 Minimum Standards of Entrances to State Highways, Virginia Department of Transportation, 1998.
7 Site Access Guidelines, Virginia Department of Transportation, Fredericksburg District, 2000.
8 Minimum Standards of Entrance to State Highways, Virginia Department of Transportation, 1998, p. 5.

The recommendations of the VTRC study have not been implemented to date; however, its findings were well received by VDOT and consistency between the findings of the VTRC report and the efforts in the current U.S. Route 13 study have been maintained as much as possible.

4.2.3 Recent Access Management Studies

The Greene County (U.S. Route 29) Access Management Study, completed in 1999, was the first VDOT-funded study focusing on corridor-specific access management within the Commonwealth of Virginia. This study recommended limited access management standards, and then evaluated alternative roadway improvement concepts including frontage roads, reverse frontage roads and driveway consolidation. The focus of the study was the vicinity of the intersection of U.S. Route 29 with Route 33. Arterial standards recommended in this study were:

- Minimum access (driveway) spacing: 450 feet
- Median crossing spacing: 900 feet
- Minimum traffic signal spacing: 1,800 feet
- Desirable traffic signal spacing: 2,640 feet (one-half mile)

The Greene County access management study was more functional in nature and scope, and did not address the range of specific access management issues along the entire roadway corridor.

The U.S. Route 13/Wallops Island Access Management Study is the largest corridor-wide study prepared to-date within the Commonwealth. Unique to this study is the consideration of both sides of the access management equation: 1) roadway improvements, and 2) land use measures. This study seeks to apply access management concepts in the improvement of the existing U.S. Route 13 roadway, develop access management standards to guide future roadway improvements, and provide land use planning tools to assist the localities in developing land use control measures that help to preserve the future corridor function of the roadway.

4.3 Access Management Techniques

A wide array of techniques can be used to manage roadway access. Appropriate measures vary according to roadway classification and existing conditions. As a principal arterial, U.S. Route 13 may benefit from a certain set of techniques that recognize the highway's mobility function (to carry large volumes of traffic at relatively high speeds over relatively long distances). Furthermore, since land uses adjacent to U.S. Route 13 vary from agricultural to commercial, different techniques might be employed on different highway sections.

This section introduces specific access management concepts that offer potential to preserve and enhance the U.S. Route 13 corridor. Their impact on safety and traffic operations is also discussed, along with highlights of current practices from Virginia and other states. The relevance of these concepts to the U.S. Route 13 corridor is discussed, followed by the identification of specific guidelines suggested for consideration for application on U.S. Route 13 corridor.

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4.3.1 Turning Treatments

Removing turning vehicles from through lanes reduces the conflicts associated with the speed changes necessary to make turns (acceleration and deceleration). As such, turn lanes can improve safety and reduce delays.

Left Turns

Because the majority of driveway-related accidents involve left-turning vehicles,[9] the NCHRP and most other sources focused on installation of left-turn lanes. Research study has found that the safety benefit of this technique has been quantified. The median accident rate reduction resulting from installation of left-turn lanes is 50 percent, although right angle accident rates show mixed results at unsignalized intersections.[10]

Turn lanes also benefit highway operations. The NCHRP[11] cites several studies documenting the delay reductions associated with left-turn lanes, and asserts that the "capacity of a shared lane…might be about 40 to 60 percent of that of a through lane." Based on this assertion, the NCHRP estimates that provision of left-turn lanes on a four-lane arterial could increase capacity by 33 percent.[12]

Given the potential impact of left-turning vehicles on highway safety and function, several states require left-turn lanes at all median openings on multi-lane, divided highways. The Florida DOT has such a requirement, and also mandates retrofit of existing openings as part of paving projects. Oregon and Texas require provision of left-turn lanes as part of new construction and reconstruction. Several left-turn warrant methodologies have been developed that indicate the need for a turn lane based on the volume of left-turning vehicles as a function of the volume of opposing traffic. The National Highway Institute (NHI) suggests that such warrants may be appropriate for rural highways.[13] The 1994 Highway Capacity Manual indicates the need for left-turn lanes where space permits when left-turn volumes exceed

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9 Gluck, Jerome, Herbert S. Levinson, and Vergil Stover, Report 420: Impacts of Access Management Techniques, National Cooperative Highway Research Program, Transportation Research Board - National Research Council, National Academy Press, Washington, D.C., 1999, p 88.
10 Loc. cit.
11 Ibid. pgs. 88-94.
12 Ibid. pgs. 93-94.
13 NHI Course No. 15255: Access Management, Location and Design - Participant Notebook, Prepared by S/K Transportation Consultants, Inc., U.S. Department of Transportation, Federal Highway Administration, National Highway Institute p. S3, 83.

100 vehicles per hour (vph), and recommends dual left-turn lanes when volumes exceed 300 vph.

Various standards also exist regarding the length of left-turn lanes. The standards are generally a function of vehicle speed and traffic volume, and are designed to allow turning vehicles to leave the travel lane, decelerate, and make the turning movement, accounting for queuing at the intersection. For a roadway with a speed limit of 35 mph or higher, VDOT requires a 200 foot stoppage distance plus a 200 foot taper as a minimum. Increased stoppage lengths may be warranted based on capacity analysis. The State of Colorado requires left-turn lanes with a 500-foot deceleration distance plus queue stoppage based on the volume of turning traffic, at a 50 mph design speed.[14] Ventura, California requires a 500-foot approach plus a 200-foot taper plus stoppage based on volume, at a 50 mph design speed.[15]

For all existing median crossovers that are to be maintained with full access, left-turn lanes should be provided. A priority ranking based on turning volumes and safety deficiencies should be developed to assist the VDOT in providing these facilities. Where development necessitates new crossovers consistent with an access management plan, the developer should provide left-turn lanes in both directions of travel. The length of turn lanes and tapers should be based on VDOT warrants, current standards, and design criteria (i.e., Road Design Manual).

Right Turns and Use of Paved Shoulder

Similar warrants and design standards exist for right-turn lanes, although research suggests they are not as universally adopted as those for left-turn lanes.[16] Warrants identify threshold needs, whereas standards identify design specifications like length of turn lane at a specific design speed. Several states, including Virginia, have adopted these warrants, and others provide right-turn striping where wide shoulders exist. VDOT standards for right-turn dimensions are graduated by speed limit, with a 100-foot long turn lane with a 150-foot long taper required on roads under a posted 35 mph speed limit, and a 200-foot long turn lane with a 200-foot long taper when the posted speed limit is 35 mph or higher. For driveways with low volumes, the warrants provide for reduced requirements (taper or wide curb radius only).

Developing practical design solutions to adequately accommodate the mixture of local and through traffic on the U.S. Route 13 corridor was a major concern of this study. During the public involvement process, the need for improved, wider shoulders or right-turn lanes was identified frequently during both the Citizen Advisory Committee meetings, as well as at the first Public Information Meeting. A sentiment often expressed by the public was a fear of slowing down to turn right onto a side street, particularly when fast moving tractor trailers are coming up from

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14 Ibid. p. 7,19.
15 Ibid. p. 7,85.
16 Ibid. p. 3,87.

behind. The presence of low-density residential driveway clusters (a series of closely spaced homes, often with each home served by a loop driveway with two access points onto U.S. Route 13) was another concern of this study.

Right turn lanes should be required at all new commercial entrances, and at the entrances to new residential subdivisions. Their length should be based on volume criteria.

Where numerous commercial or residential driveways exist in close proximity, consideration should be given to using an expanded right shoulder as a continuous turn/auxiliary lane. Priority should be given to areas with greater than 10 driveways per mile; in these areas, where constraints permit, shoulders should be expanded to 12 feet as part of routine repaving.

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4.3.2 Driveway Spacing and Consolidation

Driveway spacing is critical to highway function and focuses primarily on commercial driveways and entrances, but also addresses roadway intersections in the form of corner clearance (discussed in the next section). Because vehicles entering or leaving the highway at driveway locations operate at slower speeds than the prevailing traffic, driveways introduce increases in accident potential and travel time impacts. Managing driveway spacing offers enhancement potential for the entire corridor.

Analyzing the safety impacts of unsignalized intersections, the NCHRP[17] presents the results of several studies from various locations and found that "specific relationships vary, reflecting differences in road geometry… operating speeds, and driveway and intersection traffic volumes. Still, in every case, more access means more accidents." Focusing on rural highways, the NCHRP[18] finds that an "increase in access density from fewer than 15 access points to more than 30 access points per mile resulted in a 65 percent increase in the overall accident rate." Citing the 1994 Highway Capacity Manual (HCM), the NCHRP[19] also notes that the mere existence of unsignalized access points results in a measurable decrease in travel speed. As a result of motorists' perceptions, even when not in use, such entrances impact traffic operations.

Driveway spacing has historically been a function of lot size and driveway geometry. Individual access points were spaced in a manner sufficient to allow for the length of turning lanes required in a given situation. More recently, spacing standards have focused on traffic volume and speed. VDOT prefers shared driveways centered on property lines, and requires a minimum of 50 feet of separation where sharing does not occur. The Wisconsin Department of Transportation (WDOT) sets standards based on average daily traffic volume – for roadways carrying between 10,000 and 20,000 vehicles per day, WDOT requires spacing of 300 feet entrances and 1,000 feet

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17 Gluck, Jerome, Herbert S. Levinson, and Vergil Stover, Report 420 Impacts of Access Management Techniques, National Cooperative Highway Research Program, Transportation Research Board - National Research Council, National Academy Press, Washington, D.C., 199, pgs. 31-38.
18 Ibid. p. 38.
19 Ibid. p. 41.

for local streets. For highways carrying 20,000 to 30,000 vehicles per day, the requirements are 500 feet and 1,000 feet.[20] The New Jersey DOT bases spacing on speed, and for 50 mph requires 275 feet of separation.[21] The Montana DOT uses highway classification as its primary criteria. For divided roadways included in the National Highway System (NHS), MDOT requires 500 feet of spacing in developing areas, and 150 feet in developed areas.[22] All references reviewed provided guidelines for driveway separation ranging from 300 to 600 feet for a 55 mph roadway, such as U.S. Route 13.

For commercial driveways, as well as entrances to residential subdivisions, a minimum separation of 400 feet should be maintained. This figure has applicability to the majority of the corridor, and should be seen as a minimum – in some cases, greater separation may prove beneficial and effective. In certain areas, existing development patterns could make this standard unrealistic, and provisions need to be made for access to existing parcels of land. However, where multiple existing parcels develop as a single entity, as in the case of a shopping center, coordinated and shared access should be required. Furthermore, indirect access via secondary roads should be seen as a way to help implement the minimum standard. Finally, elimination and consolidation of sub-standard access points should be required in cases of redevelopment.

For new residential subdivisions, access from an internal road network should be required, with no new lots deriving direct access from U. S. Route 13. Furthermore, connections should be made to surrounding developments.

Driveway closures are another way of eliminating conflicts with an arterial that has too many entering access points. In certain applications, instead of closing an access point (driveway), access can be restricted to right-in and right-out turns from the arterial to a driveway and the overall safety of the arterial will be improved. Existing properties with multiple points of access onto U.S. Route 13 are candidates for this type of treatment.

For developments with access onto both U.S. Route 13 and a side street, consideration should be given to elimination of the U.S. Route 13 access point. This is dependent on the type of use, the size of the property, the current driveway density and the need for acceleration lanes, deceleration lanes or right-turn lanes on U.S. Route 13. For instance, if the side-street access will provide for full access onto the highway (at a median crossover), and the parking and internal circulation of the property can be easily modified, then consideration should be given to closing the U.S. Route 13 access point. Highway commercial uses (service stations, for instance) may argue that the direct access point onto U.S. Route 13 is vital to business. However, it should only be allowed to continue if the internal site impacts are not workable.

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20 NHI Course No. 15255: Access Management, Location and Design - Participant Notebook, Prepared by S/K Transportation Consultants, Inc., U.S. Department of Transportation, Federal Highway Administration, National Highway Institute, p. 7,11.

21 Ibid. p. 7,31.

22 Ibid. p. 7,53.

Some commercial properties fronting on U.S. Route 13 currently have no access control at all. At these locations, the implementation of a standard commercial entrance with curbing should be considered to focus access and reduce potential conflicts.

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4.3.3 Corner Clearance

Corner clearance is a related issue to driveway spacing, and addresses the distance from roadway intersections to the nearest driveway entrance. A primary safety concern at or near controlled intersections is the reduction of interferences from side-street activity. The American Association of State Highway and Transportation Officials, (AASHTO) states that "driveways should not be situated within the functional boundary of at-grade intersections. This boundary would include the longitudinal limits of auxiliary lanes."[23] An intersection has a functional boundary, as shown in Figure 4-1, which is based on the storage needs for queuing vehicles, and acceleration and deceleration distance. Since the functional boundary of an intersection is much larger than the physical limits of the intersection, this issue can become a significant concern. Inadequate clearance can result in spillback across driveway entrances as well as backup in the intersection itself. On undivided cross-streets at signalized intersections, the potential impact of inadequate corner clearances is of particular concern. Vehicle spillback into the major street could result in areas with high traffic generators (gas stations, for instance) with inadequate corner clearances.

The NCHRP report[24] states that, although data are insufficient, it is concluded that:

- Accidents appear to increase as corner clearances decrease.
- Retrofitting corner clearances is both difficult and expensive, and a
- Proactive approach to establish a desired access location prior to subdivision and development, in conjunction with minimum frontage requirements that facilitate minimum clearances is required.

In current practice, corner clearance standards vary widely. VDOT prefers driveways to be at least 150 feet from intersections. The NCHRP report[25] cites the following examples of corner clearance standards. The Florida DOT requires 75 feet to 115 feet upstream, and 100 feet to 230 feet downstream. The New Jersey DOT requires 50 feet from an unsignalized intersection, and 100 feet from a signalized intersection, and the Colorado DOT requires 325 feet at a 40 mph speed limit.

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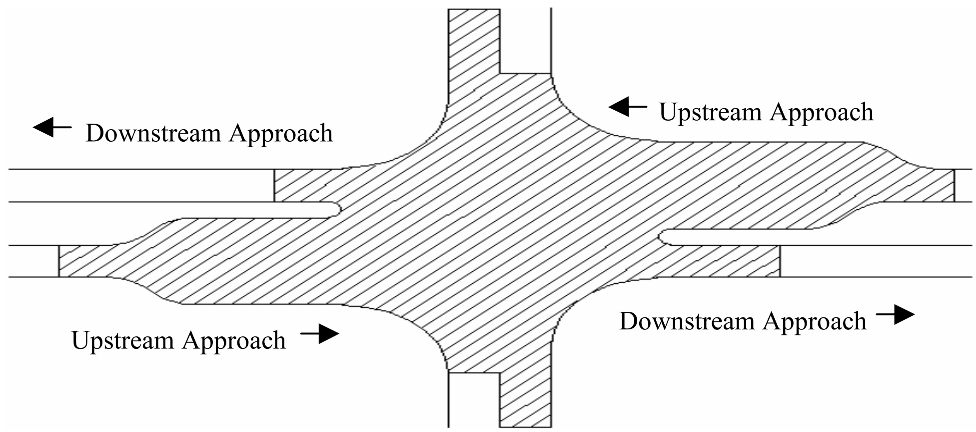
23 American Associate of State Highway and Transportation Officials, A Policy on Geometric Design for Highways and Streets, 1994, p. 793.

24 Gluck, Jerome, Herbert S. Levinson, and Vergil Stover, Report 420: Impacts of Access Management Techniques, National Cooperative Highway Research Program, Transportation Research Board - National Research Council, National Academy Press, Washington, D.C., 1999, pgs. 65-67.

25 Ibid. p. 65.

Figure 4-1
Intersection Functional Boundary



Corner clearance applies both on the main roadway and on the intersecting side streets. They also can be applied to both the upstream and downstream side of an intersection. The standards for each will therefore be quite different. The provision of a restrictive median on the side street can also reduce corner clearance requirements.

A corner clearance of 400 feet should be adopted for use on U.S. Route 13 approaching an intersection (measured from the edge of the radius at the intersection). This will allow for the construction of a turn lane of 200 feet with a taper of 200 feet. Downstream of an intersection, a corner clearance of 250 feet should be required.

For side-street approaches to U.S. Route 13, a corner clearance of 250 feet should be adopted. This will allow for the construction of a turn lane of 100 feet with a taper of 150 feet. With the use of a restrictive median on the side-street approach and on a downstream approach, a corner clearance of 100 feet should be required.

Increases to these standards may be needed to provide for increased vehicle queuing at signalized intersections. For both U.S. Route 13 and the side-streets, reductions in these standards may be allowed if a traffic study is submitted that shows that year 2020 peak period 95 percentile queue lengths will not extend past the driveway location. The goal is to have no new driveways within the functional area of an intersection.

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4.3.4 Sight Distance

A key consideration of appropriate access management treatments is the sight distance available at existing intersections, median crossovers and driveways. For the U.S. Route 13 corridor, the additional sight distance needs of heavy vehicles must be considered due to the relatively large volume of heavy vehicles in the corridor. VDOT minimum standards for a 55 mph roadway require a sight distance of 650 feet;

however, this is for highways with a relatively low composition of heavy vehicle volumes.[26] Heavy vehicles have longer stopping sight distances that may require longer distances.

On the U.S. Route 13 corridor, VDOT currently requires that minimum sight distance standards be met by all new development. The potential vehicle composition of the users of this facility should be considered in the selection of an appropriate standard. For instance, if a residential subdivision will be internally served by school buses, sanitation vehicles and moving vans, then the development's access points should be designed for these vehicles (even if they are infrequent), providing a sight distance of 1,000 feet. Existing driveways and cross streets with heavy vehicle use or known sight distance deficiencies should be re-evaluated for sight distance adequacy and corrective measures taken. Appropriate setback, landscaping, signage, and lighting requirements should be adopted by the Counties to help maintain sight distances and enhance highway safety in general.

4.3.5 Crossover Spacing and Consolidation

As is the case with driveway spacing, proper crossover spacing is important to the overall function of the highway system. In some cases, proper median spacing may result in elimination of median crossovers, and the consolidation of left-turning vehicles at specific intersections. Establishing proper crossover spacing has potential applications throughout the corridor where non-traversable medians exist.

Several studies from different jurisdictions that have implemented proper median spacing technique indicate positive safety records.[27] It is difficult to quantify the benefit of this strategy; however, as the safety record is complicated by median width and signal density. Operational effects also appear to be positive, although complicated by signal location and traffic volume.

Given the potential for crossovers to become signalized, VDOT desires to achieve a crossover spacing of 1,300 feet (roughly 0.25 miles). In practice, an absolute minimum spacing between crossovers of 900 feet has been used, especially in developed areas. As they do for driveway spacing, the Montana DOT bases crossover spacing on highway classification. For divided NHS roadways in developing areas, Montana DOT requires 0.5 miles for full access crossovers, and 0.25 miles for directional crossovers. For similar roads in developed areas, Montana DOT requires one-quarter mile for full access, and one-eighth mile for directional access.[28]

A median closure will eliminate conflicts between opposing travel lanes if an existing median opening has poor vertical or horizontal sight distance or the median opening

26 Virginia Department of Transportation, Road Design Manual, Volume 1, 1998, p. C-12.
27 Ibid. pgs. 100-101.
28 NHI Course No. 15255: Access Management, Location and Design - Participant Notebook, Prepared by S/K Transportation Consultants, Inc., U.S. Department of Transportation, Federal Highway Administration, National Highway Institute, p. 7,53.

has geometric or spacing problems. When median crossovers are needed despite a less than desirable spacing (and they cannot be moved or closed), a more restrictive median treatment that limits the turning movements that can use the median crossover may be appropriate. More detail is provided in section 4.3.7.

Crossover spacing along the U.S. Route 13 corridor averages 1,320 feet and ranges from 230 feet to 1.5 miles. Thirty-nine percent of the crossovers are located with adjacent crossovers ranging from 500 to 900 feet. Only seven percent have spacing of one-half mile or more. Of the remaining 54 percent, roughly half have spacings between 900 feet and 1,300 feet and half are between 1,300 feet and one-half mile.

The target minimum spacing for median crossovers should be one-half mile for full access and one-quarter mile for directional crossovers. Except in rare cases, new crossovers not meeting the minimum spacing should not be allowed. Where new development is proposed, the potential need for additional crossovers should be a consideration in review and approval. In addition, where development is proposed at an existing crossover, provision of access to adjacent sites should be accommodated.

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4.3.6 Median Type

The selection of an appropriate median type can be critical in providing for safe and efficient travel along a highway corridor. There are three roadway cross sections on the U.S. Route 13 corridor:

- four-lane undivided (which occurs only in Temperanceville with a 4-foot paved median),
- four-lane undivided with a two-way left-turn lane (which occurs in Painter, Keller, Melfa, Mary N Smith area, Nelsonia, Mappsville, and Oak Hall), and
- four-lane divided with a non-traversible median (concrete, grass or median barrier).

In selecting a median type, a balance is often needed between providing access to adjacent properties and ensuring adequate throughput capacity and travel speeds.

Although there are few before and after studies to provide quantifiable data, models consistently show that the presence of medians reduce traffic delay. Safety data have been quantified in a much more rigorous manner. Citing the ability of medians to reduce conflict points, the NCHRP notes that the median accident rate reduction attributable to installation of medians is 35 percent.[29] The National Highway Institute (NHI) states that "(w)ide non-traversable medians provide shelter for vehicles

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29 Gluck, Jerome, Herbert S. Levinson, and Vergil Stover, Report 420: Impacts of Access Management Techniques, National Cooperative Highway Research Program, Transportation Research Board - National Research Council, National Academy Press, Washington, D.C., 1999, p. 72.

making left-turns from or to a street. They also provide refuge for pedestrians attempting to cross the street."[30]

In four-lane roadway sections, research has shown that the selection of an appropriate median type is dependent on a number of factors, including number of access points, intensity of use of these access points, speed limit, environment (developed, developing, rural) and the provision of adequate shoulders. Guidelines have been developed to expedite this evaluation.[31] Two-way, left-turn lane (TWLTL) roadway sections seem to work best in two areas: 1) low volume conditions (generally less than 25,000 vehicles per day), and 2) roadway sections experiencing high driveway densities with low to moderate volumes, and with high left-turning volumes in relation to the overall traffic flow. Residential and low-density commercial areas are the prime examples of this type of roadside development. In both cases, TWLTL sections generally are posted for reduced travel speeds (25 to 45 mph).

By separating oncoming traffic, and by managing turning movements, non-traversable medians offer significant potential to improve roadway safety and operations. Medians exist along most of the U.S. Route 13 corridor, and this technique will help assess potential modifications and reconstruction. There are also cost/benefit considerations that distinguish between new construction and retrofit actions. This takes into account both the cost of travel, accidents, and costs of construction. This will be most relevant for the U.S. Route 13 corridor in areas with TWLTL roadway sections.

In addition, the design of a TWLTL section can also minimize safety concerns if appropriate shoulders are provided and the width of the center left-turn lane is adequately sized. VDOT standards call for a 12-foot minimum (16 -foot maximum) center left-turn lane.[32] The center turn lane is a shared space, so drivers tend to enter this area cautiously. Therefore, in areas with higher driveway densities, driver transitions into the turn lane will tend to occur at slower speeds. In addition, in these areas, the provision of a wider center turn lane (14 to 16 feet) is likely to result in fewer vehicles partially blocking the through travel lane.

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4.3.7 Median Widening

As discussed in Chapter 2, a total of 200 (74 percent) of the 271 crossovers along the U.S. Route 13 corridor have median widths less than 40 feet. The VDOT design minimum for a depressed median is 40 feet on high speed roadways. In locations where school buses and tractor trailers make turns, an even wider median is needed in order to safely accommodate these vehicles in the median while they are

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30 NHI Course No. 15255: Access Management, Location and Design - Participant Notebook, Prepared by S/K Transportation Consultants, Inc., U.S. Department of Transportation, Federal Highway Administration, National Highway Institute, p. 1,9.

31 Bonneson, James, Patrick T. McCoy, Report 395: Capacity and Operational Effects of Midblock Left-Turn Lanes, National Cooperative Highway Research Program, Transportation Research Board - National Research Council, National Academy Press, Washington, D.C., 1997, pgs. 32-39.

32 Road Design Manual, Volume1, Virginia Department of Transportation, Location and Design Division, p.

performing a turn within the crossover. Based on the length of school buses, a 50-foot wide median is a suggested guideline. For tractor-trailers, a distance from 70 to 80 feet may be needed.

Ideally, all sub-standard width median crossovers should be widened; however, it is recognized that it may be fiscally impractical to do this at every median crossover in the corridor. Where physical constraints permit, additional right-of-way could be purchased to help meet this standard with either a full widening of the roadway section or a flare widening in the vicinity of the crossover.

A wider median is especially important in areas where school buses and large trucks make frequent turns – mainly at school locations, major employment centers, and major intersecting streets. In these locations, the larger vehicles require adequate space to pause in the median while waiting for an adequate gap in traffic flow. As such, these areas should be prioritized for improvement. Furthermore, in several sections between Painter and Onley, where the roadway section switches between a flush and a depressed median, the median width is sometimes less than 20 feet. These areas should be investigated for possible median widening; however, rail and right-of-way constraints could make improvements difficult and expensive.

There are very few places where tractor-trailers can now perform U-turns safely in the corridor. The consideration of U-turn turnouts for heavy vehicles should be considered in areas with high truck volumes, if the need for the U-turn cannot be eliminated entirely through other measures.

In general, the intensity of the side-street approach to U.S. Route 13, the intensity of heavy vehicle use and the cost to widen the roadway/right of way should be used as a guide in determining whether to widen the median at a particular intersection. Most side street intersections currently do not generate enough traffic to warrant the widening of the U.S. Route 13 right-of-way.

4.3.8 Directional Median Treatments

Where median crossover spacing is less than the guideline minimum, where roadway widening may not be feasible and where turning conflicts may occur, the use of directional median treatments is suggested. This includes the prohibition of one or more turns from using the median crossover for turns from either U.S. Route 13 or from the side street. This can be accompanied by the construction of channelized islands and can include the construction of median acceleration lanes. This treatment can be used in areas with narrow medians. Applications for median crossovers experiencing high levels of tractor trailers or school bus traffic are potential candidates. Directional median treatments, as shown in Figures 4-2 through 4-7, are techniques that have potential for implementation on the U.S. Route 13 corridor. These are:

Figure 4-2
Left-turn Ingress from One Direction Only

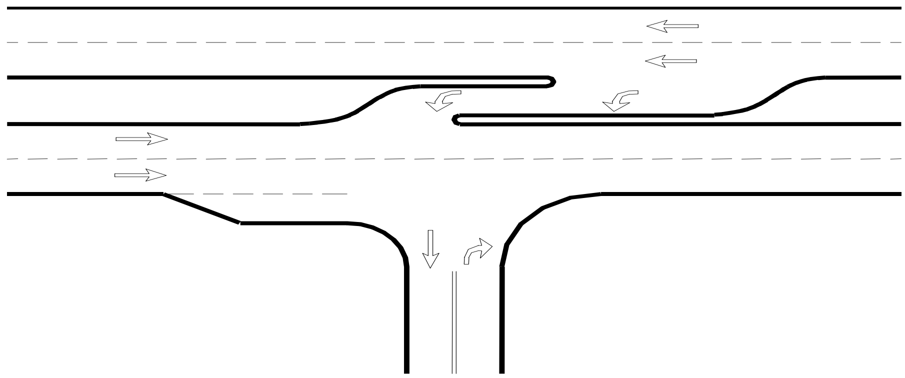


Figure 4-3
Left-turn Egress from One Direction Only

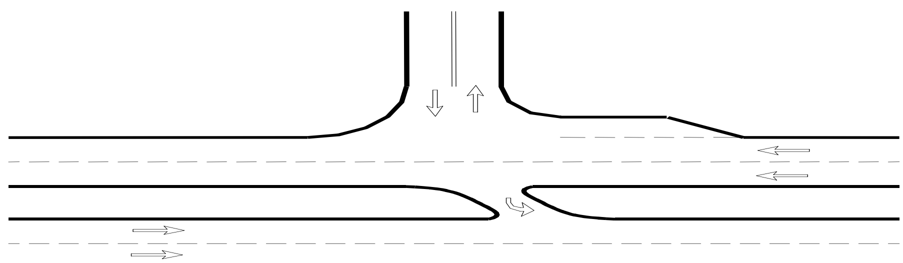


Figure 4-4
Left-turn Ingress from Both Directions

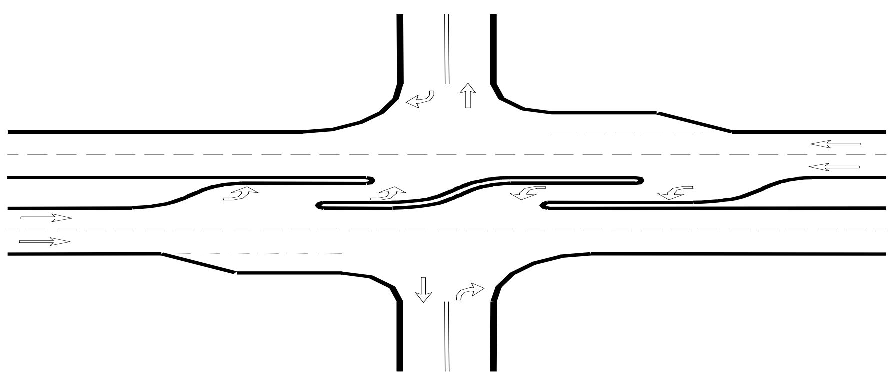


Figure 4-5
Left-turn Ingress from One Direction & Left-turn Egress from One Approach

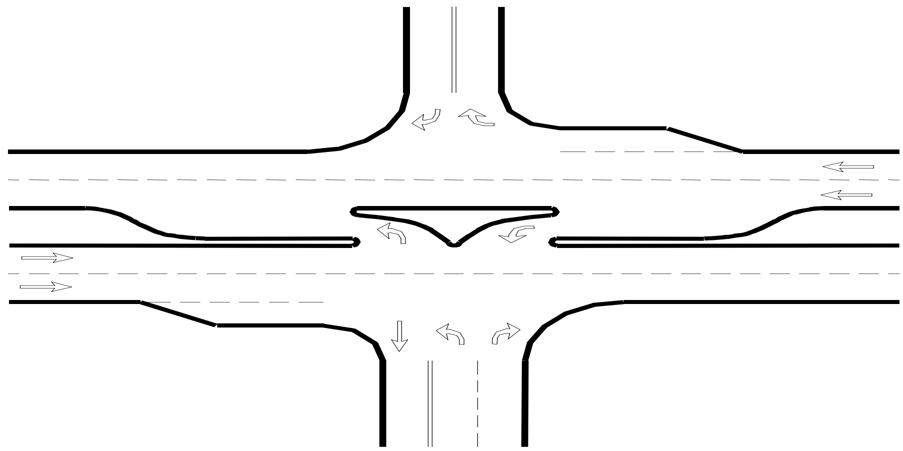


Figure 4-6
Left-turn Egress from Opposing Approaches

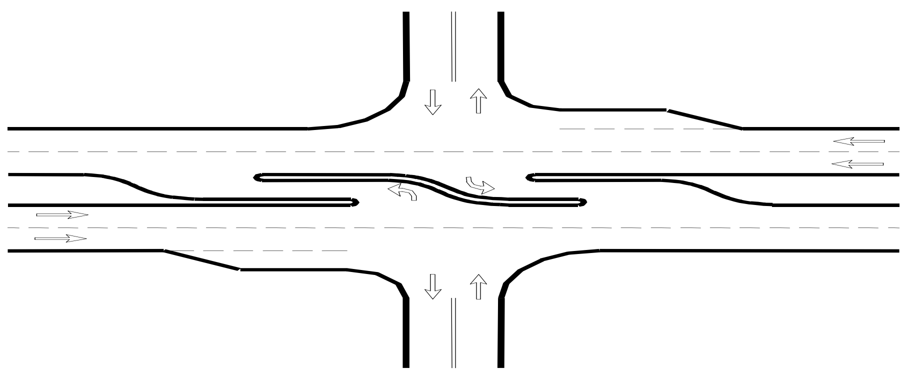
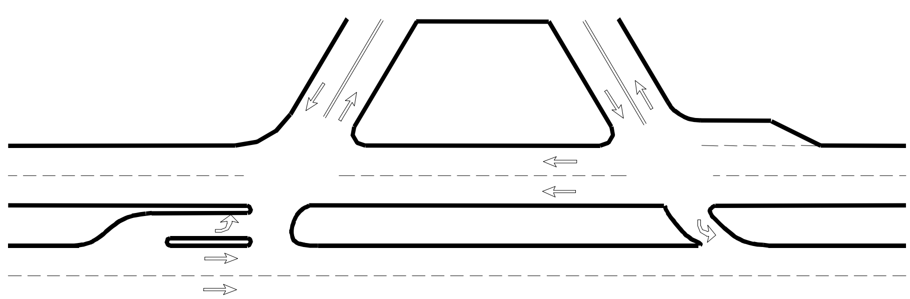


Figure 4-7
Construction of Two Directional Access Points Instead of One Full Access Point



The left-turn egress techniques effectively eliminate the need for vehicles to stop in the median. A vehicle turning left from a driveway would cross one direction of travel on the major road (in this case, U.S. Route 13) and then would enter a channelized acceleration lane within the median. The drawback of these techniques is that the acceleration lane would merge with the high-speed travel lane. Based on current VDOT standards the acceleration lane would be approximately 1500 feet long to allow the vehicle to merge at 55 mph from a stopped position. This design treatment has been used by the Maryland State Highway Administration on rural/seasonal highways, including U.S. Route 50 on the Eastern Shore.

4.3.9 Median Crossover Width

Median crossover width is an important roadway feature that can significantly affect roadway access. Although narrow medians do separate oncoming traffic, narrow median crossovers might not provide adequate shelter for turning vehicles or pedestrians. Since the majority of the corridor already benefits from the presence of medians, safety issues associated with median crossover width are a key factor.

The ideal width of the median is dependent on the presence of turn lanes in the median, and the vehicle composition and vehicle queuing needs for vehicles trying to perform a left-turn or U-turn from the median or trying to cross the highway from a side street. In rural areas, wide grassed medians are often used for stormwater conveyance.

4.3.10 Signal Spacing and Timing

The spacing of signalized intersections dramatically impacts safety and traffic operations. As emphasized by the Virginia Transportation Research Council (VTRC), "[s]ignalized intersections are not always thought of in the same way as driveways or commercial entrances, but they have just as much of an impact on traffic flow and safety."[33] Management of signal spacing includes planning for the frequency of signals, as well as the uniformity of their spacing. This technique could prove useful in managing access in some of the developed and developing areas in the U.S. Route 13 corridor, particularly where several traffic signals already exist.

The impact of signal spacing on travel time is also well documented. Optimal spacing depends on travel speed and cycle length, and the NCHRP[34] offers a matrix detailing these relationships. The data indicate that as speed and cycle length increase, so does desired spacing. In a straightforward statement of the relationship

33 The Use of Access Management as a Transportation Improvement Strategy, Prepared by the Staff of the Virginia Department of Transportation Research Council for The Executive Leadership Group of The Virginia Department of Transportation, November 15, 1999, p. 8.

34 Gluck, Jerome, Herbert S. Levinson, and Vergil Stover, Report 420 Impacts of Access Management Techniques, National Cooperative Highway Research Program, Transportation Research Board - National Research Council, National Academy Press, Washington, D.C., 1999, p. 24.

between travel delay and signal spacing, the NCHRP[35] asserts that each signal added to 1 mile of roadway will result in a drop in operating speed of 2.5 to 2.0 mph. The NCHRP further suggests[36] that "traffic signals spaced at 2.0 miles or less typically create urban arterial conditions."

VDOT coordinates signal spacing with crossover locations. Crossovers spaced from 900 to 1,300 feet apart, as discussed above, are analyzed as new development occurs – they may be signalized if any one of 11 warrants is met (although in practice, peak hour warrants are typically discounted if no other warrants are met). For highway segments with speeds of 50 mph, the New Jersey DOT requires signal spacing ranging from 2,200 to 2,640 feet based on cycle length and the dedication of half of the green time to mainline traffic flow.[37] For divided primary roadway facilities, the Michigan DOT requires traffic signal spacing of ½ mile to facilitate mainline progression in developing areas and ¼ -mile spacing in developed areas.[38]

Minimum signal spacing should be one-half mile in developing areas, and one-quarter mile in developed areas. In all cases, signal timing should be coordinated to facilitate traffic flow. For the undeveloped sections of the corridor, two-mile spacing should be considered.

Along the undeveloped and developing sections of the highway, development should be carefully planned so as to minimize the need for additional signals, and to ensure that minimum spacing standards are maintained. Large developments (developments generating 1,000 ADT or more) should be required to submit traffic impact analyses to determine the need for and location of new traffic signals, among other issues.

In areas with existing traffic signals such as Exmore and Onley, coordination of traffic signal timing may result in an overall improvement in traffic operations. As these areas experience infill and redevelopment, existing driveways and circulation patterns should be reconfigured to complement the signal system to the maximum extent. This may involve closing existing driveways, rerouting traffic to secondary streets, and providing interparcel connections.

4.3.11 Alternatives to U.S. Route 13

The localities should develop long-term transportation plans that address the entire roadway system and consider at a more detailed level than this study, local road connections, improvements and extensions. Priority should be given to major

35 Ibid. p. 27.
36 Ibid. p.40.
37 NHI Course No. 15255: Access Management, Location and Design - Participant Notebook, Prepared by S/K Transportation Consultants, Inc., U.S. Department of Transportation, Federal Highway Administration, National Highway Institute, p. 7,30.
38 Ibid. p. 7,53.

roadway feeder roadways, such as Bayside Road, major destinations, such as the Accomack Airport Industrial Park, and areas surrounding Exmore and Onley.
By preventing trips on the main highway, alternative routes for local trips can protect highway capacity and function. The essential purpose of principal arterials is to carry a high percentage of through traffic. The extent to which short local trips are forced to access the main route, due to a lack of viable options, they interfere with this purpose. Alternatives can take a variety of forms, as follows.

Local Roads

A connected system of local roads can support certain local trips that now must use U.S. Route 13 for only a short stretch of road. Often a few minor links can turn a disjointed network into a functioning local system. Such connections are designed for local traffic and relatively low speeds; they are not an alternative for through traffic. Instead, they offer connections to shopping centers and other destinations, and link residential areas to community activity centers.

Along the U.S. Route 13 corridor, there are several major cross streets that may be missing short roadway links to provide a more direct travel path that does not require travel on U.S. Route 13. An example of this is Bayside Road in Northampton County approaching Exmore. This road is a major feeder for residents living on the western side of the shore, however this road terminates just south of an existing traffic signal at Broadwater Road (Route 652). Route 652 provides access to Shore Plaza shopping center on the west and provides access across U.S. Route 13 to the east into the town of Exmore. The diversion of Bayside Road to connect into Route 652, instead of U.S. Route 13, would likely significantly reduce turning activity on U.S. Route 13 and potentially reduce the need for a future traffic signal.

Inter-Parcel Connection/Internal Roadway System

Inter-parcel connection can also limit short trips on the main route. These often take the form of simple driveway connections between commercial sites, so that traffic moving from one to the other need not access the arterial. For commercial developments along a divided highway, having access at a median crossover, hopefully with a traffic signal in place, is a priority. Good planning of commercial developments should anticipate potential future expansions in the control and provision of access.

Large residential developments can also be planned to provide a minimum number of access points on the main highway by internalizing private driveways on local subdivision streets, which in turn connect to a feeder road that has direct and full access onto the main highway (again, preferably at a median crossover). It is important to also plan for future growth of residential development by planning for interconnections of the development with adjacent (potentially undeveloped) properties. This will ensure that the best and fullest use of the existing access point on the main highway is utilized.

In some localities within the Commonwealth and in some states, commercial and large residential developments are often allowed only to have indirect access onto a major roadway. On major highways, the Wisconsin DOT preserves the access priority at a median crossover through a signal for a through roadway connection, and allows a commercial development to have a right-in/right-out access onto the main road and/or a full access point on the side street.

Frontage Roads

An effective treatment to consolidate the number of access points, and therefore conflict points, on an arterial highway can be achieved through the construction of a frontage road or a reverse frontage road. These concepts are depicted in Figures 4-8 through 4-10.

A frontage road is a local street (one-way or two-way) that serves multiple land uses (properties) and provides one to two points of access onto the main roadway. A frontage road can be constructed when adequate front yards exist to not impact the adjacent properties. This treatment is most appropriate for mid-block locations (between side streets). Frontage roads are awkward to design when they intersect with a side street due to corner clearance requirements. This requires the frontage road to bend back. A one-way frontage road, as shown below, works best as a mid-block solution.

Figure 4-8
Frontage Road Concept

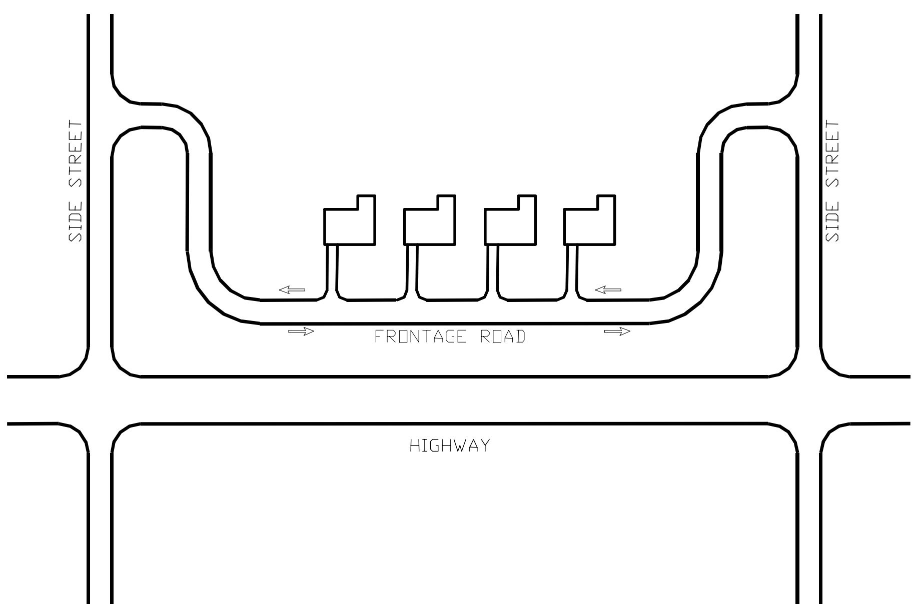


Figure 4-9
One-Way Frontage Road Concept

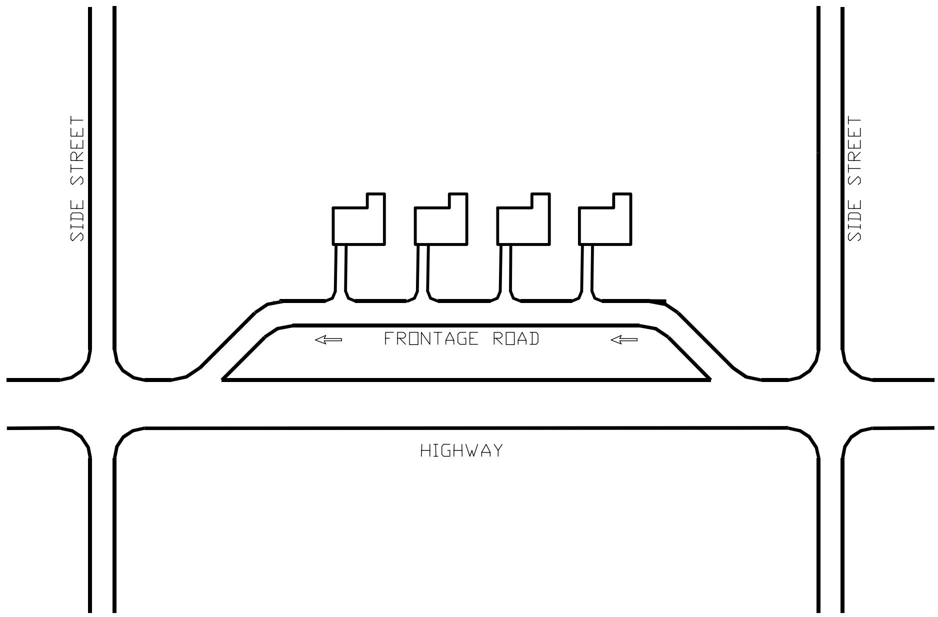
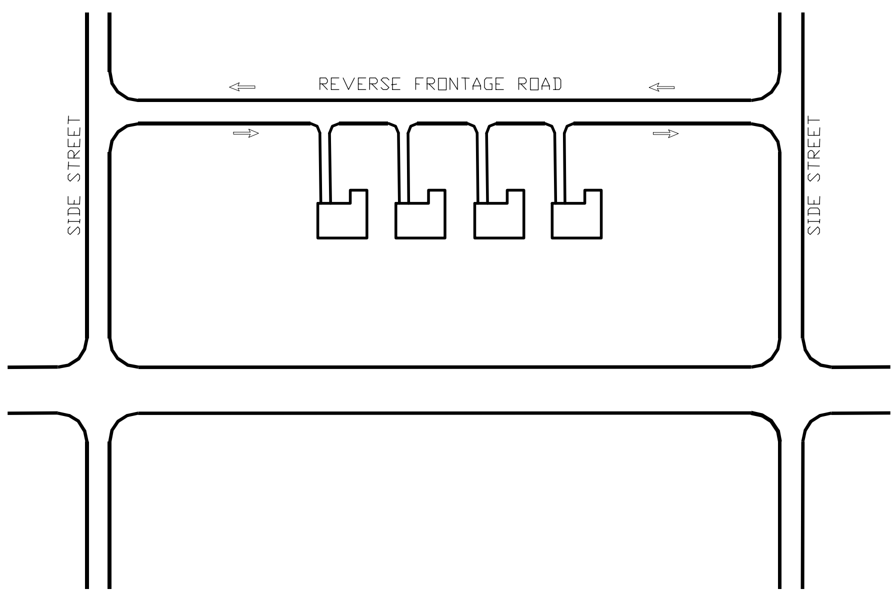


Figure 4-10
Reverse Frontage Road Concept



One of the strongest concerns raised during the public involvement process was the safety for school buses, and the children being transported, when a bus stops on U.S. Route 13 to pick-up or discharge a student at his or her driveway. Given the high percentage of heavy vehicles traveling on this road, there is a safety concern that stopped school buses may increase the risk for serious crashes in the future. The problem is that while a school bus is stopped, the visibility of the school bus can be blocked by one tractor-trailer. The provision of frontage or reverse frontage roads to serve residential driveway clusters can be an effective way to minimize access points on U.S. Route 13 and address the stopped school bus issue.

Frontage roads have a place in serving commercial development as well as residential access needs. When carefully designed to facilitate access and maintain signal operations, frontage roads can be a viable access management technique for large commercial developments. For developing areas, NCHRP[39] recommends reverse frontage, with 600 feet of separation between the frontage road and the main highway. For major activity centers, NCHRP[40] suggests that frontage roads can possibly be incorporated into ring roads.

The use of frontage roads and reverse frontage roads should be considered for implementation along the existing U.S. Route 13 corridor, and guidelines should be established to encourage their consideration for future development along the corridor. For residential uses, the provision of a frontage road should be considered when there are residential clusters of five homes or more within a quarter mile. Specific locations for frontage/reverse frontage roads evaluated and recommended along Route 13 are discussed in Chapters 5 and 6.

4.3.12 Land Use Controls

The access management literature asserts that revisions to local zoning standards are necessary. Humstone and Campoli[41] recommend zoning that requires shared access, and encourages compact centers as opposed to strip development. They also focus on subdivision regulations, suggesting that local ordinances require lot frontages and street layouts that recognize the intended function of the highway.

Sometimes, the enforcement tool available to the localities can address the access management goal in an indirect manner. For instance, the ability of the localities to provide zoning restrictions to prevent flag lots or to require minimum parcel frontages on the U.S. Route 13 corridor can significantly aid in the enforcement of driveway spacing standards. For instance, a minimum parcel frontage standard

39 Gluck, Jerome, Herbert S. Levinson, and Vergil Stover, Report 420 Impacts of Access Management Techniques, National Cooperative Highway Research Program, Transportation Research Board - National Research Council, National Academy Press, Washington, D.C., 1999, p.122.
40 Loc .cit.
41 Humstone, Elizabeth and Julie Campoli, "Access Management: A Guide for Roadway Corridors, "Planning Commissioners Journal, Number 29, winter 1998, p. 6.

consistent with proposed driveway spacing standards and right-turn lane standards would suggest a minimum frontage standard of 400 feet.

One of the most effective tools in applying corridor-specific standards is the highway corridor overlay district (HCOD). This is a separate set of zoning regulations for parcels within a certain distance from a roadway, usually an arterial highway. An HCOD ordinance contains additional regulations that are over-riding, and in some cases, additive, to existing zoning regulations. HCODs involve standards governing access, visibility and corridor aesthetics, and they generally provide standards for number and location of access points, inter-parcel connections, size and location of signs, and landscaping and buffer requirements. For this study, the traffic and safety benefits of the HCOD are the critical benefits of this land use control technique.

Several localities within the Commonwealth have successfully implemented HCODs; however, often HCODs are implemented in response to an already congested roadway. U.S Route 17 in Gloucester County is a good regional example of an HCOD in effect. In Gloucester County, county officials and VDOT work together to maintain the through function of U.S. Route 17, and this coordination has worked well.

A model HCOD has been prepared for consideration by localities along the U.S. Route 13 corridor. This document is contained in Section 4.4 and the standards contained in the ordinance are consistent with the guidelines being developed in this chapter.

4.3.13 New Development vs. Retrofitting

According to the NCHRP,[42] "access management requires both retrofit and policy actions." In other words, a comprehensive access management plan will include recommendations to improve existing problem areas, as well as requirements to ensure that new development does not degrade the future highway corridor function. The NHI report[43] devotes an entire chapter to retrofit projects, detailing the benefits of the various techniques, and highlighting case studies from throughout the nation.

The application of access management guidelines is not as straightforward, however, on the existing roadway network. Given the current uses fronting U.S. Route 13 and the rural, agricultural character of the majority of the study area, consideration must be given to farm access and access to existing non-commercial roadside developments, such as churches and schools. While some of these types of uses may be replaced in the future with continuing development of the corridor, a best-fit (or retrofit) approach must be used to try to achieve the spirit of the crossover spacing standards when accommodating existing uses.

42 Ibid. p.11.
43 NHI Course No. 15255: Access Management, Location and Design - Participant Notebook, Prepared by S/K Transportation Consultants, Inc., U.S. Department of Transportation, Federal Highway Administration, National Highway Institute, p. 1,63.

This study will be developing conceptual improvement plans to deal with existing development, and to the extent possible, access management techniques will be used to provide a more controlled access condition that may fall short of meeting the guidelines identified for new development. This is not counter-productive to the long-range plan, so long as new development is held to the higher standard including efforts to ultimately eliminate all crossovers with substandard spacing along the corridor.

As an example, a new shopping center or residential development could provide an access road that connects to an existing church property that has poor crossover spacing. This would allow for the closure of the crossover at the church property. This is a proactive process that cannot be designed in advance as adjacent development may or may not occur where planners or transportation engineers forecast. A coordinated effort on the part of the local county or municipal officials and VDOT will be needed to ultimately bring the U.S. Route 13 corridor up to standard.

In some cases, retrofit policies have been developed to encourage redevelopment in areas where access management standards cannot be met due to existing development, but where significant improvements could be realized as a result of new development. The Wisconsin DOT allows for reductions in required standards in these areas. This type of retrofitting is not likely to be appropriate for the U.S. Route 13 corridor.

4.3.14 Implementation/Coordination

Because access management deals with the relationship between transportation and land use, it requires cooperation between VDOT and local government agencies. The VTRC[44] recommends formal coordination early in the local planning process. Bowman and Rushing[45] suggest that VDOT should have a larger access planning role, encouraging local governments to address access in their comprehensive plans. They further recommend that VDOT adopt a comprehensive access management plan for primary highways, and revise their minimum standards.

VDOT and the localities should cooperate carefully to manage the U.S. Route 13 corridor. Some recommendations included in this section fall under the purview of the transportation agency, others fall under control of the local governments. Consistent application of the standards, by all parties and across jurisdictional boundaries, will produce greater success in preserving the corridor into the future.

44 The Use of Access Management as a Transportation Improvement Strategy, Prepared by the Staff of the Virginia Transportation Research Council for The Virginia Leadership Group of The Virginia Department of Transportation, November 15, 1999, p. iv.

45 Bowman, Donald L., and C. Colin Rushing, Final Report - Access management: Transportation Policy Considerations for a growing Virginia, Virginia Transportation Research Council, Charlottesville, Virginia, November 1998, p. 35.

The first step involves incorporation, by the localities, of an access management plan (one of the products of this study) into their comprehensive plans, followed by appropriate amendments to their land use ordinances. Pursuant to this strong local sanction, subsequent VDOT improvements should be consistent with the plan. Some access management techniques, such as crossover spacing and left-turn retrofits, will require diligent action on the part of VDOT. Where the plan recommends standards greater than VDOT minimum standards, VDOT should actively promote the greater provisions.

4.4 Highway Corridor Overlay District (HCOD)

This section provides a model overlay ordinance for managing land use in the U.S. Route 13 corridor. In conjunction with the roadway improvements recommended herein, a consistent approach to development management is recommended for the counties and towns along U.S. Route 13. Consistency among the localities will help ensure that isolated roadway segments do not develop in ways that negatively affect the facility as a whole. While roadway improvements are a critical element to maintaining the corridor's safety and function, land use decisions are also an important component, and can support or degrade investments in highway infrastructure. Simply put, effective access management requires roadway and land use management, based on coordination between localities and VDOT. The following section provides a model overlay district, designed for incorporation into the localities zoning ordinances.

4.4.1 Authority

Pursuant to the authority granted by the Code of Virginia, and in particular the legislative intent established in section 15.2-2200 and the purposes of zoning ordinances established in section 15.2-2283, the following standards are established.

4.4.2 Intent

The HCOD is intended to enhance the safety, function, and capacity of designated highways. As major through traffic routes, these highways represent significant community investments, and contribute to the public health, safety, and welfare. They provide access to jobs and schools, facilitate delivery of emergency services, and support the movement of goods and services. Furthermore, these corridors serve as first impressions of the community for tourists and the traveling public. Finally, as safe and accessible facilities, the corridors serve a vital economic development function, which the HCOD is intended to preserve.

4.4.3 Applicability

The HCOD shall apply to all developments abutting U. S. Route 13 and requiring site plan or subdivision review. The HCOD shall also apply to redevelopment projects, as defined herein, regardless of whether such redevelopment requires site plan or subdivision review. As an overlay district, the HCOD shall complement the requirements of the underlying zone, which shall remain in effect. Wherever the requirements of the HCOD conflict with those of the underlying zone, the greater or more stringent standard shall apply. For the purposes of this ordinance, U. S. Route 13 shall mean the mainline highway and bypass sections, and shall not mean sections of U. S. Route 13 Business.

For the purposes of this ordinance, large development projects such as shopping centers shall be considered individual development projects. Logical extensions of completed projects shall be subject to these regulations, regardless of whether they abut U.S. Route 13. For developments subject to these regulations, all required plans may be submitted as a single plan, provided that all information is clearly shown to meet the requirements outlined herein.

To ensure adequate coordination with VDOT regarding highway access management and traffic improvements, no site plan or subdivision plat shall be approved without a written finding from the VDOT Resident Engineer that the proposed roadway, driveway, and circulation systems are consistent with the U.S. Route 13 Access Management Plan.

4.4.4 Access

The purpose of this section is to manage vehicular and non-vehicular access. To achieve this goal, all site plans shall include an access plan drawn to the same scale as the site plan and showing the location and dimensions of all streets, driveways, crossovers, parking areas, access aisles, sidewalks, and any other relevant information.

Access to HCOD routes shall be provided by direct or indirect means, consistent with the following:

➤ Number of access points: Each tract of land recorded prior to *effective date* is entitled to one direct or indirect access point to the public roadway network provided that its location and design fulfill, as a minimum, the minimum corner clearance and minimum sight distance requirements of this ordinance. Where the roadway frontage of a tract of land is greater than 500 feet, an additional access point may be allowed, if it is determined that the access point will not adversely affect the capacity of the roadway. Any additional access point must be in compliance with all applicable sections of this ordinance. Where multiple tracts of land are developed as a single large entity, as in the case of a shopping center, office park, or similar development, they shall be treated as one tract of land for the purposes of determining the permitted number of access points.

- The minimum corner clearance of driveways from intersecting streets shall be 400 feet approaching the intersection. Downstream corner clearance shall be 250 feet minimum. For side street approaches to U. S. Route 13, the minimum corner clearance shall be 250 feet. At signalized intersections, corner clearances in excess of these minimum dimensions may be required, in consultation with VDOT. Where a traffic study is submitted that shows 20-year peak period, 95 percentile queue lengths will not extend past the driveway location, and corner clearances may be reduced, in consultation with VDOT.

- Minimum sight distances along the highway shall be provided to allow vehicles to safely turn left or right onto the highway. Sight distances provided along the HCOD shall be a minimum of 1,000 feet.

- Outparcels: All access to outparcels must be internalized utilizing the main access drive of the principal retail center. Access to the outparcel shall be as direct as possible, avoiding excessive movement across the parking aisles and queuing across surrounding parking and driving aisles. In no instance shall the circulation and access of the principal commercial facility and its parking and service be impaired.

- New residential subdivisions shall include an internal street layout which shall continuously connect to the street of surrounding developments to accommodate travel demand between adjacent neighborhoods without the necessity of using the highway.

- Median crossovers: Where a proposed development fronts an existing or planned median crossover, access from the development to adjacent sites shall be provided, so as to promote shared access and minimize demand for additional crossovers.

- Shared access and reverse frontage: Inter-parcel connections shall be provided to facilitate the local movement of traffic and minimize demand for local trips on the highway. Based on consultation with the VDOT Resident Engineer, inter-parcel access may take the form of direct driveway connections or reverse frontage roads.

- Pedestrian access: Pedestrian walkways shall be incorporated into each project so as to minimize conflicts with vehicular traffic. Pedestrian circulation systems shall connect uses within individual projects, and shall be extended to adjacent parcels where inter-parcel vehicular access is required.

4.4.5 Traffic Impact Analysis

All developments generating more than 1,000 average daily trips shall prepare and submit a traffic impact analysis. The projected number of average daily trips shall be based on trip generation rates as defined by the most recent publication of the Institute of Transportation Engineers "Trip Generation." In addition, a traffic impact analysis may be required for developments generating 1,000 or fewer average daily trips when it is determined, in consultation with the VDOT Resident Engineer, that safety considerations warrant such analysis. The traffic impact analysis shall identify level of service impacts of the proposed development, based on a twenty-year demand projection, and shall be used to determine necessary improvements to support the development. At a minimum, the impact analysis shall address the following:

- Turn lane and access improvements
- Internal site circulation
- Shared access/access to adjacent sites
- Impacts to intersections and median crossovers
- Potential need for signalization
- Relationship of the proposal to the U.S. Route 13 Access Management Plan

4.4.6 Required Improvements

Required improvements, the need for which is generated by the proposed development, will be determined in consultation with the VDOT Resident Engineer, based on the following:

- The U.S. Route 13 Access Management Plan
- Applicable traffic impact analyses
- Highway safety and capacity

The developer shall be responsible for provision of the improvements, which shall be shown on site plans.

4.4.7 Setbacks

In order to preserve and enhance highway safety and efficiency, setbacks shall be provided for front, side, and rear yards on all developments subject to the HCOD. Setbacks shall remain free from all development, including buildings, parking areas, gas pumps, canopies, and similar structures and facilities. Signs shall be permitted in setbacks, consistent with the regulations outlined herein. Where necessary to accommodate an approved circulation plan, access driveways are permitted within setbacks. For large developments such as shopping centers, setbacks shall apply to the full perimeter of the project, not to internal property lines. Specific setbacks, which shall be shown on site plans, shall be as follows:

- Front yard: 100 feet from the right-of-way
- Side yards: 15 feet from the property line
- Rear yard: 20 feet from the property line

4.4.8 Signage

To manage roadway signage in a manner consistent with traffic safety and corridor appearance, the following standards shall apply. Site plans shall identify the number, location, size, and height of signs, consistent with the following:

- **Location:** No sign shall be located closer than 10 feet to the right-of-way of a designated HCOD route. Signs shall not obstruct sight distances as required herein.
- **Height:** The maximum sign height shall be 6 feet above grade. Signs may be placed on landscaped berms or structural bases no higher than 3 feet tall, provided that these support methods contain no wording, logos, or other advertising material. When constructed in this manner, sign height shall be measured from the top of such berm or base.
- **Construction:** Signs shall be ground mounted, monument type structures. No pole or pylon signs shall be permitted.
- **Landscaping:** Landscaping shall be integrated with installation of freestanding signs, and shall count towards the perimeter landscaping requirements contained in this section.

4.4.9 Lighting

The following lighting standards shall apply to all exterior lighting sources, including but not limited to lighting for parking, access drives, and walkways, gasoline canopy lighting, and internally and externally illuminated signs. Site plans shall include a lighting plan, drawn at the same scale as the site plan, to demonstrate compliance with the following standards.

- All lighting shall be designed, located, and arranged so as not to direct glare on adjoining streets or residential properties. The intensity at adjoining streets or residential properties shall not exceed 0.5 foot candles.
- Lighting fixtures shall comply with the shielding requirements of the table below. Excepted from these requirements are: roadway and airport lighting, lighting activated by motion sensor devices, temporary circus, fair, carnival, or civic uses, construction or emergency lighting, temporary lighting, and lighting associated with agricultural pursuits.
- For the purposes of this ordinance, a fully shielded fixture shall be defined as an outdoor lighting fixture that is shielded or constructed so that all light emitted is projected below a horizontal plane running through the lowest part of the fixture.

Table 4-1
Table of Shielding Requirements

Fixture Lamp Type	Shielding Requirement
Low/High Pressure Sodium, Mercury Vapor	Fully Shielded
Metal Halide and Flourescent – over 50 watts	Fully Shielded
Incandescent – over 160 watts	Fully Shielded
Incandescent – 160 watts or less	None Required
Any light source of 50 watts or less	None Required

Note: Incandescent includes tungsten-halogen (quartz) lamps.

4.4.10 Landscaping

Well planned and maintained landscaping will achieve several benefits in furtherance of this ordinance. Specifically, this section is intended to:

- Preserve and enhance the visibility of traffic on major highways
- Preserve and enhance the visual quality of designated corridors
- Reduce the volume and improve the quality of stormwater runoff
- Shade parking lots, reducing heat generation

Site plans shall include a landscaping plan, drawn to the same scale as the site plan, and showing the location, size, and description of all landscaping materials in relation to structures, parking areas, and driveways.

- Plant materials specifications: All plant materials shall be living and in healthy condition, and shall conform to the standards of the most recent edition of the "American Standard for Nursery Stock," published by the American Association of Nurserymen. In order to achieve the highest likelihood of survival, plants shall be suitable for climatic zone 7. In order to maximize plant success, and to minimize maintenance expense, plant materials shall be suitable for their location on an individual site. Such concerns as danger to structures, shade requirements, wind protection, water needs, and plant spacing shall be incorporated into the landscaping plan. Where appropriate, supplementary review guidelines and expert advice may be used in the review of landscaping plans.
- Minimum size standards:
  - Large deciduous trees – Large deciduous trees shall be of a species having an average minimum mature crown spread of greater than 30 feet. A minimum caliper of 2 ½ inches at the time of planting shall be required.

   - Small deciduous trees – Small deciduous trees shall be of a species having an average minimum mature crown spread of greater than 12 feet. A minimum caliper of at least 2 ½ inches at the time of planting shall be required.
   - Evergreen trees – Evergreen trees shall have a minimum height of 5 feet at the time of planting.
   - Shrubs – Shrubs shall have a minimum height of 2 feet at the time of planting.

- Tree preservation: Preservation of existing trees shall be maximized. Except when otherwise necessary to provide access, or in accordance with accepted landscape practice, trees of 8 inches or greater diameter at breast height, located within any required setback, shall be preserved. Where any such tree is unhealthy, or needs to be removed in accordance with accepted landscape practice, its removal shall be indicated on the landscaping plan. Any healthy tree or shrub that is preserved may be credited toward the requirements of this section. All vegetation to be preserved shall be shown on the landscaping plan, and groups of trees and/or shrubs may be outlined as a single unit.

- Maintenance: The owner, or his agent, shall be responsible for the maintenance, repair, and replacement of all landscape materials required by this section. All plant materials shall be maintained in a healthy growing condition and free from debris and refuse at all times. All unhealthy plant material shall be replaced during the next planting season. All landscape areas shall be provided with a readily available water supply, which shall be shown on the landscaping plan. Water sources that require extending hoses over parking areas or access drives do not meet this requirement.

- Installation and bonding requirements: All landscaping shall be installed in accordance with accepted landscape practices. All areas approved for landscaping shall be enclosed with a visible barrier prior to the start of any site preparation or construction. Nothing shall be driven across, stored within, or otherwise intrude within these areas. Where this is not possible or where this requirement is violated, landscape areas shall be repaired by means of loosening compacted soil to a depth of 3 feet. Once completed, landscaping areas shall be protected from vehicular encroachment. When occupancy of a structure is desired prior to completion of the required landscaping, due to seasonal considerations, surety shall be provided in an amount equal to the costs of the landscaping. All landscaping shall be installed during the first planting season following occupancy, or the surety may be forfeited to the County/Town. This requirement does not preclude phasing of landscaping for larger developments, the timing of which shall be shown on landscaping plans.

- Perimeter landscaping: Landscaping shall be required at the outer boundaries of projects, or within the required setbacks, and shall be provided except where driveways or other openings may be required. For large development projects such as shopping centers, perimeter landscaping shall apply to the full perimeter of the project, and not to internal property lines. The linear feet guidelines below are to be used to calculate the number of required plantings; they do not require

that plantings be uniformly spaced. Rather, grouping of plants consistent with accepted landscape practice is encouraged. Specific requirements are as follows:

- At least 1 large deciduous tree for each 50 linear feet
- At least 1 small deciduous tree for each 30 linear feet
- At least 1 evergreen tree for each 30 linear feet
- At least 1 shrub for each 10 linear feet

- Parking lot landscaping: Parking lots containing five or more spaces shall be internally landscaped, so as to provide shade and screening, and in order to facilitate the safe and efficient movement of traffic. The area designated as required setbacks shall not be included as part of the required landscaping. Plantings shall be spaced and grouped consistent with accepted nursery standards, and shall not be located in a manner that impedes driver visibility. Specific requirements are as follows:

  - At least 20 square feet of landscaped area shall be provided per each parking space.
  - Landscaped areas shall contain no less than 100 square feet, and shall be no less than 9 feet in average width.
  - Trees shall be planted as follows: at least 1 small deciduous tree for every 100 square feet of landscaped area, or at least 1 large deciduous tree for every 200 square feet of landscaped area, or some combination thereof.
  - At least three shrubs shall be planted per each tree planted.
  - All landscaped areas shall be planted with vegetative groundcover or shall be mulched, so that no bare ground exists.
  - For double rows of parking spaces, landscaped islands shall be placed such that no row exceeds eight spaces in length. Single rows of parking spaces, separated by a continuous landscaped island, shall be encouraged.

- Beneficial plants: the following is a partial list of beneficial plants. In general, plantings should be native species, and should be selected for suitability to the Eastern Shore as well as to their specific location on site. The following list is adapted from the BayScapes program. It is not an exhaustive list, but provides examples of beneficial species.

- Large trees:

  - Red maple – *Acer rubrum*
  - River birch – *Betula nigra*
  - Red or green ash – *Fraxinus pennsylvanica*
  - Sweet gum – *Liquidambar styraciflua*
  - Tulip tree – *Liriodendron tulipifera*

- Black gum – *Nyssa sylvatica*
- White oak – *Quercus alba*

- Small trees/large shrubs:
  - Shadblow serviceberry – *Amelanchier canadensis*
  - Flowering dogwood – *Cornus florida*
  - Witch hazel – *Hamamelis virginiana*
  - Common elder – *Sambucus canadensis*
  - Highbush blueberry – *Vaccinum corymbosum*
  - Southern arrowwood – *Viburnum dentatum*

- Evergreen trees/shrubs:
  - American holly – *Ilex opaca*
  - Winterberry holly – *Ilex verticillata*
  - Northern bayberry – *Myrica pennsylvanica*
  - Common juniper – *Juniperus communis*
  - Eastern red cedar – *Juniperus virginiana*

- Small shrubs:
  - Fothergilla – Fothergilla gardenii
  - Inkberry holly – Ilex glabra
  - Compact Oregon grapeholly – Mahonia aquifolium

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4.4.11 Redevelopment

In order to promote the orderly retrofit of existing developments that do not conform to the requirements of the HCOD, while encouraging reuse of previously developed properties, the following redevelopment standards shall apply. Given the varying conditions of existing development, some administrative flexibility is required in applying standards to redevelopment. The following standards provide guidelines for use in bringing nonconforming sites as close to conformance as possible. All trip generation shall be based on ITE methods as described herein.

- Access: Reconstruction, relocation, or elimination of access points shall be required under any of the following circumstances. In such cases, necessary improvements shall be identified in consultation with the VDOT Resident Engineer, and shall be designed to bring the site as close to compliance as possible with the access provisions of this ordinance.
  - The redevelopment will cause an increase of 10 average daily trips (ADT) and 20 percent or more.
  - The redevelopment will cause any turning movement to increase by 5 ADT and 20 percent or more.

  - The redevelopment will cause an increase in use by vehicles exceeding 30,000 pounds gross vehicle weight of 10 vehicles per day or 20 percent or more.
  - Structural enlargements, building improvements, or other site improvements are made resulting in an increase of 20 percent of building square footage or totaling 20 percent of current building value.
  - As required to address identified safety deficiencies, based on consultation with the VDOT Resident Engineer.

- Traffic Impact Analysis: A traffic impact analysis shall be submitted for all redevelopment projects in which the proposed use will generate more than 1,000 ADT and increase existing ADT by 50 percent or more.

- Required Improvements: Improvements required to support the redevelopment shall be based on consultation with the VDOT Resident Engineer, the U.S. Route 13 Access Management Plan, required traffic impact analyses, and highway safety and capacity.

- Signage: Reconstruction, relocation, or elimination of freestanding signs shall be required under the following circumstances. Required improvements shall bring on-site signage as close to compliance as possible.
  - Structural enlargements, building improvements, or other site improvements are made resulting in an increase of 20 percent of building square footage or totaling 20 percent of current building value.
  - Any freestanding sign is re-faced, re-modeled, or otherwise altered.
  - Existing signs interfere with required site distances.

- Lighting: Where structural enlargements, building improvements, or other site improvements are made resulting in an increase of 20 percent of building square footage or totaling 20 percent of current building value, all lighting shall be brought into compliance with this ordinance.

- Landscaping: Where structural enlargements, building improvements, or other site improvements are made resulting in an increase of 20 percent of building square footage or totaling 20 percent of current building value, landscaping shall be brought as close to compliance as possible. This shall include appropriate landscaping of existing green space, as well as provision of additional green space to the extent that is does not interfere with traffic flow or required parking. Where additional green space is required, priority shall be given to establishing front yard green space.

4.5 Access Management Guidelines

This section provides specific recommendations for applying access management techniques to U. S. Route 13. It also suggests an administrative framework for implementation. A summary of access management guidelines is provided in Table 4-2. Chapter 5, Evaluation of Alternatives, discusses the process used to develop an overall plan for improving U.S. Route 13 and a portion of Route 175 that melds together general safety improvements, access management techniques and other types of roadway improvements.

Table 4-2
Summary of Access Management Guidelines for the U.S. Route 13 Corridor

Criteria	Recommended Guidelines	Special Notes
Left-Turn Lanes	Construct at all full-access median crossovers	May not fully apply to directional crossovers
Two-Way Left-Turn Lanes	Provide 12 feet minimum, 14 feet desirable	Replace with non-traversible median when AADT exceeds 25,000 to 30,000 vehicles per day
Right-Turn Lanes	Require at all commercial entrances and side streets	Results in minimum lot frontage requirement
Shoulders	Widen/construct 10 feet wide min. outside and 3 feet min. median shoulders	Where residential driveway densities >10/mile, 12 feet min. outside shoulder
Driveway Spacing	400 feet minimum between commercial entrances	Results in minimum lot frontage requirement
Corner Clearance	U.S. Route 13 400 feet – upstream of cross street 250 feet – downstream of cross street	Vehicle storage needs may increase the 400-foot upstream requirement
	Cross Street 250 feet – upstream of U.S. Route 13 100 feet – downstream of U.S. Route 13	Use of restrictive median may reduce the 250-foot upstream requirement to 100 feet
Crossover Spacing	0.5 miles – full access 0.25 miles – directional access	Procedure needed for variances/modifications
Median Width	➤ Provide 50 feet minimum at major generators and cross streets by: ➢ Roadway widening ➢ Flare widening	Convert medians to directional access only or close median opening if median widening not feasible
	➤ Widen crossovers and lengthen left turn lanes at locations with heavy vehicle considerations (buses, tractor trailers)	Convert medians to directional access only or close median opening if median widening not feasible
Side-Street Connections	Counties require new development to provide secondary access to side-streets where feasible VDOT to construct new local road links	
Signal Spacing	Two miles in rural areas, 0.5 miles in developing areas, 0.25 miles in developed areas	
Signal Timing	Implement signal coordination in developed areas	
Clear Zone	Establish 30-foot recovery area beyond traveled way, where practical	In areas with curbing, minimum clear zone can be reduced to 6 feet

5

Evaluation of Alternatives

5.1 Introduction

Early on in the study process, the goal of the U.S. Route 13/Wallops Island Access Management Study was defined as the development of a plan "that VDOT and the jurisdictions can implement to make U.S. Route 13 a safer and more efficient transportation facility for the traveling public over the next 20 years" (see Chapter 1). Based on an iterative process of technical analyses and public involvement, an access management plan was developed to achieve this goal. There are three components to the U.S. Route 13/Wallops Island access management plan: 1) access management roadway design guidelines (Chapter 4, Section 4.5), 2) access management land use/zoning controls (Chapter 4, Section 4.4), and 3) recommended conceptual plans for improving the existing roadway (Chapter 6 and Appendix – Recommended Conceptual Plans) based primarily on the access management design guidelines established in Chapter 4.

The development of the concept plans required that consideration be given to improving both the existing and future access management conditions on the roadway, while still providing adequate access for existing homes and businesses. In some areas, balancing the needs of existing land uses with ideal safety improvements required a compromise in the absolute access management guidelines brought forth in this plan. The alternative, wholesale relocation of existing homes and businesses, was not considered practical or economically feasible. However, the access management plan as proposed will prevent unacceptable access management conditions associated with future development along the roadway. In general, the access management guidelines have been applied to the length of U.S. Route 13 in Virginia and portions of Route 175.

This chapter details the process used to develop and evaluate alternative improvement concepts and the findings that led to the selection of various improvements along U.S. Route 13 and Route 175. It discusses access management techniques that were evaluated to address specific corridor deficiencies, and discusses other potential safety-related improvements. For each corridor deficiency examined, this study seeks to implement basic safety improvements and access management solutions first, where practicable. In those areas where access management techniques were deemed insufficient or not practicable, other solutions were evaluated including the construction of bypasses or reconstruction of intersections.

This chapter also presents a summary and evaluation of significant elements of these alternatives. Appropriate for a planning level study, potential impacts to wetlands, historic resources, businesses and residences are discussed in general terms and based on existing database information. Minor right-of-way takings and critical impacts to the function of residences or businesses were not assessed. For example, the roadway widening could impact a drain field for a septic system and in the case of roadside commercial ventures, could impact the viability of the business or impact underground structures, such as gasoline storage tanks. These features would need to be considered during future studies prior to implementation of a particular improvement. Prior to construction, more detailed investigations will be required for various features including hazardous materials, wetlands, water quality, and other sensitive environmental resources.

5.2 Alternatives Development Overview

A variety of alternatives and conceptual improvements were developed during the study based on a combination of engineering rationale and public involvement, as described below.

5.2.1 Role of Public Involvement

This study, which involved numerous incorporated communities, settlements, two counties and a regional planning agency, was a blend of both technical work and public involvement. Even before technical investigations began, a comprehensive public involvement program was developed which started with scoping interviews with elected officials, citizens, and government officials to give the study team a better idea of transportation conditions and needs of the traveling public on Virginia's Eastern Shore. Public involvement continued throughout the study in the form of public information meetings, town or community meetings, on-going coordination with elected officials from both counties, as well as regular meetings with the Citizen's Advisory Committee (CAC) and Technical Advisory Committee (TAC).

The CAC, made up of representatives from community groups, schools, public safety officials, business and other interests met a total of seven times during the study period. This group was regularly asked for observations on U.S. Route 13 travel conditions, was updated on the team's technical findings, and was instrumental in the development of alternative solutions for the corridor as described in this chapter. The TAC was made up of local, state, and federal agency representatives with expertise in the fields of planning and transportation, including road, public transit and rail.

Two rounds of public information meetings were also held during the study process in various locations in Northampton and Accomack Counties. The first series of meetings, held in May of 2001, was an opportunity for the public to review and provide comments on the early findings of the study team regarding existing/future traffic and the identification of problem areas in the corridor. The second series of public information meetings were held in November 2001 in Northampton County and Accomack County to solicit public comments on the preliminary alternatives developed along the corridor. Comments received at these meetings were used to refine and further develop alternative solutions along the corridor.

Critical to the development of alternatives was a series of five town meetings held in September 2001 to focus on initial improvement alternatives that were targeted to specific areas of the corridor. It was valuable to have a chance for in-depth analysis of these initial alternatives by the people that would be using them the most. At this stage in the study, the team was able to significantly modify and add to initial alternatives, which led to the development of the final set of alternatives presented in this report.

The alternatives that appear in this chapter are a direct result of the feedback that the study team received through the numerous opportunities for public involvement mentioned above. To highlight this, public opinion is a component featured in the description of each improvement alternative in this chapter. From initial comments about the safety of school buses on U.S. Route 13 and traffic law enforcement, to constructive suggestions for expanding the range of improvement alternatives in Machipongo and the Oak Hall and Temperanceville area, the citizens of the Eastern Shore have played an indispensable role in shaping the process and the results of this study.

5.2.2 Engineering Rationale

Existing and future conditions in the U.S. Route 13 corridor justify a need for a wide range of safety upgrades, access management techniques and other types of roadway improvements. Potential improvements and alternatives were developed throughout the corridor. In the following sections, the types of improvements are broken into three categories each of which is described in greater detail below: 1) Corridor-wide Safety Improvements, 2) Access Management Improvements, and 3) Other Improvements.

Corridor-wide Safety Improvements

Initially, existing roadway characteristics and traffic operations were assessed through field reconnaissance and data review, including the review of historic crash data along the U.S. Route 13 corridor. In addition, anecdotal evidence of roadway characteristics and traffic operations was collected through the first round of public information meetings and several meetings with the Citizen's Advisory Committee. One major finding of these efforts was that some corridor-wide deficiencies are primarily safety related, and in some cases, not necessarily related to access management per se. These deficiencies included:

- Occurrence of accidents related to vehicles running off the road.
- Insufficient shoulder width in some areas to help accommodate farm vehicles, pedestrians, bicyclists, school buses that make stops on the road, and others.
- Location of major obstructions within the clear zone, which is 30 feet from the edge of traveled way.
- Lack of milepost markings, thus hampering emergency response to cellular telephone calls for roadside assistance and crash events.
- Poor visibility at night.
- Lack of travel lane delineation.
- Raised structures within the median and within the clear zone.

To address these deficiencies and in recognition of the amount of interstate traffic carried on U.S. Route 13, the following corridor-wide improvements were initially suggested:

- Installation of rumble strips in both the inside and outside shoulders.
- Widening of the outside shoulder to provide a minimum of 10 feet of pavement, and to provide 12 feet when driveway densities exceed 10 driveways per mile.
- Removal of obstructions located within the clear zone, where possible. This includes trees, headwalls, and large crepe myrtle bushes.
- Installation of warning signs at larger obstructions that cannot be economically relocated.
- Placement of milepost markers on U.S. Route 13 at every mile.
- Installation of raised pavement markers throughout the corridor to provide better visibility at night and during inclement weather conditions.
- Reconstruction of median drainage grates to make them traversable.

Many of the above improvements are standard on interstate facilities in the Commonwealth of Virginia. They are needed because of the high through traffic volumes experienced on U.S. Route 13 and because of its role in carrying interstate traffic on the Eastern Shore. Under current conditions, the road is performing all the functions of an interstate facility but without associated interstate road standards, access control, and level of state police staffing needed for enforcement.

Furthermore, the need for U.S. Route 13 to provide access to oversized farm vehicles during planting and harvesting seasons conflicts directly with the corridor's interstate function. U.S. Route 13 is also the "Main Street" of the Eastern Shore, and while future improvements in the capacity and design of parallel secondary roads might help to reduce this need, this local function must be addressed in the development of roadway improvements.

Access Management Improvements

Access management techniques, as described in detail in Chapter 4, were employed to the extent practicable to address existing and future deficiencies. In addition to some of the corridor-wide access issues discussed above (i.e., narrow shoulders), the primary access-related concerns identified during this study included:

- Difficulty in turning into and out of residential driveways;
- Concerns of Eastern Shore residents about the high rate of speed and aggressive nature of through traffic, particularly tractor-trailers.
- Vehicles parking illegally on U.S. Route 13;
- High number of median crossovers on U.S. Route 13;
- Ability of median crossovers to safely protect vehicles from oncoming traffic;
- Safety concerns for school buses and tractor-trailers to cross U.S. Route 13;
- School buses stopping on U.S. Route 13 to pickup and discharge students, and
- High number of driveways along entire corridor, particularly residential driveways.

To address these issues, the following access management techniques were identified for implementation, consistent with the guidelines established in Chapter 4:

- Construction of turn lanes
- Closure of excess median crossovers to channelize disruptions to U.S. Route 13 traffic.
- Conversion of existing median crossovers to restrict some turning movements (directional median crossover).
- Median widening at some median crossovers to more safely accommodate cross streets or driveways with high volumes, school buses or tractor-trailers.
- Provision of frontage roads or reverse frontage roads to consolidate residential driveways and reduce school bus stops directly on U.S. Route 13 .
- Provision of alternative secondary road access for selected properties fronting on U.S. Route 13.
- Reconstruction of undivided roadway sections to accommodate future traffic capacity, access and safety needs.

The implementation of the above techniques were considered throughout the U.S. Route 13 corridor, but only applied where a deficiency was noted.

Other Improvements

Where access management techniques could not be applied to deficiencies, other geometric improvements were developed. These included:

- Realignment of intersecting secondary roads
- Bypasses
- Interchanges
- At-grade railroad crossings

Some of these improvements and various alternatives developed for these improvements were identified based primarily on traffic engineering issues, while others were developed more in response to public feedback. The specific alternatives are described in greater detail below.

5.3 Alternatives Evaluation

Following the identification and development of the various improvements and alternative improvement concepts, these were then evaluated in terms of effectiveness, and engineering.

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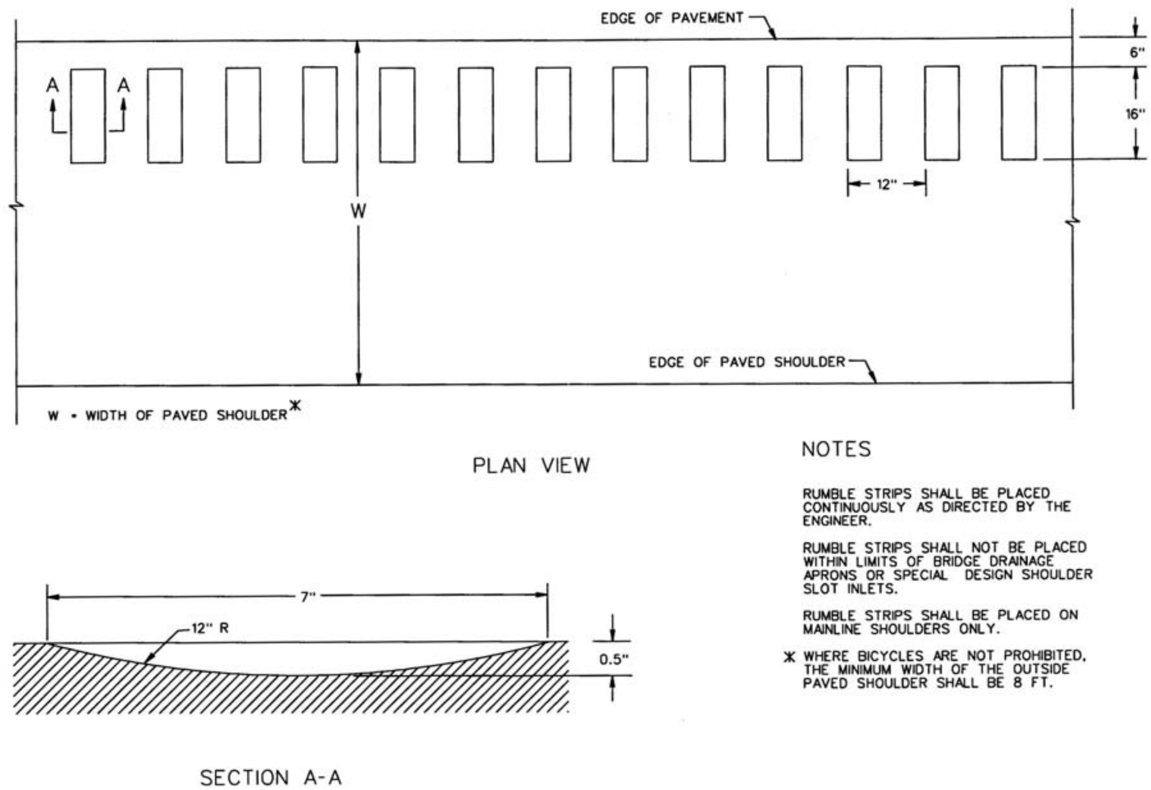
5.3.1 Corridor-wide Safety Improvements

Rumble Strips

Rumble strips are perpendicular indentations in the shoulder, immediately adjacent to the travel lanes that provide an audible warning to vehicles inadvertently straying from the travel lanes. The standard VDOT design detail for rumble strips on asphalt pavement is shown in Figure 5-1. The rumble strip is 16 inches in width and is placed approximately 6 inches from the white edge line. Rumble strips are standard items for interstate construction today; however, they are not as frequently implemented on arterial corridors, primarily due to the narrow paved width and/or shallow depth of paved shoulders.

The only concern expressed about the addition of rumble strips was related to the potential danger for bicyclists who could lose control of their bicycle if they ride on a rumble strip. Given the proposed shoulder width (10 feet or more), there should be adequate room for the bicyclist to ride near the outside of the shoulder without having to ride on the rumble strip. Furthermore, no impacts to homes/businesses, or sensitive cultural and natural resources are expected as a result of installing rumble strips along the corridor.

Figure 5-1
Rumble Strip Detail



NOTES

RUMBLE STRIPS SHALL BE PLACED CONTINUOUSLY AS DIRECTED BY THE ENGINEER.

RUMBLE STRIPS SHALL NOT BE PLACED WITHIN LIMITS OF BRIDGE DRAINAGE APRONS OR SPECIAL DESIGN SHOULDER SLOT INLETS.

RUMBLE STRIPS SHALL BE PLACED ON MAINLINE SHOULDERS ONLY.

* WHERE BICYCLES ARE NOT PROHIBITED, THE MINIMUM WIDTH OF THE OUTSIDE PAVED SHOULDER SHALL BE 8 FT.

SPECIFICATION REFERENCE	RUMBLE STRIPS (ASPHALT SHOULDER)
310 315	VIRGINIA DEPARTMENT OF TRANSPORTATION

The alternative to installing rumble strips would be to install raised pavement markers only (see below). While raised pavement markers do provide a certain level of audible warning to motorists who have veered off the road, they are intended more for added visibility. The combination of rumble strips and pavement markers is particularly effective in terms of enhancing overall safety on high speed corridors such as U.S. Route 13.

Shoulder Widening

During the public involvement process, many people noted the lack of sufficient shoulder width in some areas for the accommodation of farm vehicles/equipment, other large vehicles, school buses that need to stop on U.S. Route 13, as well as bicyclists and pedestrians who travel along U.S. Route 13.

To address these concerns, a wider shoulder width (10 feet wide) was initially proposed throughout the entire corridor. In addition, two additional feet (12 feet total) were proposed in locations with driveway densities in excess of 10 driveways per mile. The 12-foot shoulder width in high driveway density areas will provide added safety and security to motorists turning into these driveways. The alternative would be to construct a consistent 10-foot wide shoulder regardless of driveway density.

During the public involvement process, no negative comments or concerns were raised about the proposed shoulder widening. Such a widening could potentially impact wetlands in isolated areas and all appropriate wetland/water quality permits would need to be obtained prior to construction. No adverse impacts to historic resources or significant impact to groundwater recharge areas are anticipated. Occurring within existing right-of-way, no relocations of homes or businesses are expected to occur as a result of this widening. On the contrary, the shoulder widening provides an added safety benefit to motorists turning into homes and businesses along the corridor.

Relocation or Removal of Hazards in Clear Zone

The American Association of State Highway and Transportation Officials define "clear zone" to be the unobstructed, relatively flat area provided beyond the edge of the traveled way for the recovery of errant vehicles.[46] Obstructions located within the clear zone of a roadway can significantly increase the potential hazard for fixed object crashes. The provision of rumble strips, as discussed above, would help to correct drivers to some degree. However, there are obstructions along U.S. Route 13 that should be relocated or removed. During the course of the study, 209 obstructions were identified within the 30-foot clear zone. Of these, 130 (62 percent) occurred in the northbound direction and 79 (38 percent) occurred in the southbound direction.

46 A Policy on Geomeric Design of Highways and Streets, 1994, AASHTO, p. 344.

Obstructions observed included utility poles, traffic signal poles, drainage headwalls, trees, large crepe myrtle bushes (while classified as a shrub, there are many such bushes on U.S. Route 13 large enough to stop a car traveling at 55 mph), billboards, and rail signal equipment. In addition to removal of such obstructions, the increased use of reflectors should be implemented for obstructions that cannot be economically relocated or removed.

In general, concerns expressed by the public about the relocation or removal of hazards in the roadway clear zone were related to the potential removal of trees providing shade to homes. Impacts to sensitive environmental features are not anticipated as a result of these efforts, but care should be taken so as not to relocate objects in wetlands or streams.

Milepost Markers

Emergency response capabilities along the U.S. Route 13 corridor often rely on the cellular telephone calls from either drivers involved in crashes or passers-by. Given the high percentage of interstate travel on U.S. Route 13, many of these drivers are not familiar with the entire roadway and may have difficulty providing a detailed enough description for emergency response personnel to quickly pinpoint the crash location. The posting of milepost markers provides a uniform, linear referencing system to which most interstate travelers are accustomed.

No negative comments or concerns were expressed regarding the installation of milepost markers.

Raised Pavement Markers

The use of raised pavement markers, similar to rumble strips, can aid in alerting drivers when they veer off the travel lanes. When a vehicle crosses over a raised pavement marker, an audible noise is made that acts to alert drivers to correct their travel path. In addition, the raised pavement markers are also extremely effective during night and inclement weather, particularly rainstorms, to provide more visibility to drivers.

This type of improvement is not expected to have any adverse environmental impacts nor was any concern expressed by the public.

Drainage Grate Reconstruction

The existing drainage grates within the median on U.S. Route 13 present a potential obstruction hazard to vehicles running off the road and into the median. The existing grates, built to VDOT standards that are now superseded, expose approximately two feet of concrete inlet structure above ground level. The current design for drainage grates makes the grates flush with the existing ground level and therefore not a potential obstruction hazard. Retrofit screens have been developed by VDOT and can be used to significantly reduce the obstruction hazard of these drainage structures.

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5.3.2 Access Management Improvements

Throughout the U.S. Route 13 and Route 175 corridors, significant access management improvements were developed. The following sections provide a consolidated summary of those proposed improvements.

Construction of Turn Lanes

During the public involvement process, concern was raised about the hazard (perceived and real) of turning right into driveways or onto side streets. The high rate of speed and aggressive nature of out-of-state cars and tractor-trailers was frequently mentioned. Many local drivers indicated that they do not feel safe slowing down to turn, and feel that the existing shoulder is often inadequate to get their vehicle out of the travel lane safely while turning. While many sections of U.S. Route 13 provide an eight-foot wide right shoulder, this is not perceived as being wide enough. In addition to the shoulder widening discussed above, the construction of turn lanes in certain locations is also considered necessary.

While it is generally not anticipated that the construction of turn lanes will impact sensitive resources or homes and business, additional investigations may be necessary prior to construction depending on the location.

Median Closures

The existing U.S. Route 13 corridor contains a total of 271 median crossovers, of which 103 (38%) currently have no turn lanes, and 200 have narrow median widths (less than 40 feet). The desire to control access along the corridor recognizes that while many of these median crossovers serve existing residences and business, access onto and off of U.S. Route 13 needs to be planned and prioritized to minimize speed differentials and cross street left turns. The closure of selected crossovers, along with the improvement of the remaining crossovers, would help to achieve this result. Future development on U.S. Route 13 should be encouraged to locate and develop at locations with existing access via a median crossover.

During the public involvement process, significant concern was raised about this proposal, with arguments that U-turns would increase and make the road less safe as a result. It should be noted that many of the proposed crossover closures identified in this study were locations with either no current activity, locations with safety concerns, locations serving a very low density land use, or locations with alternative access. In some locations, local road connections, such as frontage roads and reverse frontage roads, were provided to compensate for the elimination of full access to residents or businesses. The recommended median closures presented in Chapter 6 have attempted to minimize motorist inconvenience while providing a discernable safety benefit.

Median closures are not expected to have environmental impacts associated with them.

Directional Crossover Treatments

The restriction of access at crossovers was carefully considered for application on the U.S. Route 13 corridor. Examples of directional crossover treatments were presented in Chapter 4. The primary directional crossover selected for this study was to restrict cross street traffic to right-in, right-out and then only allow U.S. Route 13 left turns in one direction. Areas with closely spaced intersections or where median widening may not be practical are candidates for this type of improvement. As shown in Table 5-1, only four directional crossovers were initially proposed.

Table 5-1
Proposed Directional Crossover Improvements

Milepost	Land Use Served	Left-Turn Access NB	Left-Turn Access SB
MP 132.50	Page Fischer Road (Route 703)		✓
MP 132.44 at Route 703	Arcadia High School*	✓	
MP 116.36 at Route 1530	Accomack Office Park	✓	
MP 108.38	Eastern Shore Community College*	✓	

* Only if Alternative 1 is applied (widening on existing alignment).

These improvements are not expected to have environmental impacts associated with them.

Localized Median Widening

Approximately 74 percent of the U.S. Route 13 corridor has substandard median widths (ranging from 20 to 40 feet in width). Given the location of major traffic generators directly on U.S. Route 13, such as the Eastern Shore Community College, public schools, major employment centers and churches, the ability to service sometimes high volumes of cross street traffic may be needed at certain locations. Many of these locations may ultimately require signalization, however, for some locations, this is uncertain and the safety concerns are preponderant.

A localized roadway widening option was developed to widen the median to either 50 feet or 80 feet in width to accommodate school buses and tractor-trailers, respectively. After a review of the above land uses, a total of 11 locations were selected for widening to 50 feet and 5 locations were selected for widening to 80 feet.

These proposed locations are shown in Table 5-2. While the median widenings are not expected to adversely impact sensitive resources, they should increase safety operations for the businesses, schools, Kiptopeke State Park and others.

Table 5-2
Proposed Localized Median Widening Improvements

Milepost	Land Use Served	Widen to 50 feet	Widen to 80 feet
MP 132.17 at Horsey Road/Mocks Landing Road (Route 702)	Arcadia High School*	✓	
MP 131.18	CS Fischer Poultry	✓	
MP 127.53 at John Tyler Road (Route 691N)	Eastern Shore Seafoods		✓
MP 127.29 at Goton Town Road (Route 691S)	Kegotank Elementary School		✓
MP 125.57 at Route 729	Tomato Packing Plant near Finney Mason Drive (Route 729)		✓
MP 125.13 at Route 775	Pepsi Warehouse		✓
MP 123.50 at Route 681	Littleton Road/Mason Road (Route 681)	✓	
MP 123.09	Gargatha Landing/Berry Road (Route 680)	✓	
MP 122.89	Shore Medical	✓	
MP 105.24	Central Middle School	✓	
MP 102.48	Kuzzen's Six Ls Packing Co.		✓
MP 89.54 at Young Street (Route 627)	Northampton Middle School	✓	
MP 86.58 at Bus Rt. 13	Northampton High School	✓	
MP 78.00 at Route 684	Kiptopeke Elementary School	✓	
MP 75.06 at Cape Center	Sting Ray's/ Eastern Shore Pottery	✓	
MP 72.41 at Arlington Road (Route 645)	Kiptopeke State Park	✓	

* Indirect access provided off Horsey Road (Route 702).

Frontage Roads

The construction of one-way, 16-feet wide frontage roads was developed and presented in several locations along U.S. Route 13. They are proposed to consolidate the number of driveway access points and simultaneously provide a safer facility than U.S. Route 13 for school buses to drop-off and pick up children. This issue was raised during the public involvement process as a major concern, especially in Northampton County. The locations where frontage roads were initially proposed are summarized in Table 5-3.

Table 5-3
Proposed Frontage Road Improvements

Beginning Milepost	Direction	Length (feet)	Number of Driveways Reduced
MP 118.97	SB	800	12
MP 118.09	SB	1,300	17
MP 93.63	SB	550	0*
MP 91.86	SB	1,200	12
MP 88.66	SB	1,000	5
MP 88.15 (Alt. 2 only)	NB	1,100	4
MP 76.55	NB	500	0
MP 76.22	SB	800	5

* This improvement would move the access for a church driveway to exit to the north opposite a tomato packing plant driveway at a median crossover.

Reverse Frontage Roads

The use of reverse frontage roads has been considered where existing homes or businesses are located close to either the existing or proposed U.S. Route 13 alignment. Reverse frontage allows for the elimination of driveways on U.S. Route 13, but may not suit property owners because it requires the construction of driveway extensions on private property. The reverse frontage roads are typically local streets, with 24 feet of pavement and 3-foot graded shoulders. As shown in Table 5-4, reverse frontage treatments were proposed in 13 locations along U.S. Route 13.

Table 5-4
Proposed Reverse Frontage Road Improvements

Milepost	Direction	Location	Length of Improvement
MP 125.98	NB	Route 769	2300 feet
MP 125.57	NB	Poultry Waste Management Facility	900 feet
MP 121.06	NB	South of W. Neck Road (Route 677)	1000 feet
MP 120.61	NB	Kinsey Road Route 738	670 feet
MP 114.00	NB	Daugherty Road (Route 648)	600 feet
MP 110.54	SB	Dogwood Road/ (Route 639)* (Alternative 1)	600 feet
MP 108.38	SB	Community College to Route 1402	1,200 feet
MP 98.61	NB	Route 618 to to Broad Water Road (Route 652)	2,300 feet
MP 90.63	NB	Trehereneville Road (Route 622) to Route 625	4,000 feet
MP 88.00 (Alt 1 only)	NB	Residences between Routes 1701 and 1702	1,800 feet
MP 84.34	SB	Route 633	1,000 feet
MP 79.40	NB	Route 184 to Route 641	2,000 feet
MP 75.00	NB	Sting Ray's	1,500 feet

* Cul-De-Sac

Alternative Access Improvements

Five locations along Route 13 were provided additional indirect access by connecting them to an existing side street that intersects with Route 13. These alternative access improvements would improve the safety and congestion on these roadways, and are shown in Table 5-5. Eight businesses would be impacted by these improvements.

Table 5-5
Proposed Alternative Access Improvements

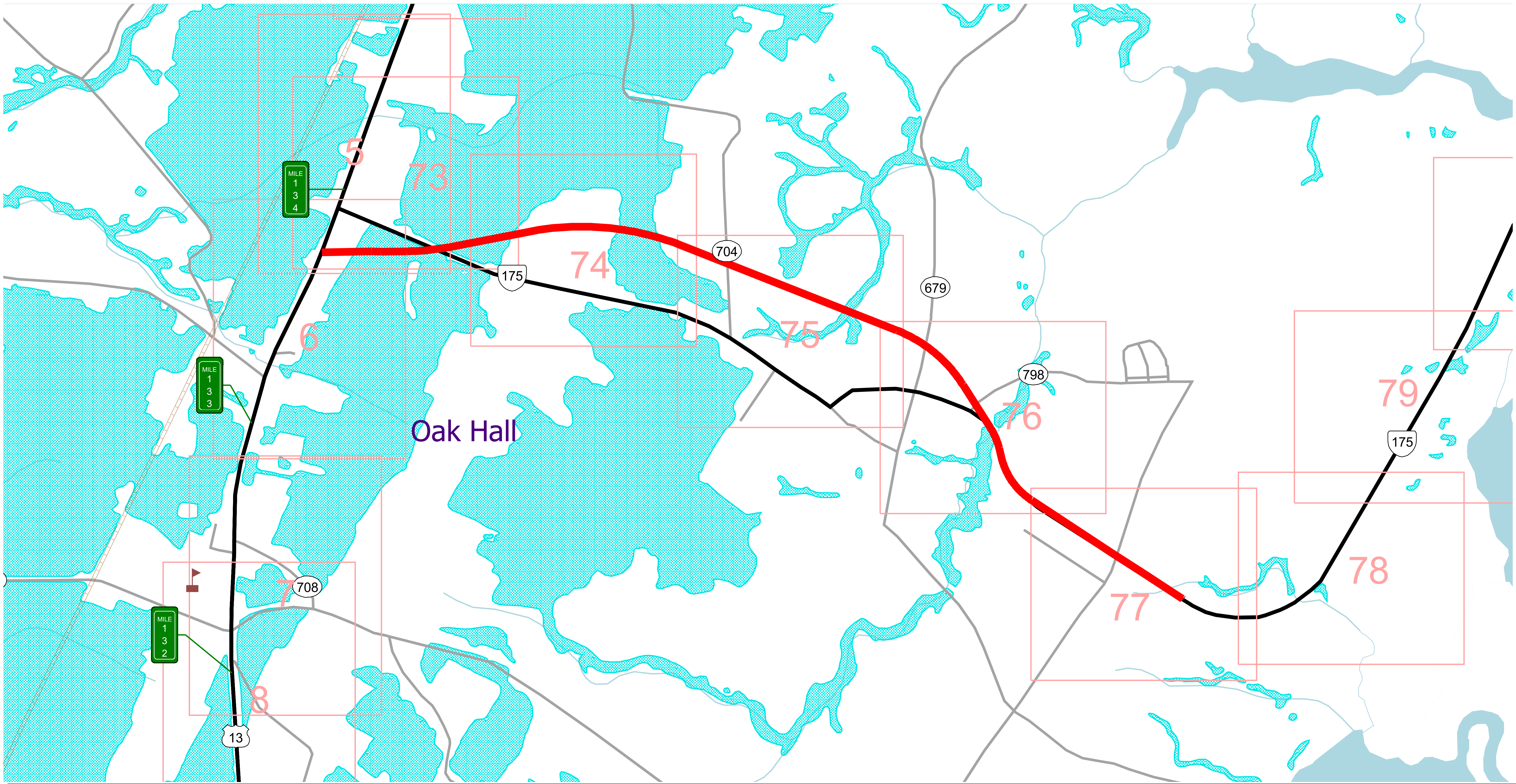
Milepost	Direction	Location	Length of Improvement
MP 116.08	SB	Route 769 in Mappsville	700 feet
MP 113.06	SB	Chesapeake Square Plaza	1,400 feet
MP 100.4	NB	Crossover Access to Food City Plaza and Trawler Restaurant	500 feet
MP 98.5	SB	Bayside Road (Route 618) to Broadwater Road (Route 652)	1,400 feet
MP 78.91	NB	Food Lion at Route 184	950 feet

5.3.3 Other Improvements

As previously noted, this study first sought ways to implement basic safety improvements and access management solutions, where practicable. In those “problem areas” where minor safety improvements or access management techniques were deemed insufficient or not practicable, other types of improvements were evaluated. This section details the development of conceptual alternatives for major transportation improvements along the U.S. Route 13 and Route 175 corridors. For most locations, several alternatives were developed during the course of the study and overlaid on aerial photographs. This evaluation describes the type of improvements, provides an opinion of probable construction costs, and describes potential impacts and benefits associated with the various alternatives. The discussions have been grouped by geographic area for clarity and are presented in a north to south direction.

5.3.3.1 Route 175 Area

Two conceptual alternatives were initially presented for Route 175 from U.S. Route 13 to the crossing over Mosquito Creek. Alternative 1 would provide improved shoulders and turn lanes with localized widening of the existing roadway. Alternative 2 would be a new controlled access four-lane divided highway on new alignment between U.S. Route 13 and Wallops Pond. These two alternatives are conceptually depicted in Figure 5-2. The potential configuration of the intersection of Route 175 with U.S. Route 13 will depend on the selection of roadway improvement alternatives for both Route 175 and U.S. Route 13 through Oak Hall. Therefore, this section will not include a description of improvements at the U.S. Route 13/ Route 175 intersection, which will follow in a later sub-section.



Alternative 1
Improvements on Existing Alignment

Alternative 2 Bypass

NWI Wetlands

Aerial Photo Number

Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

Figure 5-2
Route 175 Alternatives

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Alternative 1: Widen Existing Roadway from U.S. Route 13 to Atlantic Road (Route 798)

Description. Beginning at U.S. Route 13, heading eastbound on Route 175, Alternative 1 would consist of the following:

- Construction of right-turn lane and left-turn lane at Coardtown Road (Route 704).
- Reconfiguration of Dream Road (Route 704) and intersection with Route 175 near the skating rink.
- Widening of Route 175 to provide opposing left-turn lanes at this intersection.
- Construction of right- and left-turn lanes at Fleming Road (Route 679).
- The roadway would continue as a three-lane roadway and intersect with Mill Dam Road (the western spur of Route 798) with left and right-turn lanes in all directions.
- After Mill Dam Road, the road would taper back to a two-lane section to cross Wallops Pond at the existing crossing location to minimize environmental impacts.
- After crossing Wallops Pond, the roadway would be widened again to provide a center lane as a continuous left-turn lane offering refuge for the left turn movements into residences and businesses to the west of Atlantic Road (Route 798).
- Construction of left and right-turn lanes at the intersection with Atlantic Road (Route 798).
- The roadway would taper back to two lanes to the east of Route 798.
- The provision of a 12-foot shoulder and ditch improvements on both sides of Route 175 from U.S. Route 13 would continue to just east of the NASA air station at Mosquito Creek.

Safety and Transportation Benefits. Adding shoulders and improving the roadway with left and right-turn lanes at selected intersections would improve safety and provide a capacity of approximately 15,000 vehicles per day without major corridor relocation and reconstruction. Service life with this improvement would be approximately 20 years.

Potential Impacts. The construction of this widening alternative would have minimal impacts to wetlands along the Route 175 corridor. No previously identified historic properties or threatened/endangered species were noted in the existing database information but additional investigations would be necessary prior to implementation. Alternative 1 would require some right-of-way acquisition along the existing roadway corridor, but significant property or business displacements would not be expected.

Cost. This option, which involves widening the existing roadway from U.S. Route 13 to Mosquito Creek is projected to cost $6.1 million to construct.

Alternative 2: New 4-lane Alignment from U.S. Route 13 to Atlantic Road (Route 798)

Description. Starting at U.S. Route 13, a new four-lane, divided roadway would be constructed to carry Route 175 traffic. It would be a controlled-access roadway, with intersections only in specific locations. The roadway alignment would start to the south of existing Route 175 intersection with U.S. Route 13 at T's Corner, and then proceed to the northeast, crossing to the north of existing Route 175 between T's Corner and the first group of residences encountered on Route 175. The alignment would run to the north of most of the existing development approaching Wattsville, and would skirt Wattsville to its north. Intersections would be provided at Coardtown Road (Route 704), Fleming Road (Route 679) and Mill Dam Road (Route 798). The alignment would merge with the existing Route 175 right-of-way to cross Wallops Pond at the current location, to avoid a costly bridge structure and minimize wetland impacts. The roadway would taper back to two lanes to the east of Atlantic Road (Route 798), and the 12-foot shoulder and ditch improvements would continue to Mosquito Creek.

Safety and Transportation Benefits. This new four-lane highway would provide a safe, modern facility with capacity through the foreseeable future, handling approximately 40,000 vehicles per day west of Route 798. Expansion of the NASA facility or increased volumes to Chincoteague Island could predicate this alternative.

Potential Impacts. Alternative 2 traverses existing farmlands, forest, and wetlands in this corridor. Impacts to these resources would be significantly greater with Alternative 2 than with Alternative 1. Implementation of Alternative 2 would require various local, state and federal approvals and permits. Given the extent of wetlands in this area, wetland permitting could involve a potentially rigorous permit process. Prior to any further development of this alternative, additional field investigations should be conducted to verify jurisdictional wetland areas and evaluate avoidance and minimization measures. Again, while no previously identified historic properties or threatened/endangered species were noted in the existing database information, additional investigations would likely be necessary prior to implementation.

In addition to the right-of-way needed for the section on new alignment, Alternative 2 will require right-of-way acquisition along Route 175 east of Wallops Pond from residences and businesses. The roadway's controlled-access portion would ensure that that section of the road remains a high-capacity facility, and would prevent strip development.

Cost. This improvement is projected to cost $14.2 million to construct. It is important to note that this cost does not include an interchange with U.S. Route 13, which has been included with Oak Hall Alternative 5.

Public Input on the Route 175 Alternatives

Alternative 1 was generally favored by the public because it was viewed as less expensive than Alternative 2 and more likely to be approved and implemented in a timely manner. Most of those who liked Alternative 1 were interested in having a center turn lane. A four-lane highway on Route 175's existing alignment, also suggested, was not looked at as a viable alternative because of the potential land use impacts, especially at the intersections of Route 704, 679,and 798. Alternative 2 was generally discouraged in public comments because of its potential impact to farmland and other private property. However, the long-term viability was viewed as a positive feature of Alternative 2.

5.3.3.2 Route 175 Intersection with U.S. Route 13

Given the multiple alternative options developed for both U.S. Route 13 and Route 175, it is logical that the development of improvements at the intersection of these two routes would be dependent on the improvements selected for each road. Three likely options include:

- **Alternative A**—Improving the existing intersection in the existing location.
- **Alternative B**—Constructing a new high-capacity, conventional intersection at a new location, possibly just south of the existing intersection.
- **Alternative C**—Constructing a grade-separated interchange, possibly just south of the existing intersection.

Figure 5-3 shows Alternative A, Alternative B and Alternative C conceptually.

If improvements are implemented, the connection type will be evaluated during a location study after the alignment improvement alternative is chosen.

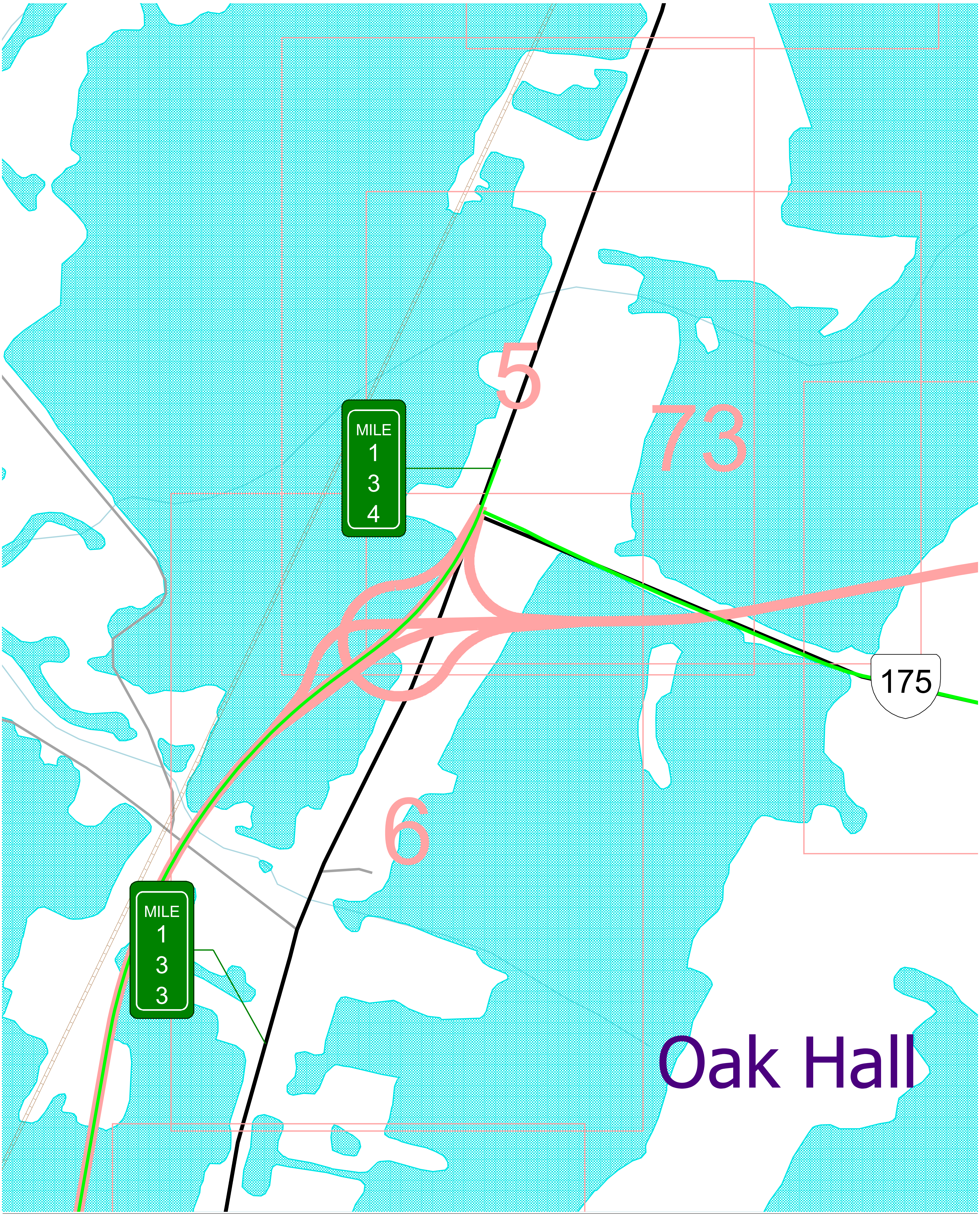
Safety and Transportation Benefits. Alternative A will improve the overall safety and travel through the current intersection of U.S. Route 13 with Route 175.

Alternative B in addition to Alternative A improvements, provides a separation of traffic on U.S. Route 13 through the use of a simple flyover. This should improve safety if a bypass improvement is recommended to the south of T's Corner.

Alternative C being a full interchange eliminates the need for the existing traffic signal and provides the highest level of service through the intersection of U.S. Route 13 and Route 175.

Potential Impacts. Alternative A will restrict access in the SE and NE quadrants of the existing intersection of U.S. Route 13 and Route 175.

Alternative B has the same impact as Alternative A and also requires the taking of additional right-of-way along U.S. Route 13 south of Route 175.



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Alternative A
Improvements on Existing Alignment

Alternative B High Capacity Intersection

Alternative C Grade Seperated Interchange

NWI Wetlands

Aerial Photo Number

Figure 5-3
Route 175 Intersection with U.S. Route 13 Alternatives

N

Alternative C will impact more property than the other two alternatives. An actual interchange location will determine the number of properties impacted.

Cost. The cost of Alternative B is projected to be $4.0 million, and Alternative C is projected to cost $7.9 million to construct.

Public Input on the Route 175 Intersection With U.S. Route 13

There was a call for widening the turn lane on U.S. Route 13 and improving the shoulder on Route 175 eastbound to accommodate tractor-trailers turning right on Route 175. No other comments were provided with regard to the various interchange options.

5.3.3.3 U.S. Route 13 between Oak Hall and Temperanceville

These two communities have been grouped together based on their proximity to each other and their similar access management and safety needs on U.S. Route 13. In some cases, a distinct solution or possible solutions were developed for each community that could be implemented independently of the selected solutions in the other community. There were also alternatives developed that spanned both communities. For comparison purposes, these two communities are presented together, and the start and end points of the proposed alternatives are coincident. By breaking out the alternatives this way, a joint Oak Hall/ Temperanceville alternative can be directly compared to the combination of one Oak Hall only alternative and one Temperanceville only alternative. In Oak Hall, a total of three alternatives were developed, and four alternatives were developed in Temperanceville. These alternatives are conceptually depicted in Figure 5-4.

Oak Hall

The descriptions of Oak Hall alternatives will begin at the U.S. Route 13/Route 175 intersection and continue to just south of the Route 694 intersection, at approximately Milepost 131.7.

Oak Hall Alternative 1: Improvements on Existing Alignment

Description. Alternative 1 consists of improvements on the existing roadway. Additional right-of-way would be required, although detailed right-of-way needs are unknown at this time.

The first median opening south of Route 175 would be closed due to its proximity to the U.S. Route 13/Route 175 intersection. The next opening to the south, approximately 1,400 feet from the intersection, would be upgraded to provide a full crossover with turn lanes for all movements. This crossover should be used to consolidate access for all properties between Route 175 and the power line easement.

Continuing south into Oak Hall, Alternative 1 improvements would include improved shoulders to a width of 12 feet, a 16-foot raised median, and an improved intersection with Withams Road (Route 703), including turn lanes for all movements. Both the northbound and southbound lanes would be realigned to provide the widened median. The median and shoulder improvements would continue south to the Route 702 (Horsey Road/Mocks Landing Road) intersection. Four existing median openings would be closed through town, with access consolidated at four remaining crossovers, which would all be upgraded with new turn lanes and improved geometry. For approximately 1,000 feet north and south of Route 702, the northbound lanes would be realigned slightly to the east to improve the existing curvature and reconstruct the intersection at Route 702. Jerusalem Road (Route 694) would be relocated to intersect at a new full crossover approximately 800 feet south of the existing intersection.

Safety and Transportation Benefits. The Alternative 1 improvements will improve the safety and capacity of U.S. Route 13 by reducing conflict points, improving geometrics of both the mainline of U.S. Route 13 and intersections with local roadways.

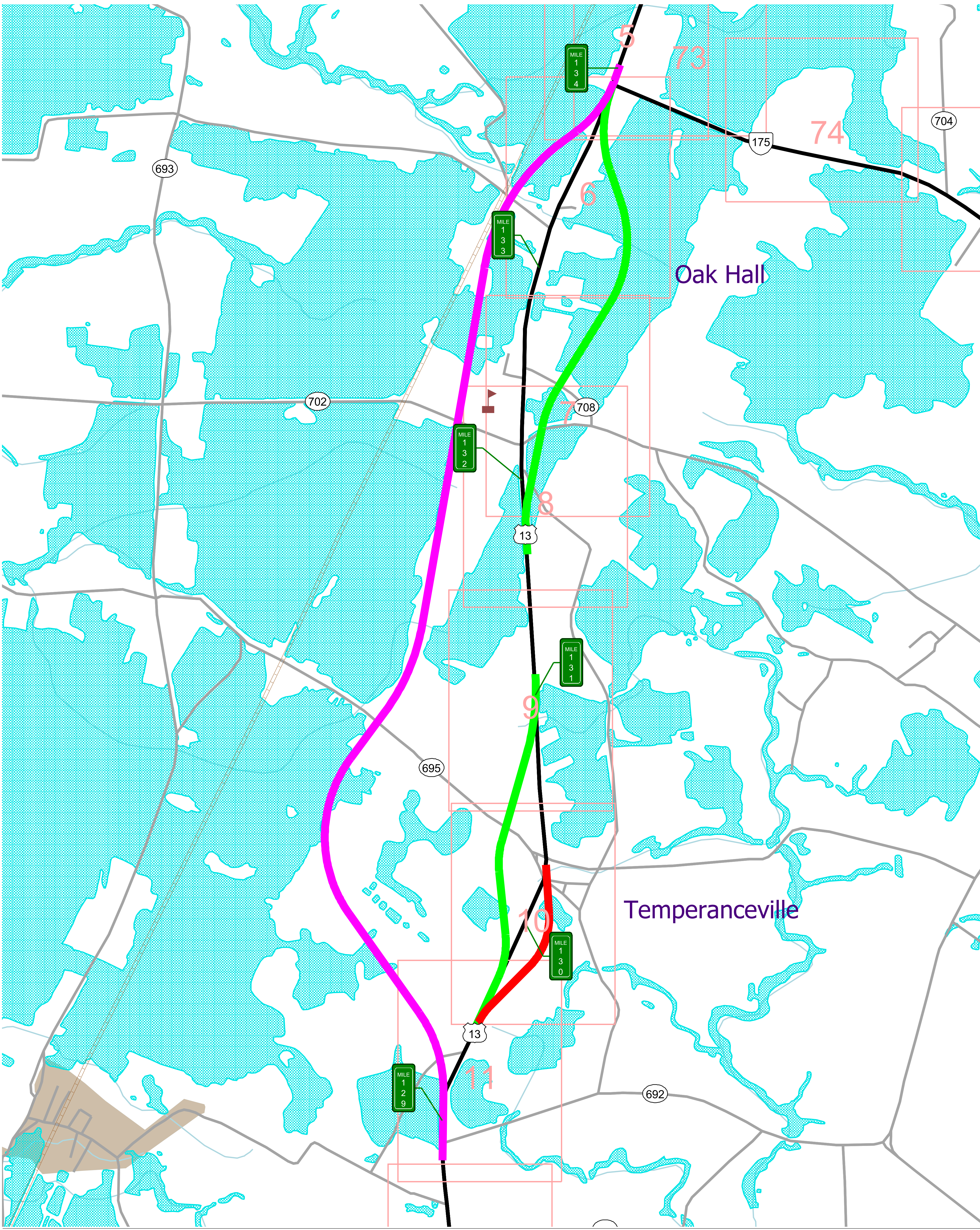
Potential Impacts. New construction in currently wooded areas, while limited, could potentially impact forested wetlands. For example, the reconstruction of Route 702 and Route 694 near milepost 132 traverses areas mapped as forested wetlands by the National Wetlands Inventory database. More detailed investigations would be required for final design and permitting. Overall, potential impacts to natural resources can be expected to be far less with Alternative 1 than Alternative 2. No previously recorded historic sites were identified in this area.

As previously noted, additional right-of-way along U.S. Route 13 will be required to construct this alternative. While the right-of-way needs have not been quantified, the potential exists for business and residential relocations in areas where homes or businesses are in close proximity to the existing roadway right-of-way.

Cost. This improvement is projected to cost $4.5 million to construct.

Oak Hall Alternative 2: Bypass to East

Description. The second alternative for Oak Hall consists of a controlled-access four-lane, divided highway bypass on new alignment, skirting the town to its east. This highway would require approximately 200 feet of right-of-way. A cross-section detail of this bypass and all other bypasses considered by this study is shown in Figure 5-5. Just south of the intersection with Route 175, this bypass would curve to the east. A cul-de-sac would be provided on existing U.S. Route 13 to preserve access to properties. A new connection road would be constructed north of the power line easement to provide access to the existing corridor,and to the north side of town.This connection would include an at-grade intersection with turn lanes for all directions. Page Fisher Road (Route 703), due to its residential nature, would be bisected and provided with cul-de-sacs. This would restrict traffic to residents only. A full



Alternative 1
Improvements on Existing Alignment

Alternative 2

Alternative 3

Alternative 4 and 5

NWI Wetlands

Aerial Photo Number

Figure 5-4
U.S. Route 13 Corridor
Oak Hall and Temperanceville
Alternatives

N

connecting intersection would be provided at Mocks Landing Road (Route 702) just to the south, approximately 500 feet east of existing U.S. Route 13. The bypass would connect again to existing U.S. Route 13 just south of the Jerusalem Road (Route 694) intersection. The existing U.S. Route 13/Jerusalem Road intersection would be eliminated; instead Jerusalem Road would be realigned to the north to connect with Mocks Landing Road. As on the north side of town, a cul-de-sac would be provided near milepost 132, to preserve access to all parcels along existing U.S. Route 13.

Safety and Transportation Benefits. A bypass has the effect of separating through traffic from local traffic, which would benefit local residents by significantly reducing the volume of tractor-trailers and other faster moving vehicles. A bypass would increase the overall safety of the bypassed portion of U.S. Route 13, improving the ability of local drivers to make left turns comfortably, and to enter and exit driveways without fear of being hit while accelerating or decelerating. Reduced traffic volumes would also provide more of the roadway capacity for local drivers in normally congested areas, such as shopping center entrances and plant entrances, and for special events in the community.

Another advantage of a bypass alternative is evident when compared with alternative 1: improving U.S. Route 13 on its existing alignment. Improving U.S. Route 13 on its existing alignment would require some additional right-of-way acquisition in certain areas adjacent to the corridor, and could cause businesses and residences to relocate. Since bypasses are proposed for outside the corridor, it is less likely that an established business or residence would have to move as a result of its construction.

Potential Impacts. An eastern bypass could have potentially significant impacts to forested wetlands that stretch along the entire area east of U.S. Route 13. As such, this alternative will require various local, state, and federal approvals and permits. No previously recorded historic sites or threatened/endangered species were identified in this area.

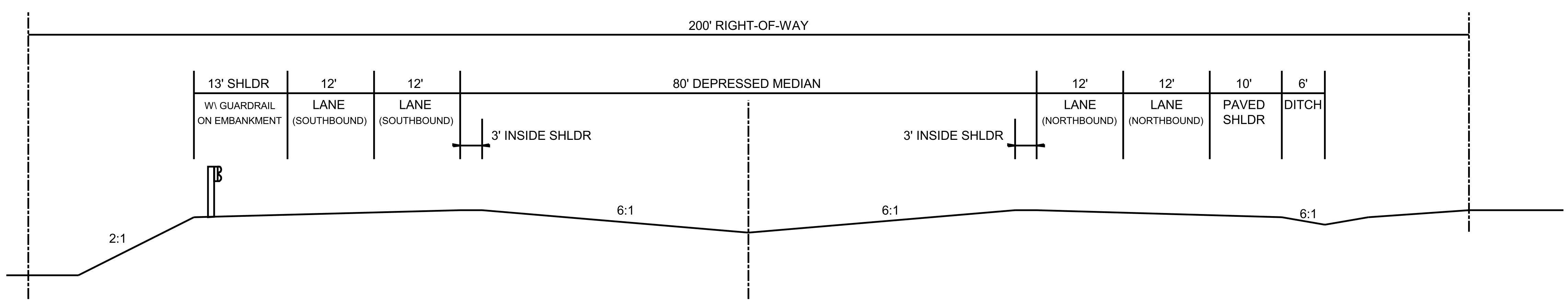
The advantage to any bypass alternative in this area, as opposed to widening U.S. Route 13, is that it would not involve direct right-of-way impacts to homes and business along U.S. Route 13. Indirectly, businesses currently along U.S. Route 13 could potentially experience economic impacts associated with the diversion of through traffic.

Cost. These improvements are projected to cost $10.2 million to construct.

Temperanceville

For the purposes of these descriptions, the Temperanceville area begins just south of the U.S. Route 13/ Jerusalem Road (Route 694) intersection, located at Milepost 131.7, and ends at the U.S. Route 13/Chesser Road (Route 692) intersection at approximately Milepost 128.9.

Figure 5-5
Bypass Cross Section



TYPICAL BYPASS CROSS SECTION (LIMITED ACCESS) (200' RIGHT OF WAY)

Route 13/Wallops Island
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Temperanceville Alternative 1: Improvements to Existing Roadway

Description. Beginning just south of Jerusalem Road (Route 694), the first alternative would upgrade the crossover at Big Daddy Home Sales with turn lanes and a realigned driveway. Approaching the C. S. Fischer Poultry area, the existing crossover just north of the existing business access would be closed. The northbound lanes would be transitioned to the east to widen the median to 50 feet. In addition, the crossover currently at this group of businesses would be improved, with turn lanes adequate for trucks serving C. S. Fischer. South of this location, the northbound lanes would transition back to the existing alignment within approximately 1,500 feet.

The median opening at Milepost 130.8, just north of Gina's antiques, would be closed. Just south of this location, where the existing U.S. Route 13 median begins to narrow, improved 12-foot wide paved shoulders and a 16-foot wide raised median would be introduced. This cross section would continue through Temperanceville to Milepost 130. A full intersection would be provided at Route 695, and Old Route 695 at the Chevron station would have right-in/right-out access.

Between Milepost 130 and the Tyson plant entrance, the roadway would widen to provide an 80-foot wide median at the Tyson entrance. All turn lanes would be improved to a 350-foot length to facilitate truck movements. Existing median openings north and south of the Tyson entrance would be closed. The roadway would taper back to its existing width at the Route 757 intersection, where there would be turn lanes for all movements.

Entering the curve just south of Route 757, the northbound lanes would be transitioned eastward to lengthen the curve radius, thereby improving sight distance and the safety of the curve. Chesser Road (Route 692) would be relocated to the north with a new intersection with U.S. Route 13. Existing median openings at existing Chesser Road and to the south of Chesser Road would be closed.

Safety and Transportation Benefits. Alternative 1 improvements will improve the safety and capacity of U.S. Route 13 by reducing conflict points, improving geometrics of both the mainline of U.S. Route 13 and intersections with local roadways.

Potential Impacts. While the potential for impacts to wetlands is relatively minimal through this area, widening of the roadway could potentially encroach upon farmland which abuts either side of the roadway. No previously recorded historic sites or threatened/endangered species were identified in this area.

Similar to the Oak Hall area, additional right-of-way along U.S. Route 13 will be required to construct this alternative. While the right-of-way needs have not been quantified, the potential exists for business and residential relocations in Temperanceville where homes or businesses are in close proximity to the existing roadway right-of-way.

Cost. This improvement is projected to cost $5.6 million to construct.

Temperanceville Alternative 2: Bypass to West

Description. This alternative includes a controlled access four-lane divided highway bypass around Temperanceville, leaving the existing U.S. Route 13 roadway as-is within the bypass limits. The bypass would have four 12-foot lanes, depressed 80-foot median with 10-foot outside shoulders and access limited to existing crossroads.

Beginning just south of Jerusalem Road (Route 694), at Milepost 131.7, Alternative 2 includes the same improvements as Alternative 1 at Big Daddy Home Sales and the C. S. Fischer Poultry area. Widening and lane improvements for the Bypass roadway would begin to the north of C. S. Fischer Poultry, and would incorporate the improved intersection at this location.

Immediately south of C. S. Fischer Poultry, near Milepost 131, the bypass would enter a gentle curve to the west. Just north of Gina's Antiques, a full intersection would connect the bypass with existing U.S. Route 13, providing access to the north end of Temperanceville. The bypass would intersect Saxis Road (Route 695) with a full crossover and intersection approximately ¼ mile west of Route 695's existing intersection with U.S. Route 13. Proceeding south from Saxis Road , the bypass would curve to the east again and proceed nearly due south to tie back into existing U.S. Route 13 adjacent to the Tyson plant.

The Tyson plant would receive a modified driveway north of the plant, intersecting with the new bypass at a full crossover that would continue east as a connector to existing U.S. Route 13. The existing full access driveway for Tyson would be closed, and the southern entrance would remain as a right-in-right out only driveway. Even though the highway would be back on the existing alignment of U.S. Route 13 at this point, the southbound lanes would be relocated to provide a wider median and to set up a full crossover at Route 757. The median opening between the Tyson entrances and Route 757 would be closed. The southernmost group of improvements for Temperanceville under Alternative 2 involve realigning the northbound lanes of U.S. Route 13 at the curve near Milepost 129, thereby improving design speed and safety. Additionally, the intersection with Chesser Road (Route 692) would be realigned to the north and provided with adequate turn lanes.

Safety and Transportation Benefits. The main feature of Temperanceville Alternative 2 is that it forms a four-lane, divided highway bypass around the town. The advantages of a bypass include improved safety within the bypassed portion of the Town, higher roadway capacity on U.S. Route 13 within the Town, a separation of local and through traffic, and less right-of-way impacts to homes and businesses within the Town.

Potential Impacts. A western bypass around Temperanceville would traverse primarily through farmland and thus impact that resource. However, only limited wetland areas would be potentially impacted. No previously recorded historic sites or threatened/endangered species were identified in this area.

The advantage to any bypass alternative in this area, as opposed to widening U.S. Route 13, is that it would not involve direct right-of-way impacts to homes and business along U.S. Route 13. Indirectly, businesses currently along U.S. Route 13 could potentially experience economic impacts associated with the diversion of through traffic.

Cost. This alternative is projected to cost $10.4 million to construct.

Temperanceville Alternative 3: Bypass to East

Description. Temperanceville Alternative 3 includes a bypass to the east of town with four 12-foot lanes, depressed median with 10-foot outside shoulders and controlled access rights.

North of Temperanceville, the improvements to the C.S. Fischer and Big Daddy Homes access would be identical to those for Alternatives 1 and 2. The existing U.S. Route 13 roadway would be widened to a 4-lane divided highway with a 16-foot raised median from approximately adjacent to the Mason lodge south through an improved intersection with Route 695, which would be rebuilt with turn lanes for full access in all directions. South of this intersection, the alignment would continue nearly due south into the wooded area east of U.S. Route 13 and south of Route 2701. A cul-de-sac would be installed on Route 2701 to isolate the residential roadway from the new highway. From this area, the bypass would form a sweeping curve, passing east of the residences to the east of U.S. Route 13, and tying back to U.S. Route 13 immediately south of the Tyson plant. The Tyson access driveway would be lengthened and made into a high capacity intersection for truck access to and from U.S. Route 13. Alternative 3 includes the same improvements near Chesser Road (Route 692) and Route 757 as Alternatives 1 and 2.

Safety and Transportation Benefits. Temperanceville Alternative 3 places a bypass to the east of the south side of town, resulting in less disruption to business frontages than Alternative 1, while keeping the through traffic on Route 13 at the main commercial intersection with Route 695.

Potential Impacts. An eastern bypass around Temperanceville would impact both farmland and forested wetland areas located to the east of town. While no previously identified historic properties or threatened/endangered species were noted in the existing database information, additional investigations would likely be necessary prior to implementation.

The advantage to both bypass alternatives in this area, as opposed to widening U.S. Route 13, is that they would not involve the extent of direct right-of-way impacts to homes and businesses along U.S. Route 13. The eastern bypass, as shown, could potentially impact more homes and businesses through displacement than Alternative 2, the bypass to the west. Indirectly, businesses currently along U.S. Route 13 could potentially experience economic impacts associated with the diversion of through traffic.

Cost. This alternative is projected to cost $6.6 million to construct.

Combined Improvement Alternatives

Alternatives 4 and 5 feature the development of a joint bypass, also known as a controlled access roadway on new alignment. The bypass would start just south of the U.S. Route 13 intersection with Route 175 and would bypass Oak Hall and Temperanceville to the west, tying back to existing U.S. Route 13 south of the Tysons development in Temperanceville.

Alternative 4: Western Bypass of Oak Hall and Temperanceville

Description. Alternative 4 consists of a four-lane controlled-access highway bypassing both Oak Hall and Temperanceville to the west on approximately 200 feet of right-of-way. The connection between this new bypass and existing U.S. Route 13 would be a single flyover interchange that would allow southbound traffic to access existing U.S. Route 13 into Oak Hall via a slip ramp connection. Likewise, traffic moving northbound out of Oak Hall would use a slip ramp occupying the current location of the U.S. Route 13 northbound lanes. Thus movements to and from Oak Hall from the north would be direct. The connection between the bypass and Route 175 in this case would be an at-grade intersection in the existing location.

South of Route 175, the roadway would curve west to intersect Withams Road (Route 703) very near the railroad right-of-way. Withams Road would be elevated on embankment in this vicinity, and would bridge the railroad. Due to its proximity to the railroad, the intersection of Withams Road and the bypass would also be elevated on embankment.

South of Withams Road, the bypass alignment would head nearly due south on a straight alignment. After a conventional intersection with Horsey Road (Route 702), with turn lanes in all directions, the alignment would skirt the tree line behind the agricultural fields between Horsey Road and Saxis Road (Route 695), where there would be another conventional intersection with Saxis Road. South of this intersection, the bypass would curve to the east so as to skirt the Tyson plant to its west and south. A new connection driveway for Tyson would be constructed for Tyson's access with heavy truck accommodations. South of the Tyson plant, the bypass would curve to the south and tie back to the alignment of existing U.S. Route 13 near Milepost 129. Existing U.S. Route 13 would end in a cul-de-sac just south of the existing Route 757 intersection so as to provide access to all properties along existing U.S. Route 13.

Safety and Transportation Benefits. Alternative 4 would remove through traffic from Oak Hall and Temperanceville, minimizing physical impacts on land uses adjacent to existing U.S. Route 13 and would result in a bypass of both towns. The decision to elevate Withams Road (Route 703) and its intersection with the bypass was chosen to minimize direct impacts to residential properties along Withams Road.

Potential Impacts. As shown in Figure 5-4, potentially significant impacts to forested wetlands and farmland are associated with Alternative 4 given the length of this new corridor. Furthermore, there are limited opportunities to avoid such impacts. No previously recorded historic sites or threatened/ endangered species were identified in this area. However, further field investigations for both natural and cultural resources would be necessary during the design and permitting of this alternative.

As with the individual bypass alternatives, this larger bypass would result in less direct right-of-way impacts to homes and businesses along U.S. Route 13 within the towns. However, some homes or properties further outside the towns but within the footprint of the new alignment could potentially be displaced. Also, extensive right-of-way would be needed from property owners outside the towns.

Cost. This alternative is projected to cost $25.0 million to construct.

Alternative 5: Western Bypass of Oak Hall and Temperanceville with Interchange

Description. Alternative 5 is the same joint bypass concept as Alternative 4, except for a full interchange connection between Route 175 and the new bypass highway, rather than the limited movement interchange of Alternative 4. For this scenario, existing U.S. Route 13 would be terminated north of the power line easement, and Oak Hall access would be provided via Withams Road (Route 703) for all movements. Movements and access south of Route 175 would be the same as those for Alternative 4.

Safety and Transportation Benefits. The safety and transportation benefits are similar to Alternative 4, but Alternative 5 uses a higher capacity solution for traffic passing through or interchanging with Route 175.

Potential Impacts. Potential impacts associated with Alternative 5 are similar to those noted for Alternative 4 except all anticipated impacts would be correspondingly greater for Alternative 5 as a result of the additional interchange.

Cost. This alternative is projected to cost $28.9 million to construct.

Public Input on the Oak Hall and Temperanceville Alternatives

At the Town Meeting in this area, attendees generally preferred a bypass over improvements to U.S. Route 13. At this meeting, citizens suggested that another bypass option, starting south of Tyson's, be developed – this led to the development of Alternatives 3 and 4. In addition, citizens suggested that another alternative be developed in the form of one larger bypass around both towns. This suggestion led to the development of Alternatives 4 and 5. Some citizens did favor the improvements to the existing roadway. At the subsequent Public Information Meeting, there was a mix of support for a bypass option and support for Alternative 1, the widening of existing U.S. Route 13.

5.3.3.4 U.S. Route 13 between Mappsville and Nelsonia

These alternatives are conceptually depicted in Figure 5-6.

Mappsville Alternative 1: Improvements to Existing Corridor

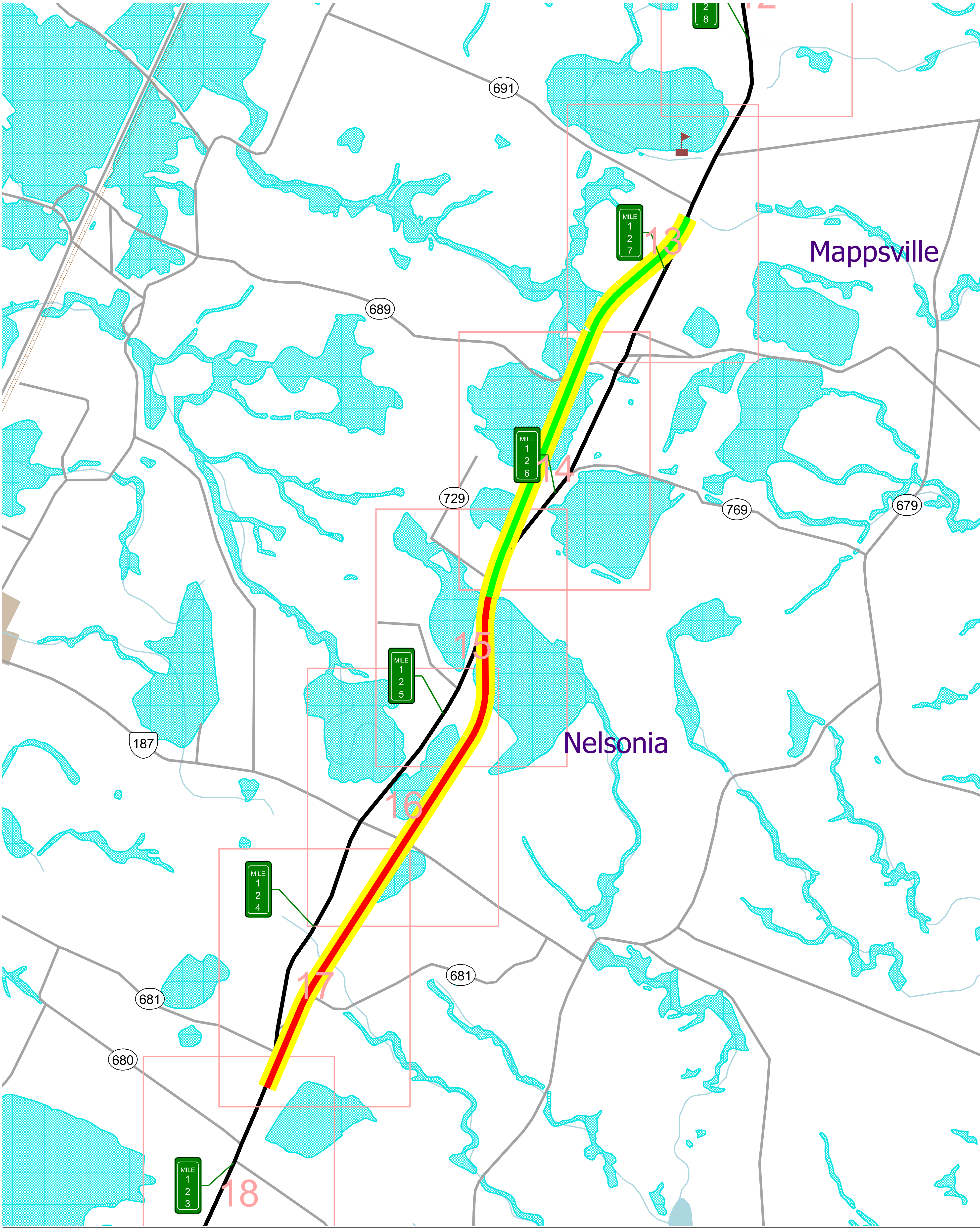
Description. The Mappsville area begins at the northern boundary of the Metompkin District, at Milepost 128. Looking south from this location, U.S. Route 13 curves to the west, and approaches two intersections, the first serving the east leg of Route 691 (John Taylor Road) and Eastern Shore Seafood, the second, approximately 1200 feet to the south, serving the west leg of Route 691(Groton Town Road) and Kegotank Elementary School. The existing median at John Taylor Road is approximately 35 feet wide, and at Groton Town Road the median is merely a 12-foot continuous left-turn lane.

The Alternative 1 improvements would begin approximately 1,200 feet north of John Taylor Road, and the northbound lanes would be rebuilt to the east to provide an 80-foot wide median through the area, to south of Groton Town Road. Turn lanes, 350 feet long, would accommodate heavy vehicle movements at both intersections. The median would taper back and the lanes would meet the existing cross section approximately 2,000 feet south of Groton Town Road, near Milepost 127.

From Milepost 127 to Milepost 126, within the built-up portion of Mappsville, the existing continuous two-way left-turn lane would be removed in favor of a raised median. Localized widening would accommodate turn lanes for all movements at intersections with realigned Mappsville Road (Route 689) and Route 769. Additionally, 12-foot shoulders with curb and gutter would be added to U.S. Route 13 through this same area to serve as continuous right-turn lanes and buffer land uses from the highway.

A reverse frontage road system would provide better heavy vehicle access to the Stuckey's on the east side of U.S. Route 13 immediately south of Mappsville, directing the southbound motorist north to the improved intersection with Route 769 for the left turn movement. Directional turn lanes in the median at Milepost 126 would prevent left turns at this intersection, and the next median crossover to the south would be closed. Alternative 1 includes an improved northbound radius for the curve on U.S. Route 13 at Milepost 125.6, adjacent to the tomato packing facility on the west of the highway. This improvement would widen the median to 80 feet and provide a full crossover with 350-foot turn lanes for all movements to accommodate heavy vehicles. A second reverse frontage road system would provide access to the poultry facility northeast of the new intersection.

Safety and Transportation Benefits. Alternative 1 will improve the safety and capacity of U.S. Route 13 by reducing conflict points, improving geometries on both the mainline of U.S. Route 13 and intersections with local roadways.



Route 13/Wallops Island Access Management Study

We Keep Virginia Moving

Alternative 1
Improvements on Existing Alignment

Alternative 2 Nelsonia Bypass

Alternative 2 Mappsville Bypass

Alternative 3

NWI Wetlands

Aerial Photo Number

Figure 5-6
Mappsville and Nelsonia Alternatives

N

Potential Impacts. Potential impacts associated with Alternative 1 are expected to be limited to small areas of wetlands, as well as farmland and right-of-way impacts to homes and businesses along U.S. Route 13 in Mappsville and near the other improvements. Improvements related to Alternative 1 could potentially impact wetlands primarily in the location of the proposed reverse frontage road.

Cost. This improvement is projected to cost $6.4 million to construct.

Mappsville Alternative 2: Upgraded Improvements to Existing Corridor

Description. Alternative 2 for the Mappsville area includes improvements similar to those in Alternative 1, yet with certain operational improvements. From Milepost 128 south past the Eastern Shore Seafood plant, the improvements would be identical to Alternative 1. The northbound lanes would be rebuilt to the east of their current location, and an 80-foot wide median would carry south past Groton Town Road(Route 691). However, rather than taper back to the existing section at Milepost 127, Alternative 2 would continue with a 16-foot raised median via a relocation to the west of both the northbound and southbound lanes. This improvement would also include new 12-foot paved shoulders, and would continue south to the Stuckey's, where the existing grass median resumes.

Mappsville Road (Route 689) would be relocated with an improved intersection at Mathew's Market, and Route 769 would be relocated at a new full crossover just north of its current intersection. The two median crossovers just south of Milepost 126 would be closed, and the northbound lanes of U.S. Route 13 would be realigned to provide an 80-foot wide median and a full crossover adjacent to the tomato plant at Milepost 125.6. To serve agricultural and heavy vehicles, a reverse frontage road would run parallel to and east of U.S. Route 13, from relocated Route 769 behind Stuckey's, to intersect with a new service road connecting to the new crossover at Milepost 125.6.

Safety and Transportation Benefits. Alternative 2 will improve the safety and capacity of U.S. Route 13 similar to Alternative 1 and will provide additional protection for vehicles using the crossover as a result of the increased median width.

Potential Impacts. Impacts for Alternative 2 would be similar to those for Alternative 1 with the exception of additional impacts associated with the longer reverse frontage road near the poultry waste management facility. The extension of the reverse frontage road in this area appears to traverse additional forested wetland areas.

Cost. This improvement is projected to cost $6.2 million to construct.

Mappsville Alternative 3: Bypass to West

Description. Alternative 3 is a western bypass of Mappsville starting on the north end south of Route 691. The Bypass parallels existing U.S. Route 13 to the west and connects back to U.S. Route 13 near the Tomato Packing Plant. A full intersection is provided with the Bypass and Route 689 and on the southern end a full intersection is provided with a connector road to existing U.S. Route 13 near the Poultry Waste Management Facility.

Safety and Transportation Benefits. The main feature of Mappsville Alternative 3 is that it forms a four-lane, divided highway bypass around the town. The advantages of a bypass include improved safety within the bypassed portion of the Town, less congestion on U.S. Route 13 within the Town, a separation of local and through traffic, and less right-of-way impacts to homes and businesses within the Town.

Potential Impacts. The entire alignment for a bypass alternative to the west traverses large areas of both farmland and forested wetlands. Impacts to these resources would be significantly greater with Alternative 3 than with Alternatives 1 and 2. Implementation of Alternative 3 would require various local, state and federal approvals and permits. No previously recorded historic sites or threatened/ endangered species were identified in this area. However, further field investigations for both natural and cultural resources would be necessary during the design and permitting of this alternative.

As with other bypass alternatives in the corridor, this bypass would result in less direct right-of-way impacts to homes and businesses along U.S. Route 13 within Mappsville. Indirectly, businesses currently along U.S. Route 13 could potentially experience economic impacts associated with the diversion of through traffic.

Cost. This improvement is projected to cost $8.4 million to construct.

Nelsonia Alternative 1: Improvements to the Existing Corridor

Description. Between the intersection at Milepost 125.6 and Route 775, two existing median crossovers would be closed, and the southbound lanes of U.S. Route 13 would be transitioned west to provide an 80-foot median and upgraded intersection with Sherwood Road (Route 775). This intersection would be modified to accommodate a new northern driveway for the Pepsi distributor, and the existing crossover at the Pepsi distributor would be closed. The roadway would transition back to the existing cross section approximately 1000 feet south of this intersection, at Milepost 125.

The crossover at the Christmas Shop would receive upgraded turn lanes. South of the Christmas Shop, Alternative 1 would include realigning the existing southbound lanes, replacing the existing continuous two-way left-turn lane with a new 16-foot raised median and adding 12-foot paved outside shoulders. This improvement would continue south to the existing limit of the continuous two-way left-turn lane. Included is an upgrade of the Route 187 intersection to provide new turn lanes and reconfigure the signal. The southernmost improvements in the Nelsonia area include the realignment of the eastern leg of Route 681 (Littleton Road) to line up with the western leg of Route 681 (Mason Road) at a new intersection with a 50-foot median and turn lanes. These improvements taper back to the existing cross section approximately 1000 feet south of the new intersection.

Safety and Transportation Benefits. Alternative 1 improvements will improve the safety and capacity of U.S. Route 13 by reducing conflict points, improving geometrics on both the main line of U.S. Route 13 and intersections with local roadways.

Potential Impacts. Based on existing database information and mapping, impacts to wetlands, other sensitive resources and farmland are expected to be minimal. Additional right-of-way will be required from homes and businesses along U.S. Route 13 in Nelsonia but residential or business displacements are not anticipated.

Cost. This improvement is projected to cost $4.9 million to construct.

Nelsonia Alternative 2: Eastern Bypass

Description. Alternative 2 brings the through movement of U.S. Route 13 onto a bypass east of Nelsonia. South of the new crossover at Milepost 125.6, the mainline would be rebuilt to continue curving to the east, and would pass behind the Pepsi distributor. A connection roadway intersecting the new bypass would allow access back to existing U.S. Route 13 just north of Sherwood Road (Route 775).

After turning generally parallel to and running east of existing U.S. Route 13, the bypass would intersect Route 187 approximately 1000 feet east of existing U.S. Route 13. The bypass alignment would continue to the southwest, intersecting with the eastern leg of Route 681 (Littleton Road). Littleton Road would be extended to the existing lanes of U.S. Route 13 to provide access to the south portion of Nelsonia, and the western leg of Route 681 (Mason Road). The bypass ties back to existing U.S. Route 13 approximately at Milepost 123.3.

Safety and Transportation Benefits. A bypass will remove through traffic from existing U.S. Route 13 and improve overall safety within the bypassed portion of the Town. The four-lane bypass will provide higher capacity than the widening of U.S. Route 13 on existing alignment. There will be less right-of-way impacts to homes and businesses along U.S. Route 13 near Nelsonia.

Potential Impacts. Alternative 2 traverses existing farmlands, forest, and wetlands in this corridor. Impacts to these resources would be significantly greater with Alternative 2 than with Alternative 1. Implementation of Alternative 2 would require various local, state and federal approvals and permits. While no previously identified historic properties or threatened/endangered species were noted in the existing database information, additional investigations would likely be necessary prior to implementation.

As with other bypass alternatives in the corridor, this bypass would result in less direct right-of-way impacts to homes and businesses along U.S. Route 13 within Nelsonia. Indirectly, businesses currently along U.S. Route 13 could potentially experience economic impacts associated with the diversion of through traffic.

Cost. This improvement is projected to cost $8.2 million to construct.

Mappsville and Nelsonia Alternative 3: Joint Bypass

Description. This Alternate provides a joint bypass of both Mappsville and Nelsonia with a single controlled access facility on approximately 200 feet of right-of-way. In Mappsville, the Joint Bypass is similar to the Mappsville Alternative 3 north of Kegotank Elementary School. However, just south of the improved intersection at Route 691 (Groton Town Road), the controlled access bypass would tie to the existing U.S. Route 13 lanes and immediately sweep to the west. Running approximately parallel to and 800 feet west of U.S. Route 13, the bypass would intersect with a relocated portion of Mappsville Road (Route 689), which would serve as a connector back to the existing U.S. Route 13 corridor in Mappsville.

Continuing south, the bypass would pass between the tomato facility and the existing home at approximate Milepost 125.6. Still a controlled access highway, the alignment would then sweep to the east into the Nelsonia area, passing behind the Pepsi distributor to the east. From this point, the Nelsonia portion of Alternative 3 is similar to Alternative 2 in Nelsonia.

Safety and Transportation Benefits. This alternative combines the benefits of the Mappsville bypass and Nelsonia bypass.

Potential Impacts. As shown in Figure 5-6, potentially significant impacts to forested wetlands and farmland are associated with Alternative 3 given the length of this new corridor. Furthermore, there are limited opportunities to avoid such impacts due to the extent of wetlands and farmland throughout this area on both sides of the road. No previously recorded historic sites or threatened/endangered species were identified in this area. However, further field investigations for both natural and cultural resources would be necessary during the design and permitting of this alternative.

As with the individual bypass alternatives, this larger bypass would result in less direct right-of-way impacts to homes and businesses along U.S. Route 13 within both towns. However, extensive right-of-way would be needed from property owners outside the towns.

Cost. This improvement is projected to cost $16.6 million to construct.

Public Input on the Mappsville and Nelsonia Area Alternatives

Most of the comments received for this area pertained to Mappsville improvement alternatives. At the Town meeting conducted in this area, it was suggested that for Alternative 1, U.S. Route 13 be widened towards the west side rather than to the east. Suggestions to add a western bypass for Mappsville led to Alternative 3.

5.3.3.5 U.S. Route 13 in the Mary N. Smith Area

Description. The roadway alignment of U.S. Route 13 between Accomac (starting at the northern intersection with Business Route 13) and Parksley Road (Route 176) is characterized by a meandering, curvilinear path with access and sight distance issues. A portion of this section (between MP 118.84 and 116.30) is undivided with a center two-way left-turn lane. There are a significant number of single-family homes here, particularly along southbound U.S. Route 13. The improvements developed for this roadway section involve three major efforts as shown in Figure 5-7 and Figure 5-8:

- Realignment of both northbound and southbound travel lanes to provide a straighter alignment.
- Construction of entire roadway section as a divided roadway.
- Signage to indicate the wider shoulders on U.S. Route 13 as a designated bicycle route between Business Route 13 and Metopkin Road (Route 679).

In addition, the existing acceleration lane from northbound Business Route 13 onto northbound U.S. Route 13 would be removed, due to poor sight distance. The intersection of U.S. Route 13 with Business Route 13 and Route 663 (Mary N. Smith Road) would be upgraded to provide improved turn lanes and a wider, 50-feet wide median. Also, on southbound U.S. Route 13, one-way frontage roads would be constructed at two locations, primarily using existing pavement from the southbound travel lanes, which would be relocated to the east.

Safety and Transportation Benefits. The improved alignment and the provision of a median should improve overall safety of this section of U.S. Route 13. The purpose of designating U.S. Route 13 as a bicycle route in this area is to provide a signed connection between Route 600 in Accomac and Route 679, two routes currently proposed for bicycle accommodation in the regional bicycle plan.

Potential Impacts. Based on existing database information and mapping, impacts to wetlands, other sensitive resources and farmland are expected to be minimal. Additional right-of-way will be required from homes and businesses along U.S. Route 13 but displacements are not anticipated. The construction of two frontage roads will impact the direct access to U.S. Route 13 but should make travel safer on U.S. Route 13.

Cost. These improvements are projected to cost $7.0 million to construct.

Public Input on the Mary N. Smith Alternative

The need for safety improvements in this area was originally identified by the Citizen Advisory Committee (CAC) early in the study process and confirmed by subsequent field reconnaissance efforts. One of the issues specifically noted by the CAC was the difficulty in turning left out of Mary N. Smith Road due to restricted sight distance. In addition, the CAC noted poor sight distance for motorists traveling northbound on Business Route 13 with U.S. Route 13 northbound. No public comments were made with respect to the proposed improvements as described above.

5.3.3.6 Route 13 in the Whispering Pines Area

Description. The improvement developed for this location involves the replacement of the existing flashing lights (which constantly flash) to warning signs that are signal activated. The second part of this improvement is the realignment of Business Route 13 (Tasley Road and Front Street) to intersect with U.S. Route 13 at a right angle. This proposed improvement is shown in Figure 5-9.

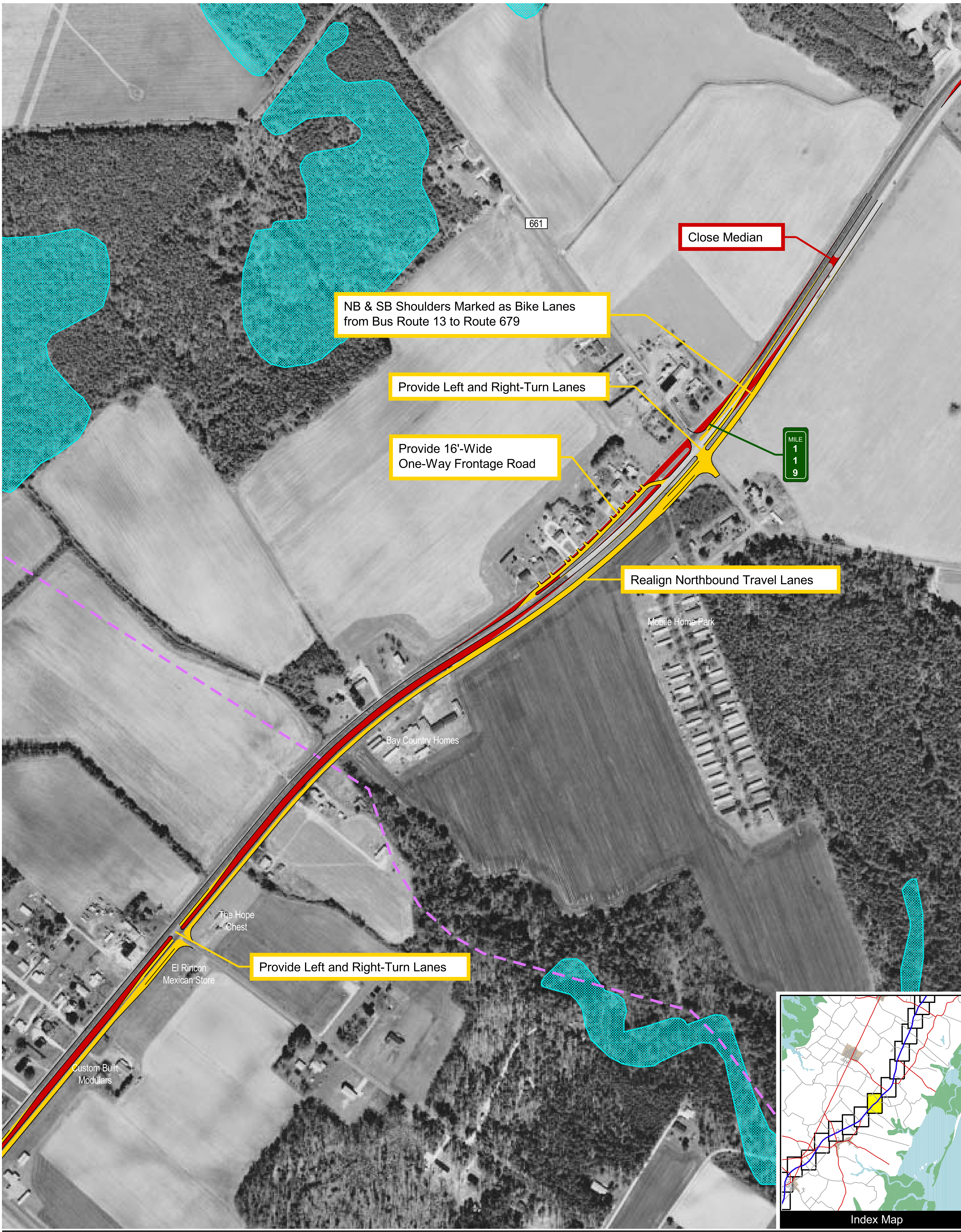
Safety and Transportation Benefits. Throughout the study, Eastern Shore residents identified the Whispering Pines signal, located at the intersection of U.S. Route 13 with Business Route 13 (between Onley and Accomac), as a hazardous location. Vehicles have been frequently observed running the red light at this location, apparently as if they did not notice the traffic signal lights. This intersection has advance flashing signal warning signs in both directions, yet on two separate occasions the study team observed vehicles inadvertently running the red light nearly causing vehicular crashes.

Potential Impacts. No wetlands are anticipated to be impacted by these improvements but field investigations should be conducted prior to construction to confirm this. No previously recorded historic structures or threatened and endangered species are located in this area. Impacts associated with this alternative appear to be limited to farmlands and right-of-way in the vicinity of the interchange realignment.

Cost. This improvement is projected to cost $1.1 million to construct.

Public Input on the Whispering Pines Alternative

The Citizens Advisory Committee identified the Whispering Pines intersection as a major safety concern of the citizens of the Eastern Shore. No comments have been provided with respect to the proposed improvements as shown.



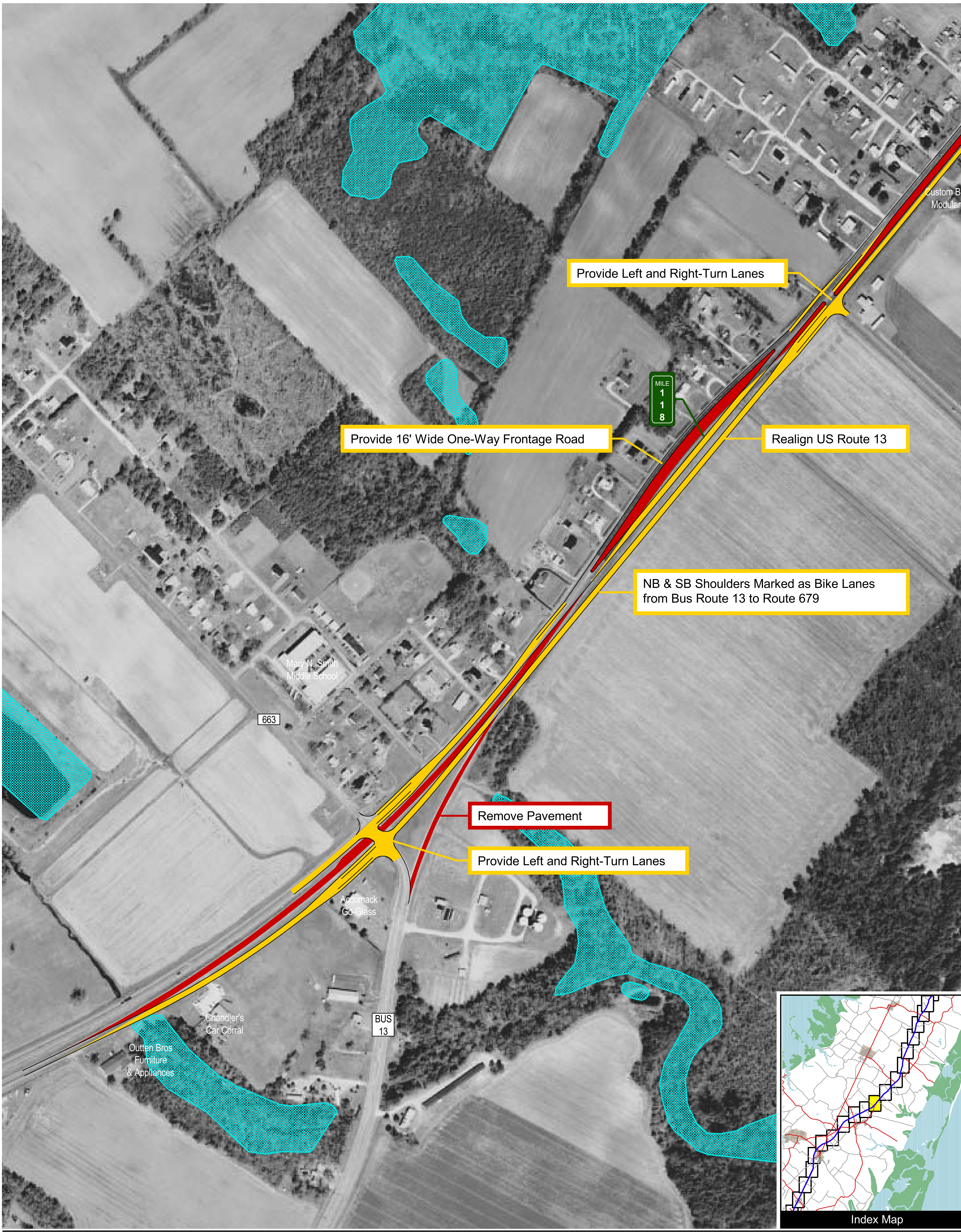
- New Pavement
- Pavement Removal
- Shoulder Widening to 12 feet
- Clear Vegetation
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Business Names
- NWI Wetland

Figure 5-7
Sheet 22 of 80
County - Accomack

N

Scale: 1" = 400'

Aerial imagery flown on March 29, 2000



Route 13/Wallops Island
Access Management Study

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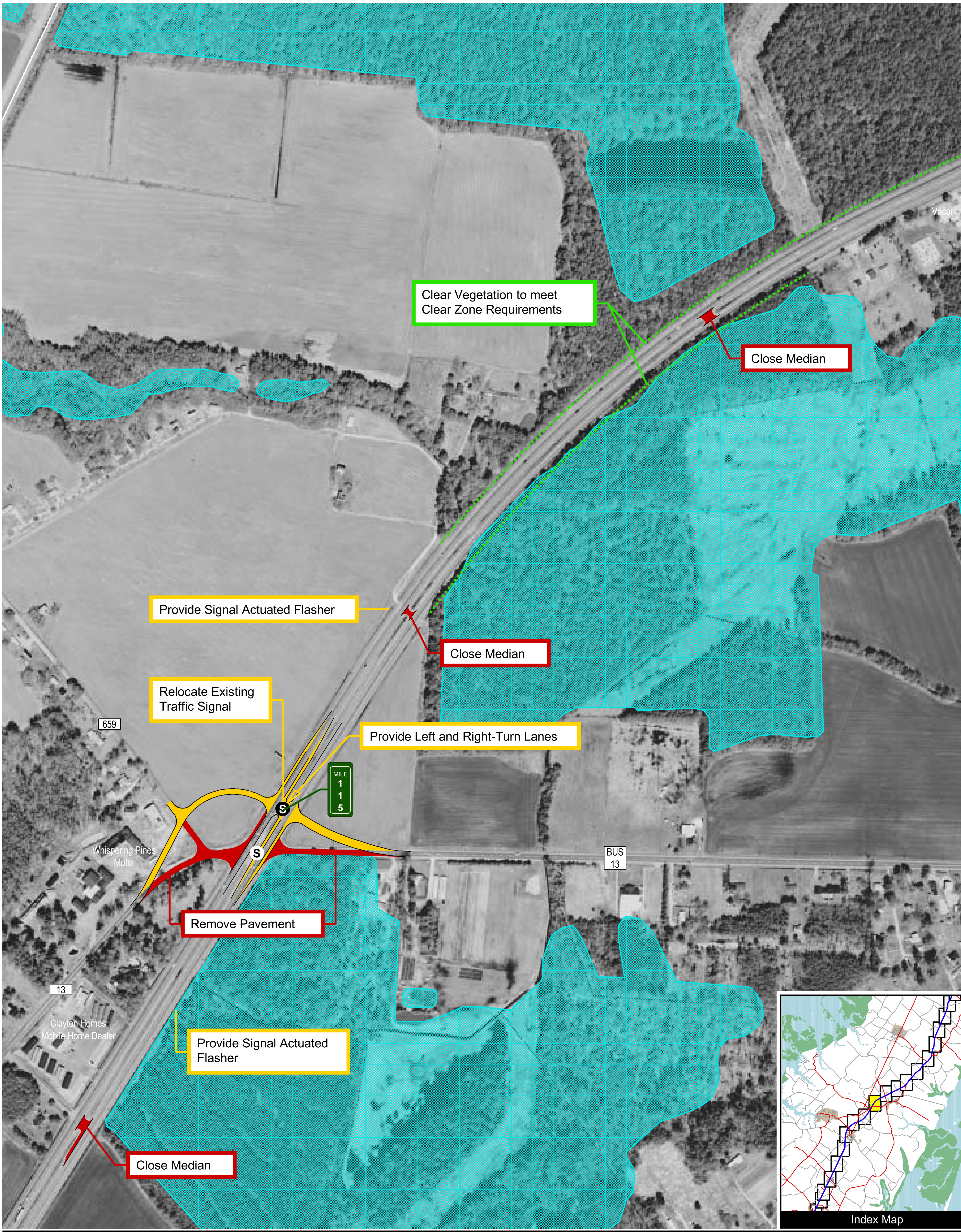
Aerial imagery flown on March 29, 2000

- New Pavement
- Pavement Removal
- Shoulder Widening to 12 feet
- Clear Vegetation
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Text Business Names
- NWI Wetland
- Historic

Figure 5-8
Sheet 23 of 80
County - Accomack

N

Scale: 1" = 400'



Route 13/Wallops Island
Access Management Study

VDOT
We Keep Virginia Moving

Aerial imagery flown on March 29, 2000

- New Pavement
- Pavement Removal
- Shoulder Widening to 12 feet
- Clear Vegetation
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Text Business Names
- NWI Wetland
- Historic

Figure 5-9
Sheet 26 of 80
County - Accomack

N

Scale: 1" = 400'

5.3.3.7 U.S. Route 13 in the Onley Area

Description. U.S. Route 13 through Onley is surrounded by commercial development. To minimize travel on U.S. Route 13 between this development, a 24-foot local roadway connection is proposed between Chesapeake Square shopping center and Route 179. In addition, the existing left and right-turn lanes would all be improved to provide a minimum 12-foot width, 200 feet of storage, with a 200-foot taper. This improvement is shown in Figure 5-10.

Safety and Transportation Benefits. U.S. Route 13 through Onley is congested as a result of traffic from Chesapeake Square shopping center and Four Corner Plaza. Chesapeake Square shopping center does not have direct access from Route 179, and as a result, traffic from Route 179 must turn north onto U.S. Route 13 for a very short distance, and then make a left turn into the shopping center. This stretch of road had one of the highest crash rates within the entire Eastern Shore. These improvements are recommended to take a portion of local traffic off U.S. Route 13 by facilitating travel between Route 179 and the Chesapeake Square shopping center.

Potential Impacts. Based on available database information and mapping, no impacts to sensitive resources are anticipated as a result of this alternative. This should be confirmed in the field prior to construction.

Costs. This improvement is projected to cost $2.0 million to construct.

Public Input on the Onley Area Alternative

The need for safety improvements in this area was identified by citizens throughout the study process. No comments have been received regarding the proposed improvements as presented.

5.3.3.8 U.S. Route 13 in the Melfa, Keller and Painter Area

For each town, two similar alternatives were developed. In order to provide improved roadway geometrics, the Eastern Shore railroad right-of-way is proposed to be either shifted to the east within the town boundary (Alternative 1), or relocated out of town (Alternative 2). These two alternatives are conceptually depicted in Figure 5-11.

The town of Melfa and some citizens from Melfa, Keller and Painter suggested a western highway bypass of their towns. These solutions were not studied in any detail. The impact on wetlands to the west of all three towns, and the barrier of a limited access highway on the west with the railroad left in its current location as an eastern barrier, were not viewed as a reasonable solution.

Alternative 1: Shift Railroad Right-of-Way within Town

Description. The first alternative would shift the existing railroad right-of-way and railroad tracks by 30 feet to the east in order to provide an improved roadway cross section on U.S. Route 13. With this shift, a 20-foot wide median would be provided as shown in the proposed cross section detail in Figure 5-12. In the southbound travel direction, a 12-foot wide shoulder would be provided for access to existing businesses. A 10-foot wide shoulder would be provided on northbound U.S. Route 13, primarily for safety reasons.

Safety and Transportation Benefits. The towns of Melfa, Keller and Painter developed directly on the rail line. U.S Route 13 was then built just to the west, parallel to the rail line, and by 1968, with the widening of U.S. Route 13 to a four-lane, divided roadway, the two transportation facilities were left too close together with little to no room for further improvement. The Eastern Shore railroad is currently a one-track railroad operating on a two-track (width) right-of-way, which is 66 feet wide. This makes the development of roadway improvements to U.S. Route 13 difficult to accomplish without the relocation of the Eastern Shore railroad.

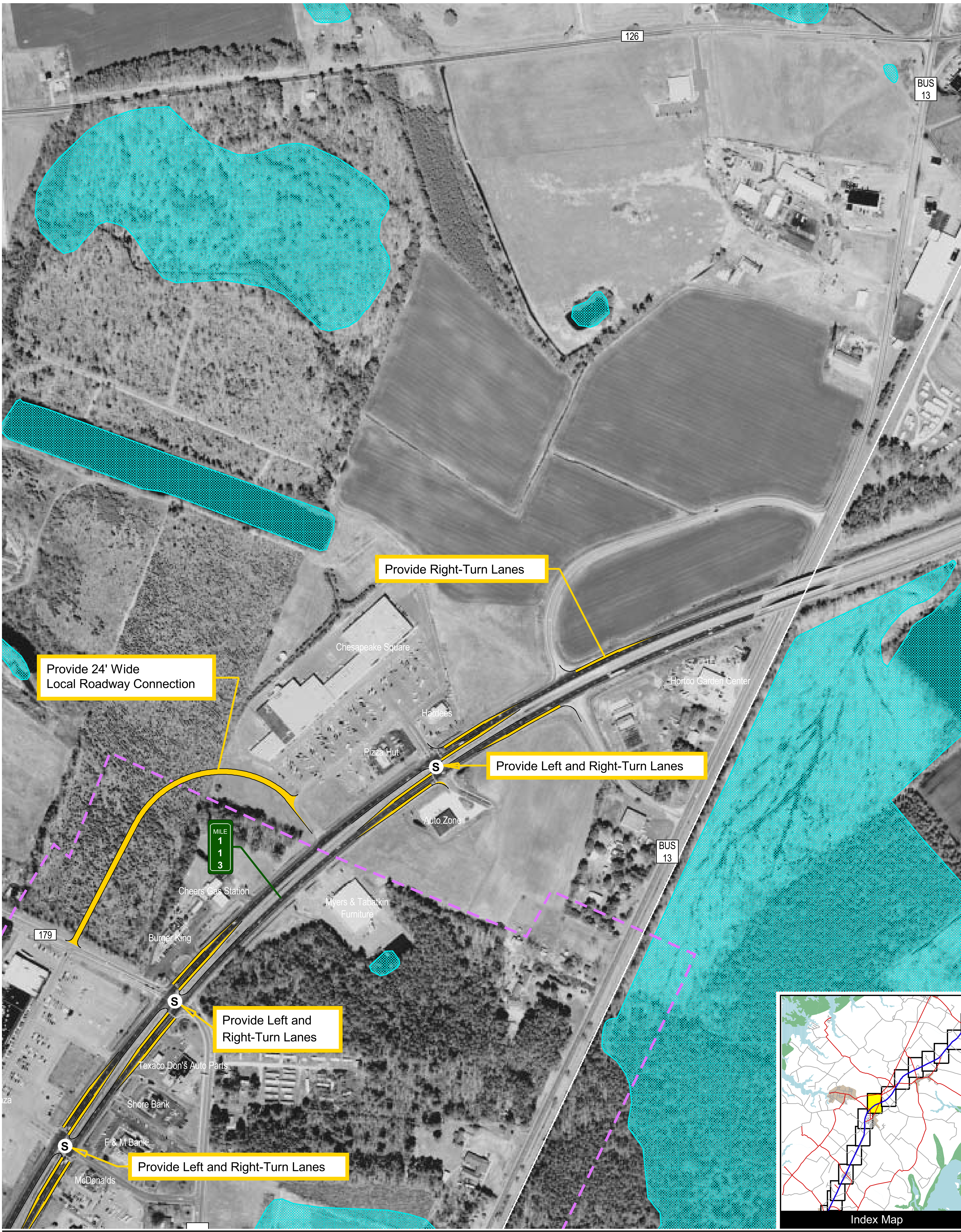
Potential Impacts. Based on available database information and mapping, some impacts to sensitive resources are anticipated as a result of this alternative including wetlands, farmland and historic resources. Areas of wetlands, farmland and potentially significant historic sites are in close proximity to the existing railroad and could be affected depending on exact limits of these resources and the limits of construction needed. At this time, these impacts have not been quantified. Additional field investigations should be conducted to more accurately determine the limits of construction and potential impacts to these resources.

Cost. This improvement is projected to cost $15.2 million to construct.

Alternative 2: Relocated Railroad Right-of-Way Outside Town

Description. A second option would be the total removal/realignment of the Eastern Shore railroad to an undetermined alignment to the east of all three towns. With this option, the existing railroad right-of-way would be acquired and used for highway expansion. As shown in the cross section detail in Figure 5-12, this would allow for a 50-foot wide median with left and right-turn lanes.

Safety and Transportation Benefits. The second rail relocation concept, Alternative 2, will allow for even greater flexibility for improvements on U.S. Route 13 and for accessible development along U.S. Route 13 than Alternative 1.



Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

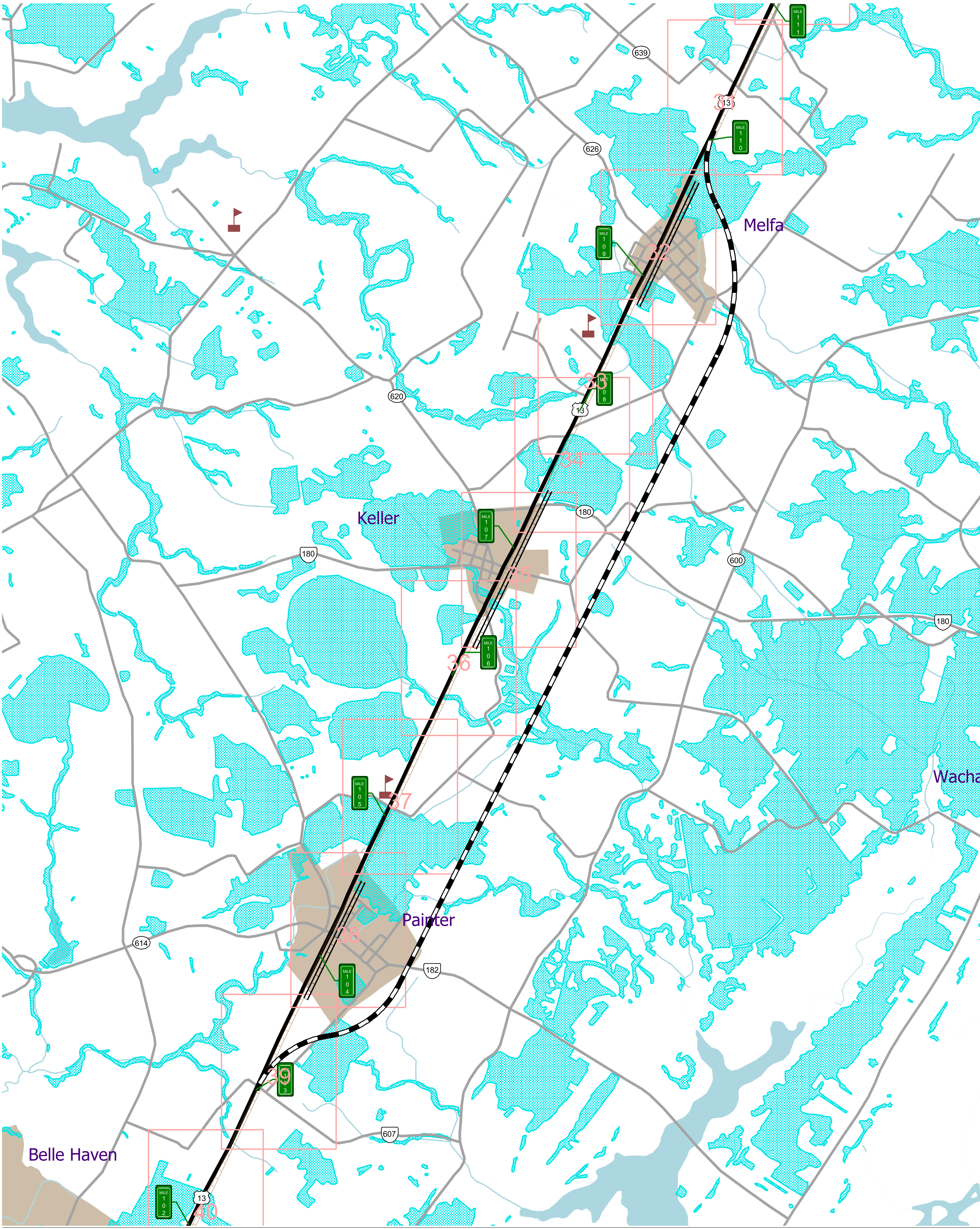
Aerial imagery flown on March 29, 2000

- New Pavement
- Pavement Removal
- Shoulder Widening to 12 feet
- Clear Vegetation
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Business Names
- NWI Wetland

Figure 5-10
Sheet 28 of 80
County - Accomack

N

Scale: 1" = 400'



U.S. Route 13
Improvements on Existing Alignment

Alternative 1 Shift Railroad ROW

Alternative 2 Relocate Railroad ROW

NWI Wetlands

Aerial Photo Number

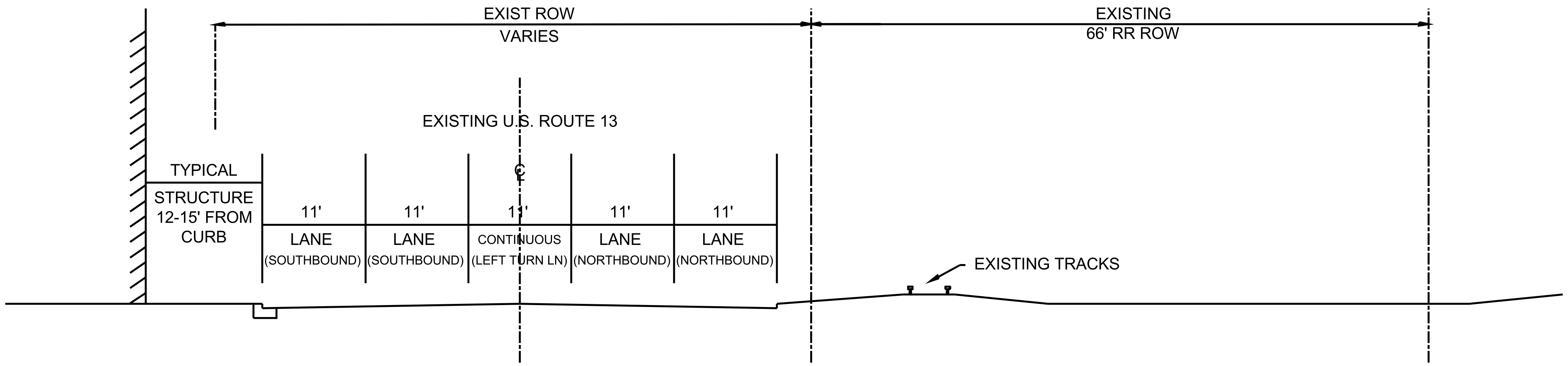
Route 13/Wallops Island
Access Management Study

We Keep Virginia Moving

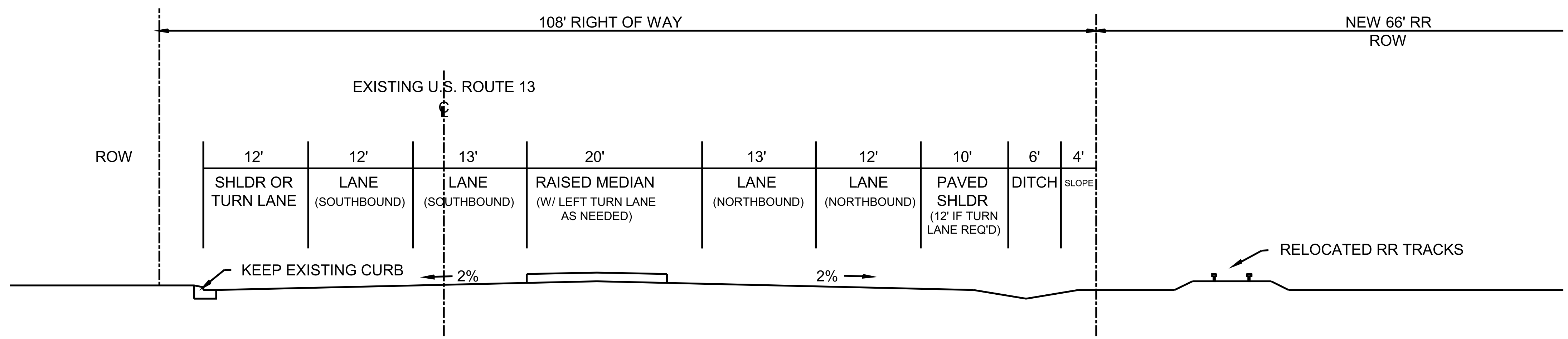
N

Figure 5-11
Melfa, Keller, Painter Alternatives

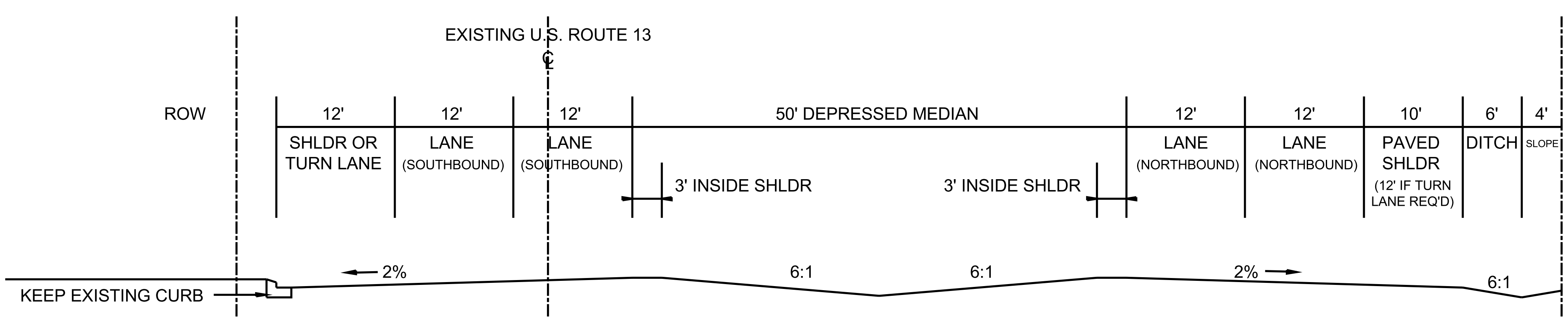
Figure 5-12
Melfa, Keller, Painter Cross Sections



EXISTING TYPICAL CROSS SECTION; PAINTER, KELLER, MELFA (EXISTING RIGHT OF WAY VARIES)
LOOKING NORTH



ALTERNATE 1
URBAN 20' RAISED MEDIAN, RAILROAD RELOCATED EASTWARD WITHIN CORRIDOR (108' RIGHT OF WAY)
LOOKING NORTH
PAINTER, KELLER, MELFA, NASSAWADOX



ALTERNATE 2
RURAL 50' DEPRESSED MEDIAN, RAILROAD RELOCATED EASTWARD OUT OF CORRIDOR (136' RIGHT OF WAY)
LOOKING NORTH
PAINTER, KELLER, MELFA, NASSAWADOX

Potential Impacts. Based on available database information and mapping, some impacts to sensitive resources are anticipated as a result of this alternative including wetlands, farmland and historic resources. Areas of wetlands, farmland and potentially significant historic sites are in close proximity to the existing railroad and could be affected depending on exact limits of these resources and the limits of construction needed. At this time, these impacts have not been quantified. Additional field investigations should be conducted to more accurately determine the limits of construction and potential impacts to these resources.

However, the relocation of the rail line onto a new alignment could potentially have significant impacts to wetlands, farmland and other resources. For this reason, Alternative 2 is expected to have far greater impacts than Alternative 1.

Cost. This improvement is projected to cost $30.6 million to construct.

Public Input on the Melfa/Keller/Painter Area Alternatives

The majority of comments related to improvements in this area were in favor of Alternative 1, realigning the railroad slightly as opposed to moving the railroad a substantial distance from its current location. Citizens were hesitant to support such a massive relocation without knowing the exact location, its potential impacts, and potentially prohibitive cost.

5.3.3.9 U.S. Route 13 in the Exmore Area

Alternative improvements have been prepared for southern Exmore in the vicinity of the Shore Plaza shopping center. Currently, two traffic signals are located on U.S. Route 13 very close together (900 feet) at the intersections of Broadwater Road (Route 652) and the shopping center main driveway. Given the amount of land available for future commercial development, roadway improvements and signal coordination to accommodate projected growth while maintaining reasonable travel speeds was given priority. In addition, because this area is a destination for shoppers from central and northern Northampton County, there was a desire to provide alternative access, where possible, so that customers could reach shopping locations without having to travel on U.S. Route 13.

Alternative 1: Bypass Between Bayside Road and Broadwater Road

Description. The first concept provides a bypass roadway for drivers traveling between the Bayside Road (Route 618), Exmore and points north of Exmore. A local, two-lane road with 3 foot graded shoulders would connect Bayside Road with Broadwater Road. This road would end directly opposite an entrance to the Shore Plaza shopping center. Turn lane improvements would be constructed at the U.S. Route 13 intersections with Route 604, Broadwater Road and Route 1043. These proposed improvements are shown in Figure 5-13.

Safety and Transportation Benefits. This alternative would keep current and future shopping center traffic from entering and exiting U.S. Route 13, which would maintain the flow of traffic on U.S. Route 13, thus improving safety and lowering travel time.

Potential Impacts. Based on available mapping, most of the bypass alignment traverses forested wetlands and would therefore require local, state and federal permits. No other previously identified resources are located in this area. Additional investigations should be conducted for wetlands and other sensitive resources prior to implementation.

Cost. These improvements are projected to cost $1.8 million to construct.

Alternative 2: Relocate Shore Plaza Signal

Description. The second alternative maintains corridor capacity by relocating the existing traffic signal at the Shore Plaza shopping center to a new driveway 500 feet north. This proposed improvement is shown in Figure 5-14.

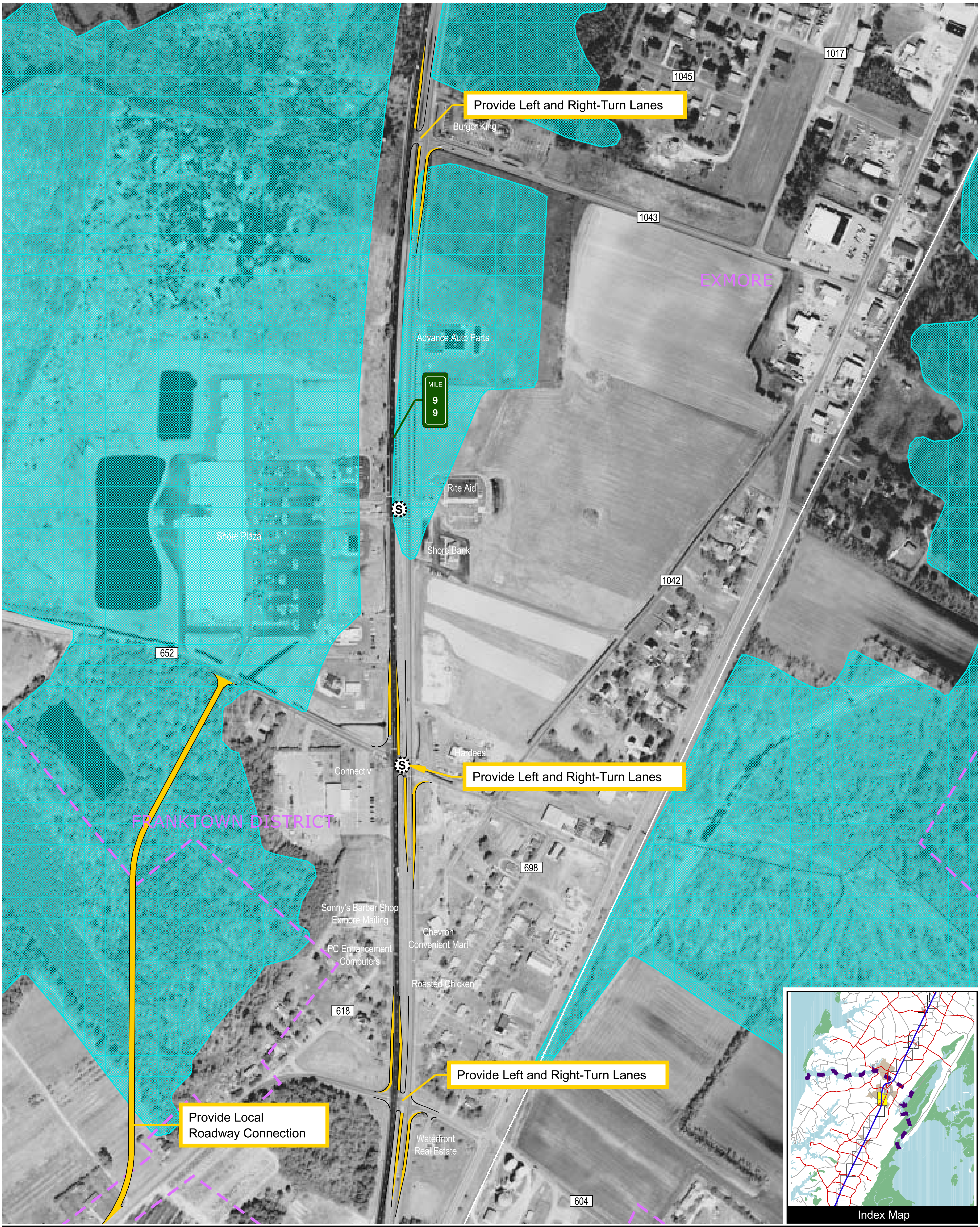
Safety and Transportation Benefits. Alternative 2 would have the same benefit as Alternative 1, plus it would improve the close spacing to the Broadwater Road signal and the site design of the two businesses on the east side of the intersection. A Rite Aid pharmacy and a Shore Bank are located on the northeast and southeast quadrants of this intersection, respectively. The Rite Aid parking lot, however, extends almost directly to the intersection. This signal therefore cannot effectively be used for any future development on land behind these two businesses. The relocation of this signal would also serve any future development on undeveloped commercial property located just north of Shore Plaza.

Potential Impacts. Given the existing development in this area, no impacts to natural or cultural resources are anticipated for this improvement.

Cost. This improvement is projected to cost $2.8 million to construct.

Public Input on the Exmore Alternatives

No public comments have been provided on these alternative options to date.



Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

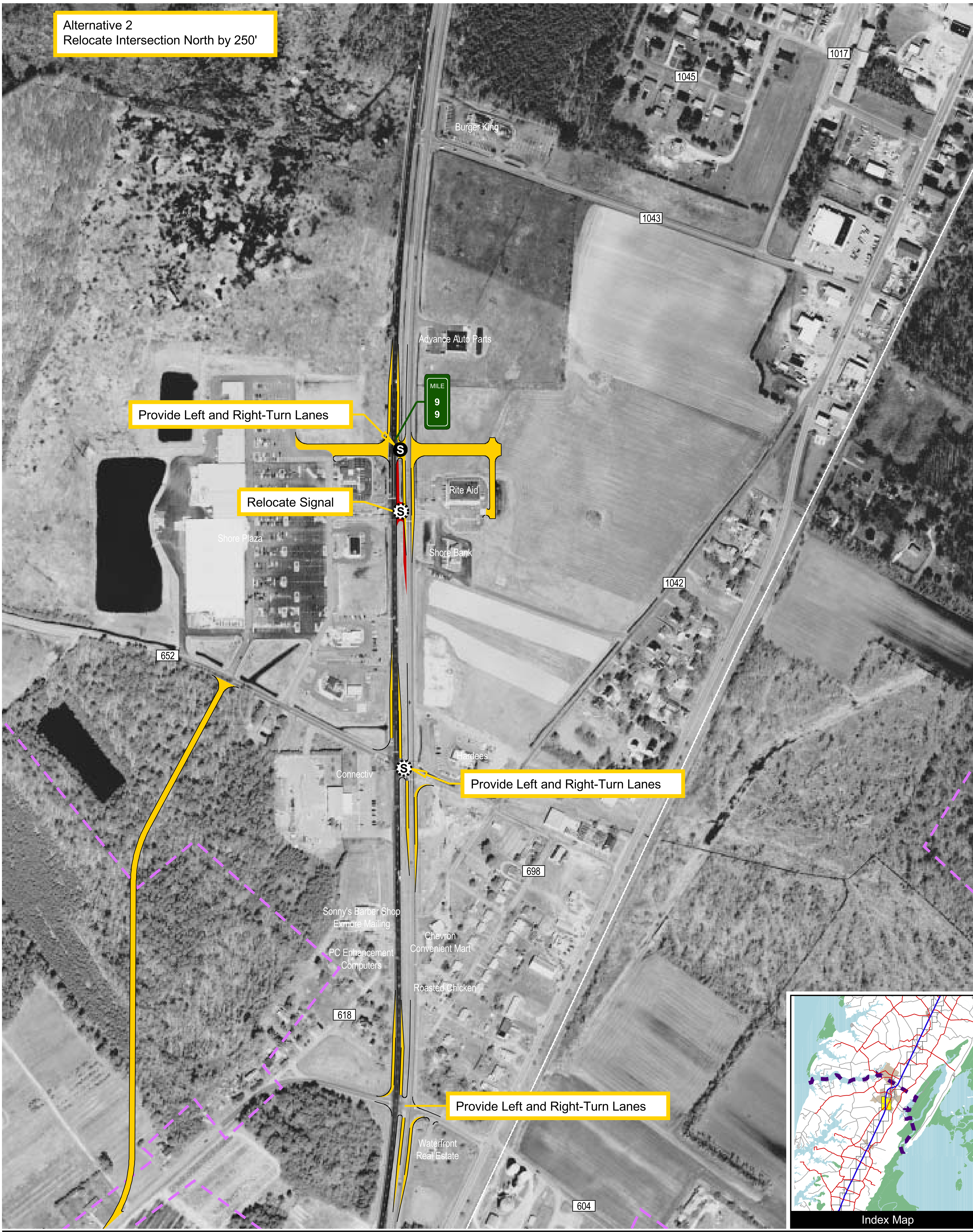
Aerial imagery flown on March 29, 2000

- Proposed Traveled Way
- Alternative Improvement Concept
- Pavement Removal
- Shoulder Widening to 12 feet
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Business Names
- NWI Wetland

Figure 5-13
Sheet 43 of 80
County - Northampton
Alternative 1

N

Scale: 1" = 400'



Route 13/Wallops Island Access Management Study

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- Right of Way
- Business Names
- NWI Wetland

Figure 5-14
Sheet 43 of 80
County - Northampton
Alternative 2

N

Scale: 1" = 400'

Aerial imagery flown on March 29, 2000

5.3.3.10 U.S. 13 in the Nassawadox Area

Two potential alternatives were developed for the Nassawadox area. In order to provide improved roadway geometrics, the Eastern Shore railroad right-of-way is proposed to be shifted within town (Alternative 1), or relocated out of town (Alternative 2). These two alternatives are conceptually depicted in Figure 5-15.

Alternative 1: Shift Railroad Right-of-Way Within Town

Description. The first alternative would shift the existing railroad right-of-way and railroad tracks by 30 feet to the east in order to provide an improved roadway cross section on U.S. Route 13. With this shift, a 20-foot wide median would be provided as shown in the proposed cross section detail in Figure 5-12. Existing at-grade railroad crossings would be closed at Franktown Road (Route 609) and Route 712. In addition, in the southbound travel direction, a 12-foot wide shoulder would be provided for access to existing businesses. A 10-foot wide shoulder would be provided on northbound U.S. Route 13, primarily for safety reasons.

Safety and Transportation Benefits. Similar to Melfa, Keller and Painter in Accomac County, Nassawadox developed directly on the rail line. U.S. Route 13 was then built just to the west, paralleling the rail line, and by 1968, with the widening of U.S. Route 13 to a four-lane, divided roadway, the two transportation facilities were left too close together with little to no room for further improvement. As with the railroad relocation recommended for the three towns to the north, the Eastern Shore railroad is currently a one-track railroad operating on a two-track (width) right-of-way, which is 66 feet wide. This makes the development of roadway improvements to U.S. Route 13 difficult to accomplish without the relocation of the Eastern Shore Railroad.

Potential Impacts. Based on available database information and mapping, some impacts to sensitive resources are anticipated as a result of this alternative including wetlands, farmland and historic resources. Areas of wetlands, farmland and potentially significant historic sites (i.e., VA Eastern Shore Produce Exchange building near Route 609) are in close proximity to the existing railroad and could be effected depending on exact limits of these resources and the limits of construction needed. At this time, these impacts have not been quantified. Additional field investigations should be conducted to more accurately determine the limits of construction and potential impacts to these resources.

Cost. This improvement is projected to cost $4.4 million to construct.

Alternative 2: Relocated Railroad Right-of-Way Outside Town

Description. A second option would be the total removal/realignment of the Eastern Shore railroad to an undetermined location to the east of Nassawadox. With this option, the existing railroad right-of-way would be acquired and used for highway expansion. As shown in the cross section detail in Figure 5-12, this would allow for a 50-foot wide median with left- and right-turn lanes.

Safety and Transportation Benefits. The second rail relocation concept considered for this study is thought to allow for even greater flexibility for improvements to U.S. Route 13 and improved safety along U.S. Route 13 than Alternative 1.

Potential Impacts. Based on available database information and mapping, some impacts to sensitive resources are anticipated as a result of this alternative including wetlands, farmland and historic resources. Areas of wetlands, farmland and potentially significant historic sites (i.e., VA Eastern Shore Produce Exchange building near Route 609) are in close proximity to the existing railroad and could be effected depending on exact limits of these resources and the limits of construction needed. At this time, these impacts have not been quantified. Additional field investigations should be conducted to more accurately determine the limits of construction and potential impacts to these resources.

However, the relocation of the rail line onto a new alignment could potentially have significant impacts to wetlands, farmland and other resources. For this reason, Alternative 2 is expected to have far greater impacts than Alternative 1.

Cost. This improvement is projected to cost $7.0 million to construct.

Public Input on the Nassawadox Alternatives

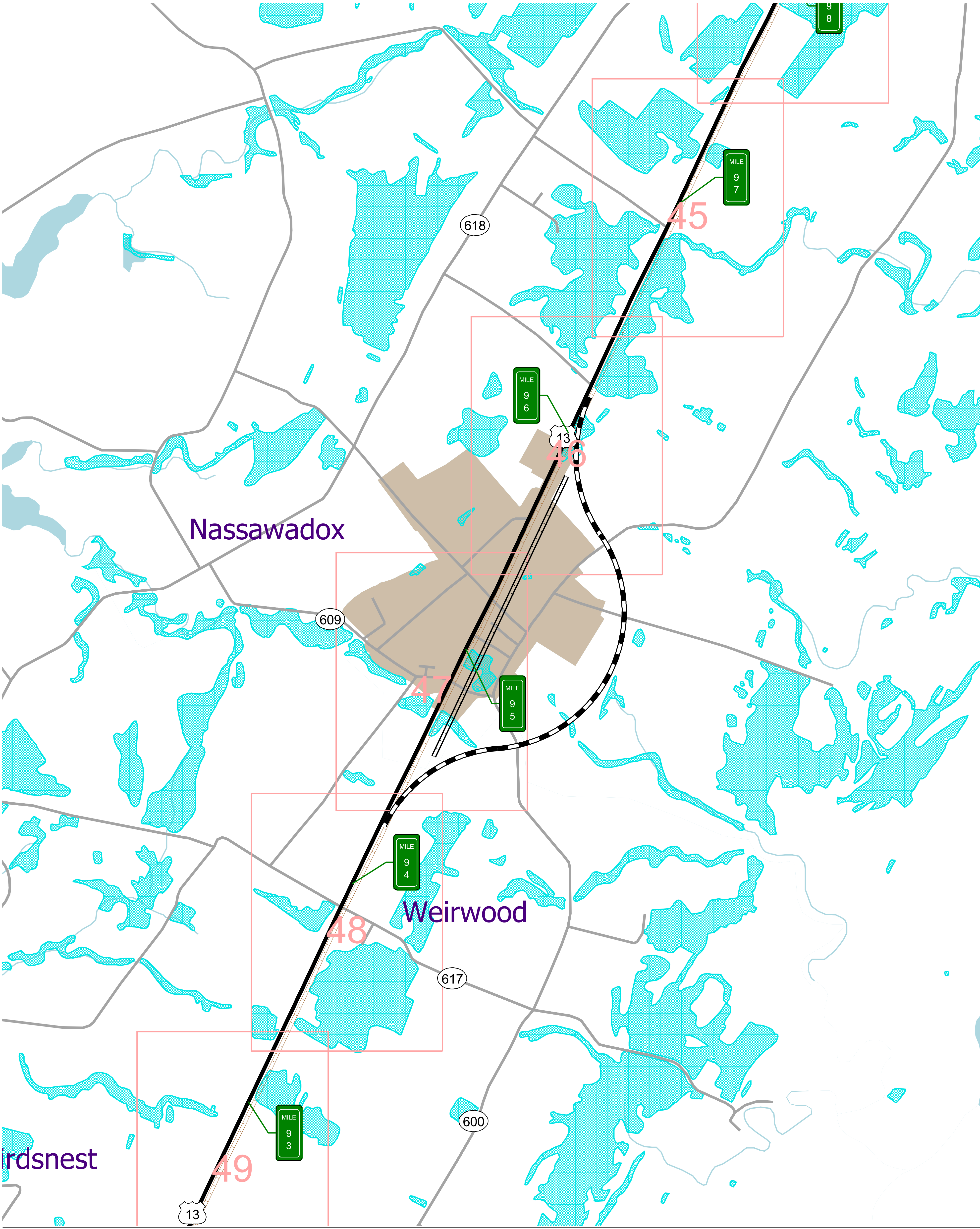
Input from the Citizen Advisory Committee and from the public meetings in November 2001 indicated a preference for Alternative 1. As with the Keller, Painter and Melfa railroad relocation alternative, there were concerns over the unknown effects of moving the railroad outside of the corridor, such as impacts on private property and the potentially prohibitive cost. There were suggestions for a highway bypass of Nassawadox, but an alternative was not developed because of the magnitude of potential impacts on environmentally sensitive areas, farmland and private property.

5.3.3.11 U.S. Route 13 in the Machipongo Area

A total of five improvement alternatives were developed for the Machipongo area, roughly the area between MP 90 and MP 89. The presence of Northampton Middle School immediately to the west on Young Street (Route 627) and commercial businesses (B&B Chevron and the Great Machipongo Clam Shack) on Route 627 to the east has made this section of U.S. Route 13 a significant cross roads in central Northampton County. The existing median crossovers, at Young Street and Machipongo Road (both Route 627) are only 30 feet wide.

Alternative 1: Route 627 Consolidated Median Crossing Near Clam Shack

Description. The first alternative consists of the realignment of Young Street and Machipongo Road to intersect at one intersection. This improvement would also include the widening of U.S. Route 13 to provide a 50-foot wide median at this one improved intersection. This proposed improvement is shown in Figure 5-16.



U.S. Route 13
Improvements on Existing Alignment

Alternative 1 Shift Railroad ROW

Alternative 2 Relocate Railroad ROW

NWI Wetlands

Aerial Photo Number

Figure 5-15
Nassawadox
Alternatives

N

Route 13/Wallops Island
Access Management Study

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Safety and Transportation Benefits. This improvement would expand the existing median openings from 30 feet to 50 feet, allowing for more room for school buses and other vehicles to wait in the median until it is safe to make a left turn.

Potential Impacts. Although minor, potential impacts to farmland may result from this alternative. No other impacts to natural or cultural resources are expected from this alternative.

Cost. This improvement is projected to cost $4.3 million to construct.

Alternative 2: Route 627 Consolidated Median Crossing At Young Street

Description. The second alternative is a variant of Alternative 1 with the creation of only one intersection of U.S. Route 13 with Route 627, but at the current Young Street intersection. The eastern leg would require realignment to the south of the Clam Shack. This proposed improvement is shown in Figure 5-17. This alternative has been further modified from what was presented at the Public Meetings by providing a southbound U.S. Route 13 directional access to Route 626.

Safety and Transportation Benefits. Same benefits as Alternative 1. In addition, access to the B&B Chevron would be direct.

Potential Impacts. Similar to Alternative 1, minor impacts to farmland may result from this alternative. No other impacts to natural or cultural resources are expected from this alternative.

Cost. This improvement is projected to cost $4.2 million to construct.

Alternative 3: New Local Roadway Connection to Route 618

Description. The third alternative provides better spacing between Wilsonia Neck Road (Route 628) to the south, Route 627 on the west and Route 627 on the east. A new access road would be constructed between U.S. Route 13 and Bayside Road (Route 618) approximately 1,200 feet north of Route 628 and a median crossover would be provided on U.S. Route 13 at this location. The Route 628 crossover would be closed. This would provide an approximate spacing of 1,200 feet between these three access points. Young Street would then be closed between Northampton Middle School and the access for the Barrier Island Center. All car and bus access to and from the school would then use the new roadway access. This proposed improvement is shown in Figure 5-18.

Safety and Transportation Benefits. The access road provides even better spacing between Wilsonia Neck Road (Route 628) to the south, Route 627 on the west and Route 627 on the east.

Potential Impacts. Similar to Alternatives 1 and 2, minor impacts to farmland may result from this alternative. No other impacts to natural or cultural resources are expected from this alternative. Access to Route 628 and Route 627 east will be restricted to right turns in and out from U.S. Route 13. Route 627 west (serving Northampton Middle School) would no longer access U.S. Route 13.

Cost. This improvement is projected to cost $5.0 million to construct.

Alternative 4: Variant of Alternative 3 Keeping Young Street Open

Description. The fourth alternative is identical to Alternative 3, except that Young Street (Route 627 west) between Northampton Middle School and the Barrier Island Center driveway would remain open for right turns in and out from U.S. Route 13. This proposed improvement is shown in Figure 5-19.

Safety and Transportation Benefits. This alternative allows the west leg of Route 627 to serve Northampton Middle School traffic that desires to make right turns in or right turns out on to U.S. Route 13.

Potential Impacts. Similar to previous alternatives, minor impacts to farmland may result from this alternative. No other impacts to natural or cultural resources are expected.

Cost . This alternative improvement is projected to cost $4.9 million to construct.

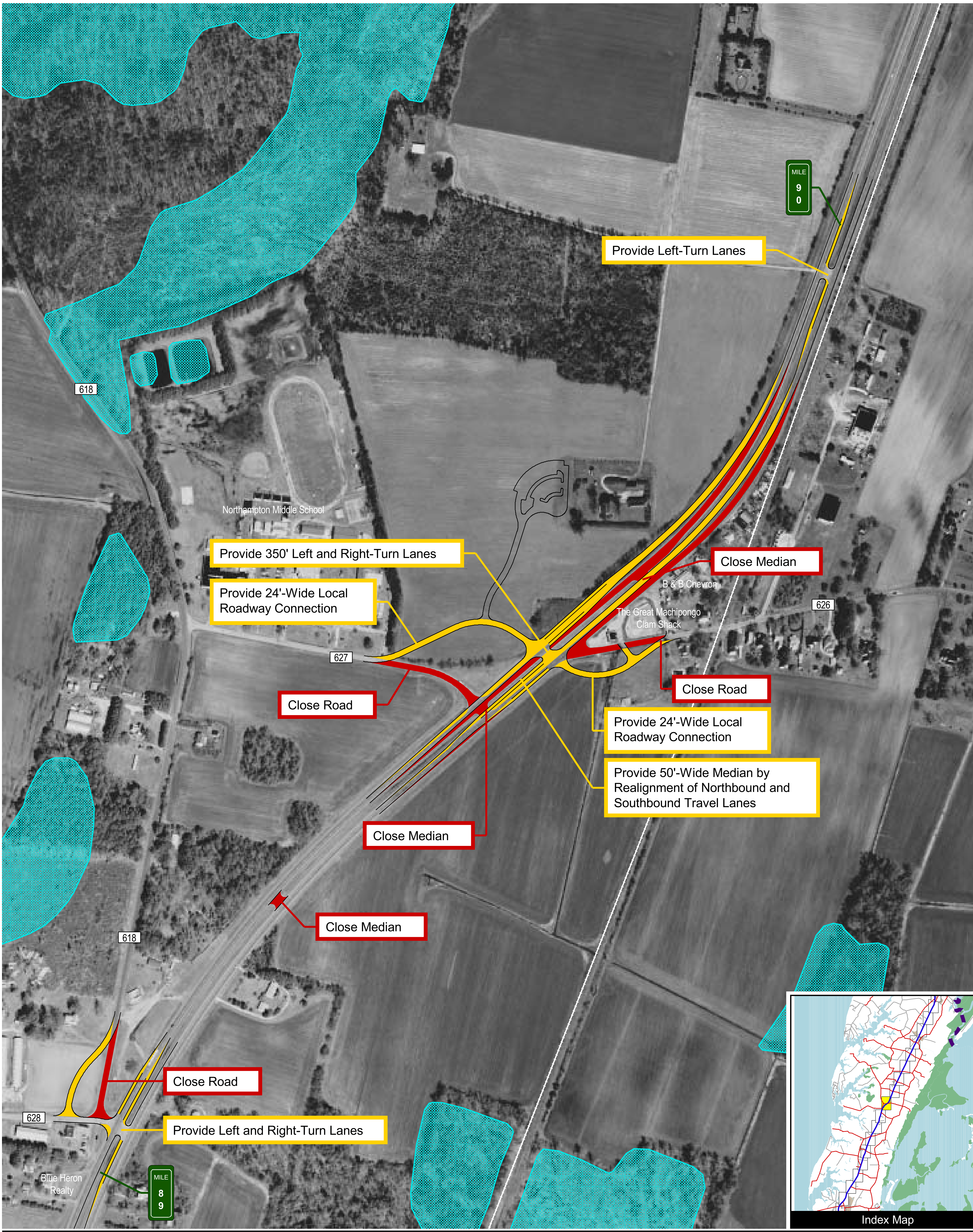
Alternative 5: Route 627 Consolidated Median Crossing Near B&B Chevron/Island Barrier Center

Description. The fifth alternative proposes to relocate Young Street to the north to intersect directly opposite Route 626 just south of the B&B/Chevron station. The Wilsonia Neck Road (Route 628) crossover location would remain open with left and right-turn lane improvements. This proposed improvement is shown in Figure 5-20.

Safety and Transportation Benefits. By leaving the Wilsonia Neck Road (Route 628) median open, the subdivision served by Wilsonia Neck Road will not be impacted. Leaving the median open at Route 626 will reduce the impact on the B & B Chevron and will still provide good direct access to U.S. Route 13 by the Northampton Middle School.

Potential Impacts. Similar to previous alternatives, minor impacts to farmland may result from this alternative. No other impacts to natural or cultural resources are expected.

Cost. This improvement is projected to cost $4.5 million to construct.



Route 13/Wallops Island Access Management Study

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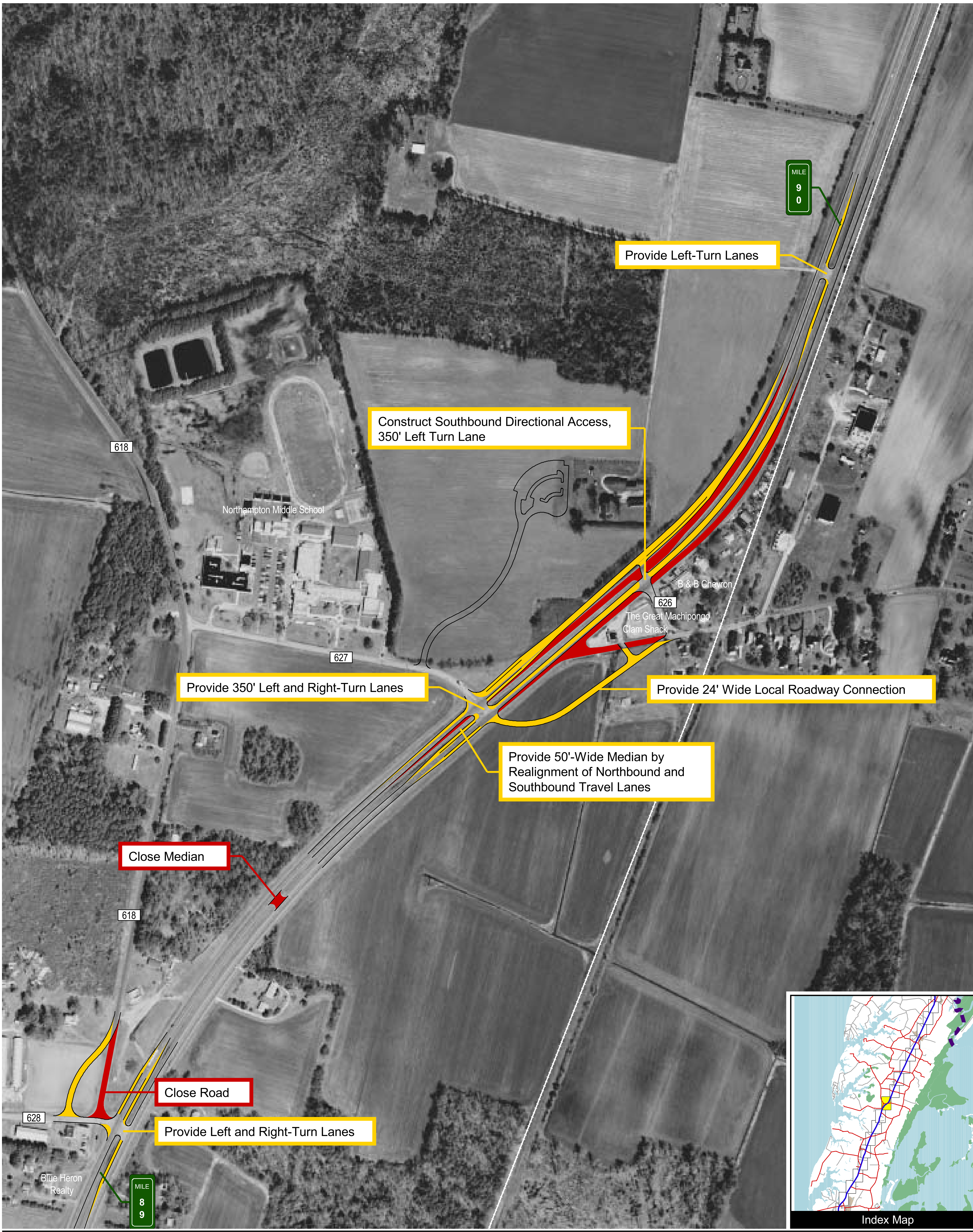
Aerial imagery flown on March 29, 2000

- Proposed Traveled Way
- Alternative Improvement Concept
- Pavement Removal
- Shoulder Widening to 12 feet
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Business Names
- NWI Wetland

Figure 5-16
Sheet 52 of 80
County - Northampton
Alternative 1

N

Scale: 1" = 400'



Route 13/Wallops Island Access Management Study

- Proposed Traveled Way
- Alternative Improvement Concept
- Pavement Removal
- Shoulder Widening to 12 feet
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Business Names
- NWI Wetland

Figure 5-17
Sheet 52 of 80
County - Northampton
Alternative 2

N

Scale: 1" = 400'

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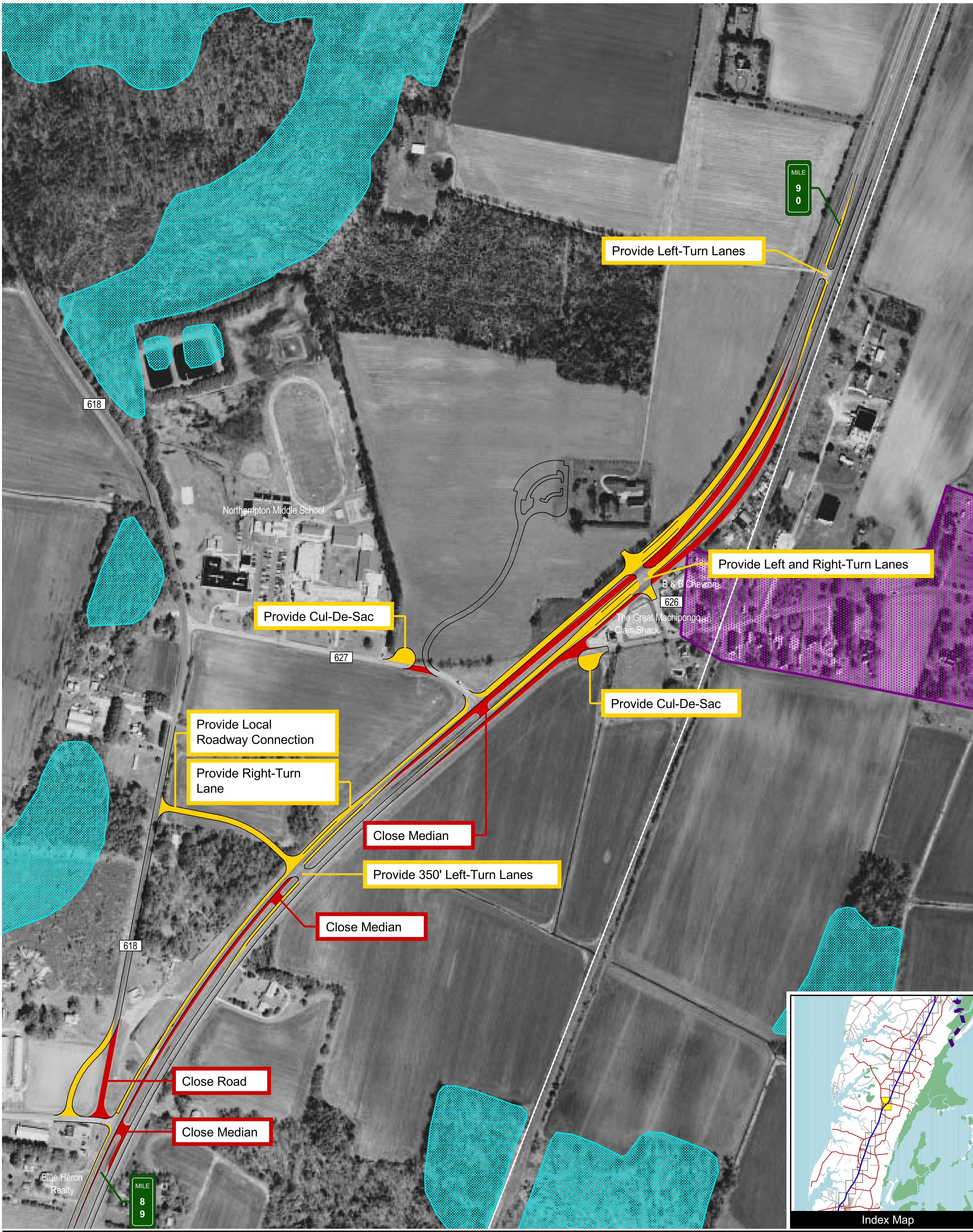
Aerial imagery flown on March 29, 2000



Route 13/Wallops Island Access Management Study

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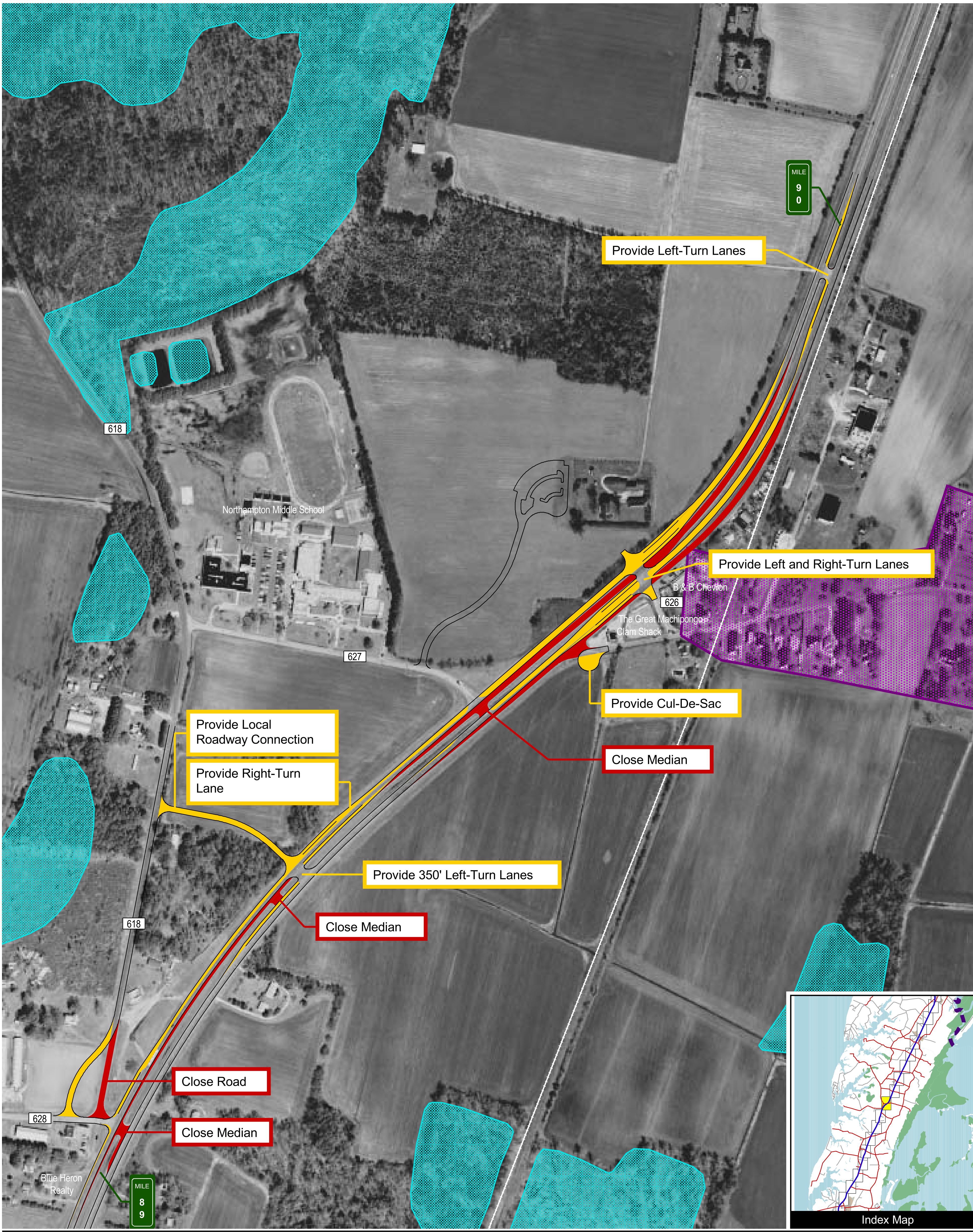
Aerial imagery flown on March 29, 2000

- New Pavement
- Pavement Removal
- Shoulder Widening to 12 feet
- Clear Vegetation
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Business Names
- NWI Wetland

Figure 5-18
Sheet 52 of 80
County - Northampton
Alternative 3

N

Scale: 1" = 400'



Route 13/Wallops Island Access Management Study

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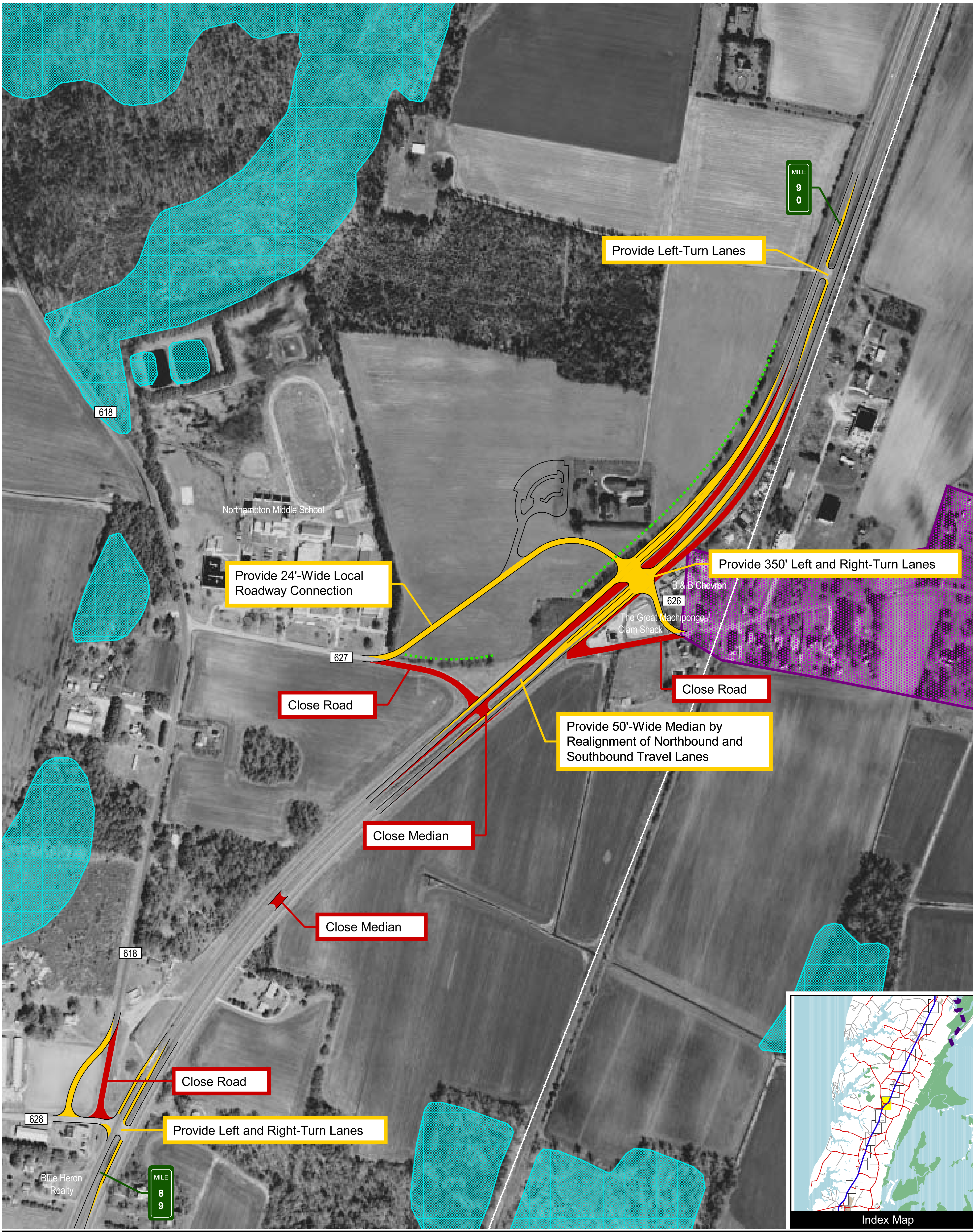
Aerial imagery flown on March 29, 2000

- Proposed Traveled Way
- Alternative Improvement Concept
- Pavement Removal
- Shoulder Widening to 12 feet
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Business Names
- NWI Wetland

Figure 5-19
Sheet 52 of 80
County - Northampton
Alternative 4

N

Scale: 1" = 400'



Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

Aerial imagery flown on March 29, 2000

- Proposed Traveled Way
- Alternative Improvement Concept
- Pavement Removal
- Shoulder Widening to 12 feet
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Text Business Names
- NWI Wetland

Figure 5-20
Sheet 52 of 80
County - Northampton
Alternative 5

N

Scale: 1" = 400'

Public Input on the Machipongo Alternatives

During the public involvement process, Young Street was a major concern of Northampton County schools for providing safe access on and off U.S. Route 13 to the middle school. Potential impacts to planned access improvements for the Barrier Island Center were also a concern. Those improvements were taken into account, and are shown on all five alternative concept drawings. The closing of full access at Routes 626 and 628 was a major concern for some. As a result of these comments and others, Alternatives 4 and 5 were added. A petition was received supporting Alternative 5 over all other alternatives.

5.3.3.12 U.S. Route 13 in the Martins Siding Area

The area located between James Allen Drive (Route 628) and Bell Lane (Route 1701) is characterized by numerous single-family dwellings along U.S. Route 13. On the west side of the road, there are 6 residences with a total of 8 driveways (some homes have loop driveways with two access points). On the east side, there are 11 residences with a total of 12 driveways. Median crossovers exist at James Allen Drive, Martins Siding Road and Bell Lane. Crossovers at Martins Siding Road and between Martins Siding Road and Bell Lane are proposed to be closed, while left-turn lanes are provided at the remaining crossovers. Two alternatives were developed for this section of U.S. Route 13.

Alternative 1: Closure of Martin Siding Lane and Construction of Frontage and Reverse Frontage Roads

Description. The first alternative was presented at the public information meetings (see Figure 5-21). This alternative calls for the construction of a frontage road along southbound U.S. Route 13, a reverse frontage road (or new local road) between Bell Lane and Martins Siding Road, and the closure of the existing northbound residential driveways on U.S. Route 13 between these two roads. The southbound one-way, 16-foot wide frontage road would reduce the number of driveway access points on U.S. Route 13 from eight to two. Similarly, the northbound improvements, similarly, would eliminate 12 access points by relocating these driveways to the reverse frontage road. This alternative also involves the closure of the median crossover at Martins Siding Road.

Safety and Transportation Benefits. The three cross streets are located too close to each other for each of them to need crossover access. The construction of the reverse frontage road would allow residents of Martins Siding Road to reach Bell Lane where they could have full access onto and off of U.S. Route 13.

Potential Impacts. The construction of the reverse frontage and frontage roads will require right-of-way acquisition from the immediately adjacent property owners but no displacements are anticipated from this alternative. In addition, no impacts to natural or cultural resources are anticipated. Field investigations should be conducted to verify this assumption.

Cost. These improvements are projected to cost $2.0 million to construct.

Alternative 2: Realignment of U.S. Route 13 at Bell Lane and Construction of Frontage Roads

Description. Alternative 2 was developed as shown in Figure 5-22. The northbound and southbound travel lanes would be shifted slightly to the west by rebuilding U.S. Route 13 in this area with flatter, higher speed curves. This would provide more room between the homes and the northbound travel lanes, thereby allowing for the construction of a northbound one-way, 16-foot wide frontage road.

Safety and Transportation Benefits. This alternative improves the alignment of U.S. Route 13 and consolidates the driveways in a more conventional manner with less impact to developed properties.

Potential Impacts. This alternative requires less right-of-way acquisition from property owners than Alternative 1.

Cost. These improvements are projected to cost $1.1 million to construct.

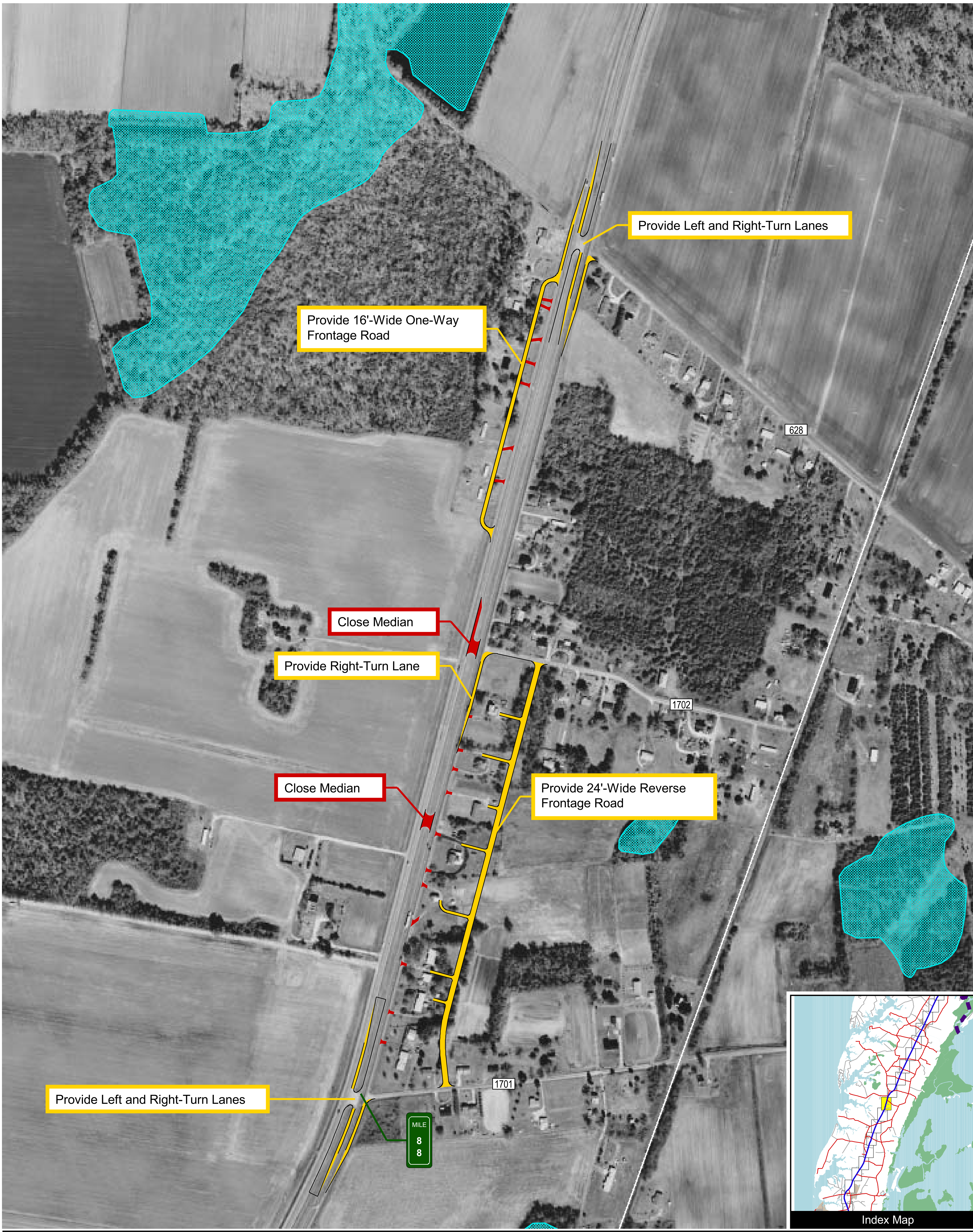
Public Input on the Martins Siding Alternatives

Comments received during the public involvement process dealt with the awkward alignment of the U.S. Route13/Bell Lane intersection and also indicated that a newly constructed home might be on the proposed alignment of the reverse frontage road in Alternative 1. In response to these concerns, the study team conducted a field investigation, which indicated that there were in fact alignment issues with the U.S. Route13/Bell Lane intersection, as proposed in Alternative 1. It was found that the new home, which was built after aerial base mapping was developed in March 2000, could be avoided with slight modification to the proposed U.S. 13/Bell Lane intersection.

5.3.3.13 U.S. Route 13 at Route 184

Alternative 1: Grade Separated Interchange of U.S. Route 13 over Route 184 and the Eastern Shore Railroad

Description. This alternative proposes the construction of a fully directional, one-sided cloverleaf interchange. U.S. Route 13 would pass over both the railroad tracks and S. Bayside Road on structure. Ramps would be provided in both directions to access Route 184 to the west and Business Route 13 to the east. The ramps would be stop sign controlled. On- and off- ramps to the north of Route 184 would require the elimination of access rights to several current businesses on U.S. Route 13, including the auto parts store, the gas station, and the boat dealer. Proposed access roads were developed to provide alternate access to and from U.S. Route 13 and the local street system. These improvements are shown in Figure 5-23.



Route 13/Wallops Island Access Management Study

New Pavement
Pavement Removal
Shoulder Widening to 12 feet
Clear Vegetation
Existing Traffic Signal
Future Potential Traffic Signal
Municipal Boundaries
Right of Way
Business Names
NWI Wetland

Figure 5-21
Sheet 53 of 80
County - Northampton
Alternative 1

N

Scale: 1" = 400'

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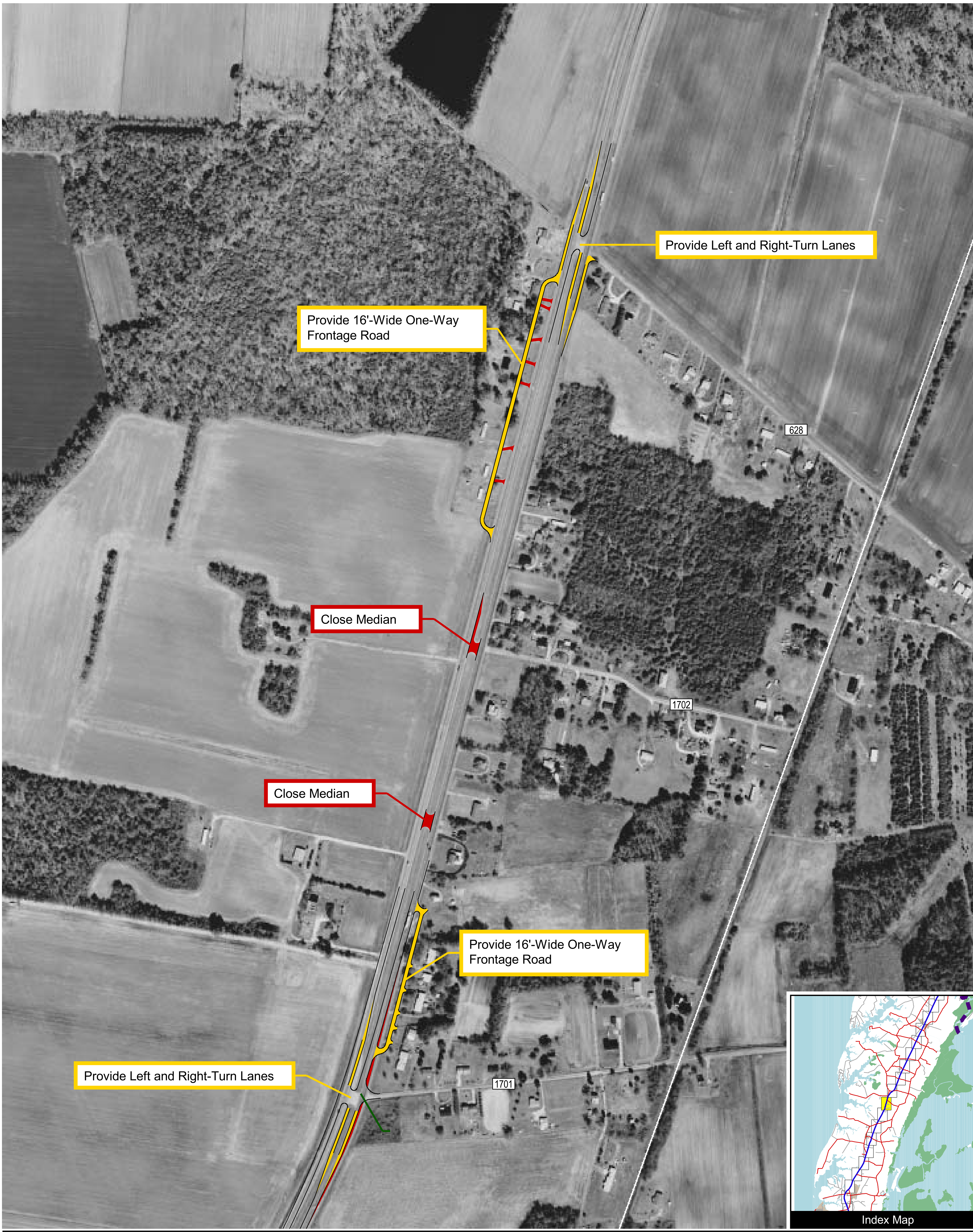
Aerial imagery flown on March 29, 2000



Route 13/Wallops Island Access Management Study

- New Pavement
- Pavement Removal
- Shoulder Widening to 12 feet
- Clear Vegetation
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Business Names
- NWI Wetland

Figure 5-22
Sheet 53 of 80
County - Northampton
Alternative 2

N

Scale: 1" = 400'

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Aerial imagery flown on March 29, 2000

Safety and Transportation Benefits. The intersection of U.S. Route 13 with S. Bayside Road and Business Route 13 is one of the most critical junctions along U.S. Route 13 in southern Northampton County. South Bayside Road (to the west of U.S. Route 13) provides the primary access to the town of Cape Charles, while Business Route 13 (on the east side) provides access to the town of Cheriton. This intersection is controlled by a traffic signal and is located immediately adjacent to the only at-grade rail crossing on U.S. Route 13. The Eastern Shore Railroad, beginning in Cape Charles at a barge ferry terminal and yard, parallels S. Bayside Road, crosses U.S. Route 13 and then curves north traveling parallel to U.S. Route 13. The future traffic operations projected for the year 2020 would require greater vehicle storage on northbound U.S. Route 13 than is available.

Potential Impacts. To the south of the railroad tracks, access would be limited or severely restricted for the existing shopping center containing Dollar General, Food Lion and McDonalds. The current access driveway would be located in the vicinity of the existing Route 184 Ramps. Alternative access to Bayview Drive (Route 642) was proposed to compensate for the loss of full access at the shopping center driveway.

Other potential impacts for this alternative would be limited to farmland and right-of-way impacts.

Cost. This interchange and related roadway improvements is projected to have a construction cost of $17.2 million.

Alternative 2: Intersection Improvements/Grade Separation of the Eastern Shore Railroad

Description. A second alternative was developed to raise U.S. Route 13 to cross over the Eastern Shore Railroad, and then to move the S. Bayside Road intersection to the north by approximately 150 feet. This would require the elevation of the entire intersection and its approaches to meet the grade of U.S. Route 13 once adequate clearances over the railroad tracks are achieved. This concept is shown in Figure 5-24.

Safety and Transportation Benefits. This alternative provides a grade separation between U.S. Route 13 and the railroad. The intersection of the two highways is improved.

Potential Impacts. Based on available information and mapping, potential impacts for this alternative would be limited to farmland and right-of-way impacts.

Cost. This improvement is projected to cost $11.1 to construct.

Public Input on the Route 184 Alternatives

When initially proposed to the Citizen Advisory Committee, Alternative 2 was not viewed favorably because members believed it would not result in any appreciable benefits for the cost. At that time, members of the committee suggested an interchange concept which led to the development of Alternative 1. The owner of McDonalds indicated Alternative 1 was unacceptable as shown.

5.3.3.14 U.S. Route 13 in the Cape Center Area

Description.

- The Cape Center area is located just north of Capeville Drive (Route 624) at approximately milepost 75.00.
- The southbound travel lanes would be shifted to the west in order to provide a wider median and median crossovers.
- Full left-turn storage lanes would be provided at 1) the northern entrance to Sting Ray's, 2) the Cape Motel, and 3) at a combined entrance to Sting Ray's and Eastern Shore Pottery. This concept is shown in Figure 5-25.
- An existing state road would be connected to a private road now traveling behind the residential properties (to the north of Sting Ray's) to form a reverse frontage road. This road would connect to Route 683 to the south, to the combined median opening south of Sting Ray's and to the median opening north of Sting Ray's.
- Four median crossovers would be closed, and a fifth median crossover would be developed.
- Two driveway accesses would be closed.

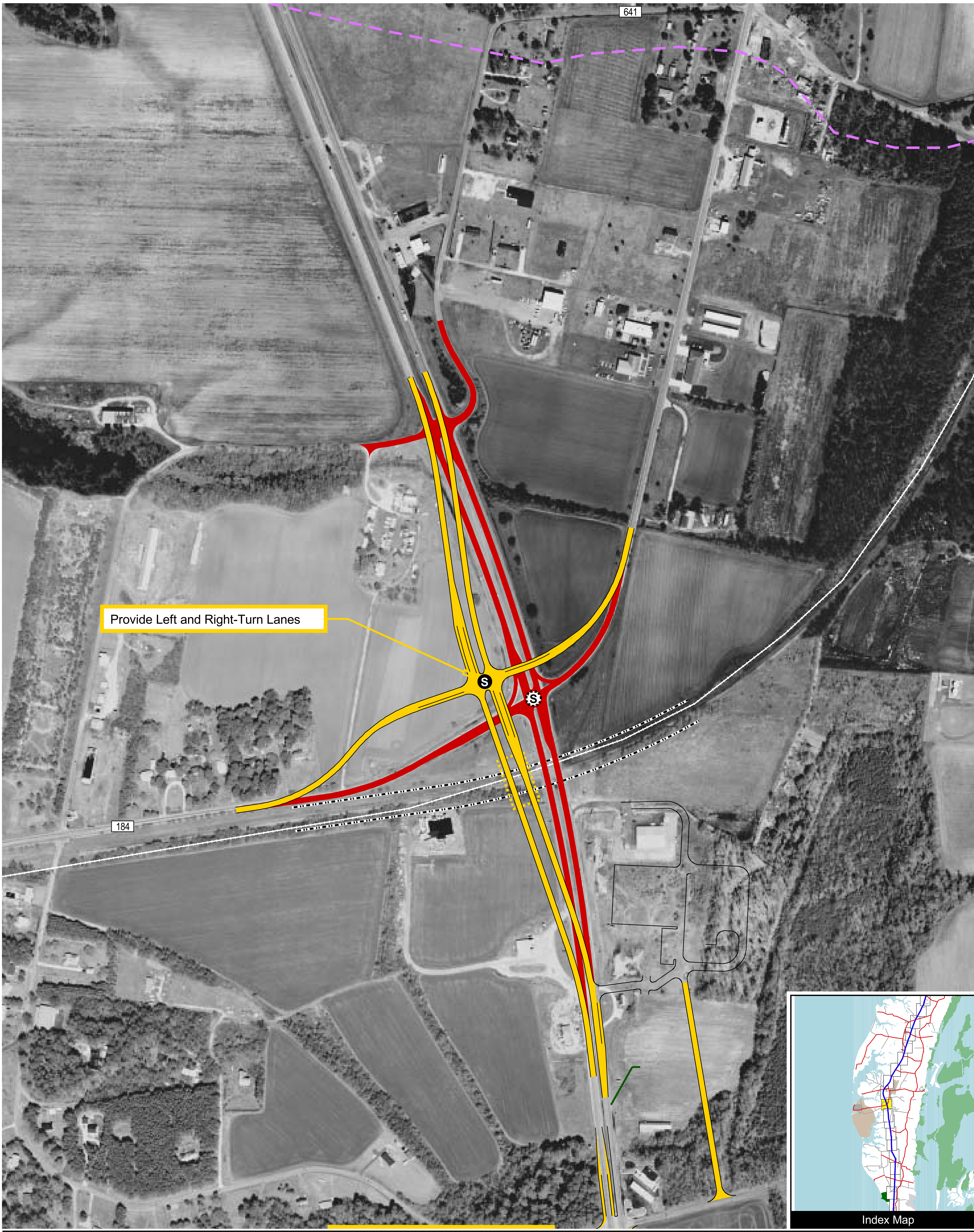
Safety and Transportation Benefits. The Cape Center area is located approximately 1,800 feet north of Capeville Drive (Route 624) in southern Northampton County. This area is home to the Eastern Shore Pottery, Cape Center Exxon/Sting Ray's Restaurant, the Cape Motel, the Peacock Motel and several residences. In less than one mile, there are a total of 19 driveway openings in the northbound direction and 6 median crossovers. Two of these median crossovers have no turn lanes and the width of the median is only 20 feet. The primary goals of the proposed improvements are to 1) consolidate accesses to and from U.S. Route 13 and 2) to make those accesses safe, with turn lanes and a wider median. In order to consolidate accesses on U.S. Route 13 while preserving access to businesses along U.S. Route 13, a reverse frontage road is proposed. This would establish a safer alternative to U.S. Route 13 from which patrons can access the businesses. This reverse frontage road would connect to U.S. Route 13 at two intersections with turning lanes and a 50-foot wide median.

Potential Impacts. No impacts to natural or cultural resources are anticipated as a result of these improvements.

Cost. These improvements are projected to cost approximately $3.0 million to construct.

Public Input on the Cape Center Alternative

The public was concerned about the safety of entering and exiting the Cape Center Exxon/Sting Ray's Restaurant. No comments were received regarding the proposed improvement.



New Pavement
Pavement Removal
Shoulder Widening to 12 feet
Clear Vegetation
Existing Traffic Signal
Future Potential Traffic Signal
Municipal Boundaries
Right of Way
Business Names
NWI Wetland

Figure 5-23
Sheet 62 of 80
County - Northampton
Alternative 1

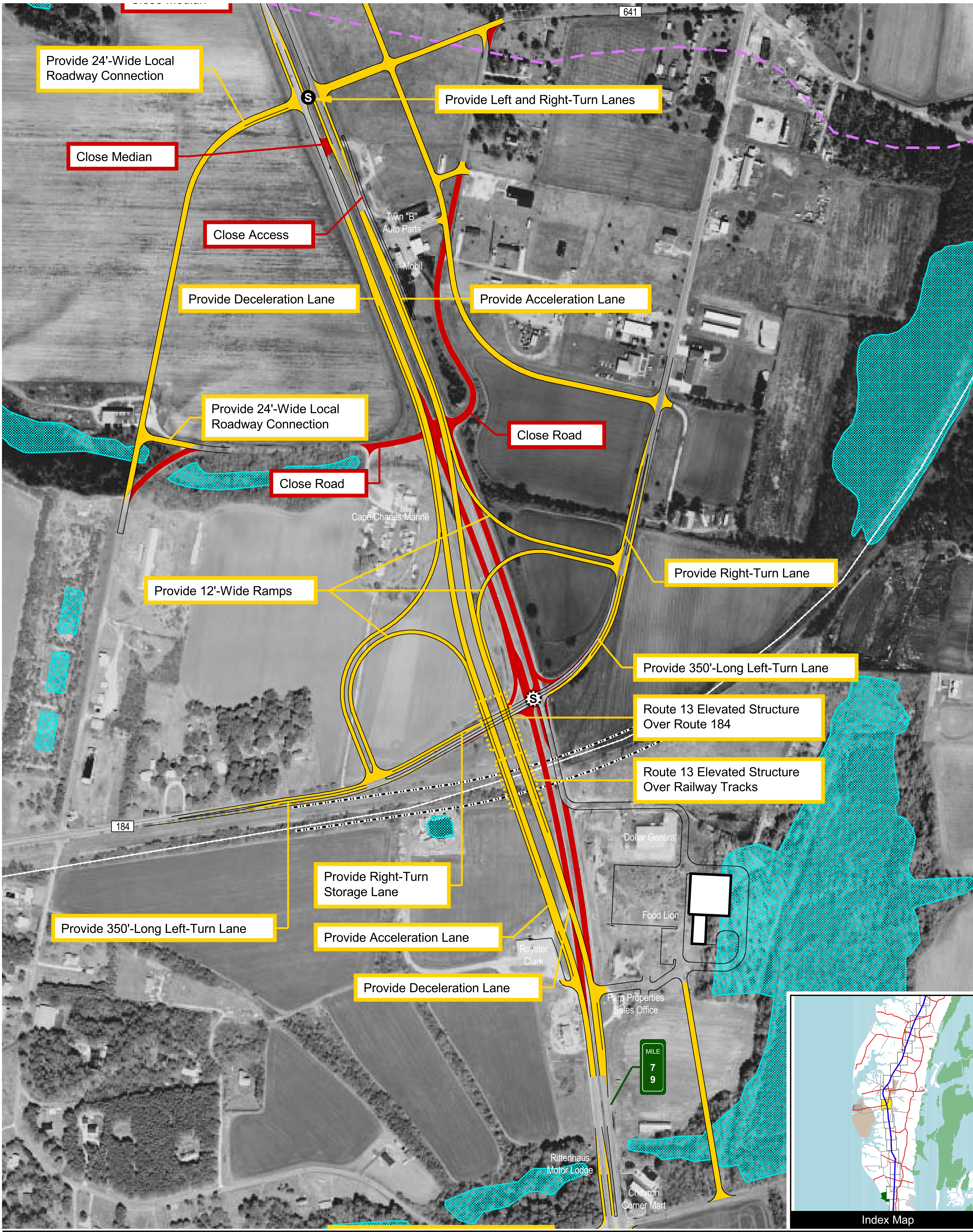
N

Scale: 1" = 400'

Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

Aerial imagery flown on March 29, 2000



Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

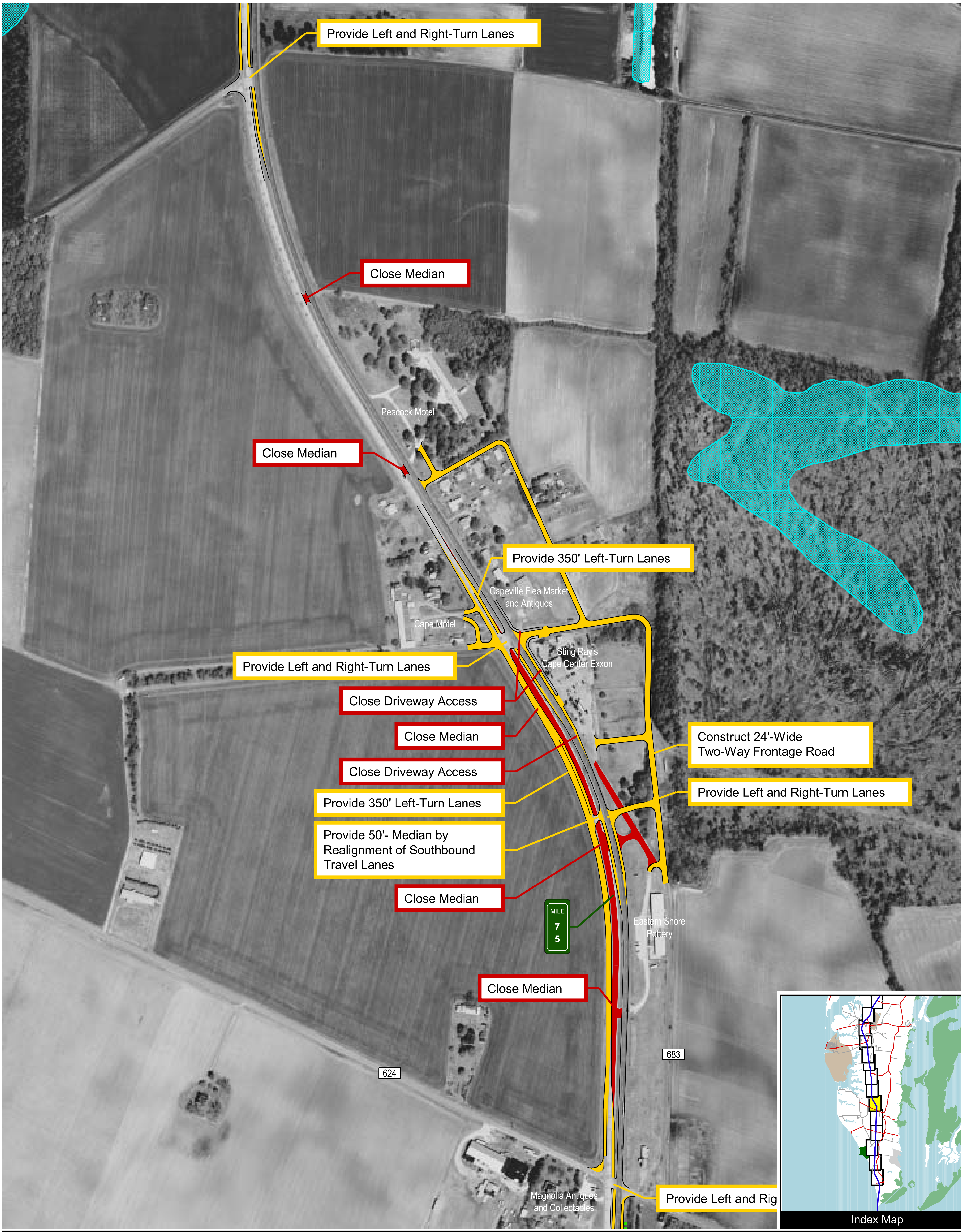
Aerial imagery flown on March 29, 2000

- New Pavement
- Pavement Removal
- Shoulder Widening to 12 feet
- Clear Vegetation
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Text Business Names
- NWI Wetland

Figure 5-24
Sheet 62 of 80
County - Northampton
Alternative 2

N

Scale: 1" = 400'



Route 13/Wallops Island Access Management Study

We Keep Virginia Moving

Aerial imagery flown on March 29, 2000

- New Pavement
- Pavement Removal
- Shoulder Widening to 12 feet
- Clear Vegetation
- Existing Traffic Signal
- Future Potential Traffic Signal
- Municipal Boundaries
- Right of Way
- Business Names
- NWI Wetland
- Historic

Figure 5-25
Sheet 67 of 80
County - Northampton

N

Scale: 1" = 400'

5.3.3.15 U.S. Route 13 in the Route 704 – Kiptopeke Road Area

Description. The improvements developed for this area (see Figure 5-26) involve the following actions:

- Improvement of Arlington Road (Route 645) to function as the access road to Kiptopeke State Park.
- Closure of the Kiptopeke Road (Route 704) intersections and median crossovers at U.S. Route 13.
- The reconstruction of the existing Kiptopeke Road between U.S. Route 13 and Arlington Road into a local road to provide access to the 11 homes now located on the existing channelized right-turn lane.

Safety and Transportation Benefits. The existing alignment of Kiptopeke Road was found to have several safety concerns. Kiptopeke Road is the primary access road into Kiptopeke State Park. This park experiences significant visitation, particularly from cars with boat trailers. The road is a four-lane, divided facility and intersects U.S. Route 13 at two closely spaced median crossovers. In the southbound direction, there is an off-ramp style right-turn lane for vehicles destined onto Kiptopeke Road.

The signage and design of these two locations is a problem, particularly in the northbound direction. A no left-turn sign is posted immediately in advance of the first crossover (which is the exiting, or eastbound travel lane for Kiptopeke Road). The second crossover, however, is located only 750 feet to the north with a left-turn lane. The no left-turn sign appears to confuse some drivers who interpret the sign to prohibit left-turns onto Kiptopeke Road entirely.

In addition, there are several single-family homes located on the southbound channelized right-turn lane which pose a potential safety hazard and requires these residents to turn right out of their homes, and then turn around at a narrow crossover on Kiptopeke Road which is located 650 feet to the west of U.S. Route 13.

Potential Impacts. No impacts to natural or cultural resources are anticipated as a result of these improvements.

Cost. These improvements are projected to cost approximately $3.1 million to construct.

Public Input on the Route 704 - Kiptopeke Alternative

Members of the Citizen Advisory Committee pointed out that northbound U.S. Route 13 traffic turning left into Route 704 was confused by the current geometrics of the existing intersection.

New Pavement
Pavement Removal
Shoulder Widening to 12 feet
Clear Vegetation
Existing Traffic Signal
Future Potential Traffic Signal
Municipal Boundaries
Right of Way
Business Names
NWI Wetland

Figure 5-26
Sheet 70 of 80
County - Northampton

N

Scale: 1" = 400'

Aerial imagery flown on March 29, 2000

5.4 Summary of Alternatives Evaluation

This chapter dealt with the process used to develop and evaluate alternative improvement concepts and the findings. Access Management techniques were evaluated to address specific corridor deficiencies along with potential safety-related improvements. This study first sought to recommend the implementation of basic safety and access management solutions, where practical. In those areas where access management techniques were deemed insufficient or not practical, other solutions were evaluated including reconstruction of intersections or the construction of bypasses.

Since this is a planning level study, potential impacts are discussed in general terms and based on existing database information. Minor right-of-way takings and impacts to abutting land uses were not assessed. Furthermore, field investigations should be conducted prior to any construction activities to ensure compliance with all appropriate local, state and federal rules and regulations.Table 5-6 on the following page summarizes the evaluation of the alternatives considered by this study.

Table 5-6
Summary: Evaluation of Alternatives

	Crossover Closure	Median Widening	Turn Lane Improve	Mainline Realign	12-Foot Shoulder	Frontage Roads	Wetland Impact	Clear Zone	Bypass Length	Cost (Millions)
Route 175										
Alt 1–Existing	N/A	6,900 ft.	6	N/A	67,200 ft.		11.3 ac			$6.1
Alt 2–New Alignment	N/A	N/A	5	N/A	None		22.1 ac		19,000 ft.	$14.5
US Route 13 Oak Hall & Temperanceville										
Oak Hall Alt 1 (Existing)	6	7,650 ft.	7	2,400 ft.	8,600 ft.					$4.5
Oak Hall Alt 2 (East Bypass)	2		2				34.4 ac		11,800 ft.	$10.2
Temperanceville Alt 1 (Existing)	5	5,600 ft.	3	4,300 ft.	8,750 ft.					$5.6
Temperanceville Alt 2 (West Bypass)	1		3				1.6 ac		9,300 ft.	$10.4
Temperanceville Alt 3 (East-South Bypass)	2		3				2.7 ac		4,600 ft.	$6.6
Combined Alternatives										
Alt 4–West Bypass of Oak Hall & Temperanceville	1		4				38.5 ac		22,000 ft.	$25.0
Alt 5–Alt 4 with Interchange	1		4				38.5 ac		22,000 ft.	$28.9
Intersection of US Route 13 and Route 175										
At-grade	1		1							
High-capacity Intersection	1		1							
Interchange	1		1							
Mappsville & Nelsonia										
Mappsville Alt 1 (Existing)	5	8,400 ft.	4	2,800 ft.	12,400 ft.					$6.4
Mappsville Alt 2 (West Bypass)	0		2				12.0 ac		8,800 ft.	$8.4
Nelsonia Alt 1 (Existing)	4	6,400 ft.	5	2,800 ft.	6,000 ft.		0.2 ac			$4.9
Nelsonia Alt 2 (East Bypass)	2		3				14.1 ac		11,600 ft.	$8.2
Mappsville & Nelsonia Alt 3 (Joint Bypass)	1		6				26.1 ac		20,400 ft.	$16.6
Mary N. Smith	1	9,600 ft.	4	9,600 ft.		2,000 ft.				$7.0
Whispering Pines	2	900 ft.	1	900 ft.				4,100 ft.		$1.1
Onley	1		5							$2.0

Table 5-6
Summary: Evaluation of Alternatives (Cont'd.)

	Crossover Closure	Median Widening	Turn Lane Improve	Mainline Realign	12-Foot Shoulder	Frontage Roads	Wetland Impact	Clear Zone	Bypass Length	Cost (Millions)
Melfa/Keller/Painter										
Alt 1–Shift RR within Town	4	22,000 ft.	12		11,400 ft.					$15.2
Alt 2–Shift RR outside Town	4	36,950 ft.	12		28,300 ft.		10.6 ac			$30.6
Exmore										
Alt 1–Connector Bayside Rd to Broadwater Rd	1		6							$1.8
Alt 2–Alt 1 plus Relocate Signal Shore Plaza Signal	2		7							$2.8
Nassawadox										
Alt 1–Shift RR within Town	2	6,250 ft.	3		6,250 ft.					$4.4
Alt 2–Shift RR Outside Town	2	6,250 ft.	3		6,250 ft.		1.5 ac			$7.0
Machipongo										
Alt 1–Route 627 Consolidate Median at Clam Shack	3	3,400 ft.	4	3,400 ft.				1,400 ft.		$4.3
Alt 2–Route 627 Consolidate Median at Young St	3	3,400 ft.	3	3,400 ft.				1,200 ft.		$4.1
Alt 3–New Local Connection to Route 618	4	3,400 ft.	5	3,400 ft.				1,200 ft.		$5.0
Alt 4–Variant of Alt 3 (Young St Open)	4	3,400 ft.	5	3,400 ft.				1,200 ft.		$4.9
Alt 5 Route 627 Consolidate Median near Chevon	3	3,400 ft.	3	3,400 ft.				1,400 ft.		$4.5
Martin Siding										
Alt 1–Frontage & Reverse Frontage Roads	2		3			1,000 ft.				$2.0
Alt 2–Realign US Route 13 & Construct Frontage Rds	2	1,200 ft.	3	1,200 ft.		1,100 ft.				$1.1
Route 184 Intersection										
Alt 1–Interchange & Grade Separation of RR	5		5	4,500 ft.						$17.2
Alt 2–Intersection Improve & Grade Separation of RR	2		4	3,000 ft.						$11.1
Cape Center	5	3,100 ft.	2	3,100 ft.						$3.0
Kiptopeke Road	2	2,400 ft.	2	2,400 ft.						$3.1

6

Study Recommendations and Action Plan

The approach being taken to improve the efficiency and safety of the U.S. Route 13 corridor is multi-faceted. First, this study recommends that VDOT implement the Access Management Guidelines set forth in Chapter 4. Second, this plan recommends that each locality along the corridor adopt the Highway Corridor Overlay District also discussed in Chapter 4. Finally, a series of roadway and safety improvements are recommended based on the alternatives analysis and public input process described in Chapter 5. This chapter summarizes the recommendations and defines the "Action Plan" for implementation of the improvement program.

6.1 Overview

To aid in the preparation of this plan, the study team relied heavily on input from local citizens and officials, those that experience the corridor on a daily basis. This input was particularly helpful in the identification of objectives for the plan and in the identification of existing transportation deficiencies. Each of the recommendations presented in this plan ultimately satisfy one or more of the defined objectives and address many of the current deficiencies described by the public. In addition, this plan addresses the anticipated future needs of the corridor based on projected growth and traffic volumes through 2020. In their entirety, all of the physical recommendations to the U.S. Route 13 and Route 175 roadway network are shown in a separate document referred to as the *Recommended Conceptual Plan*. The next section briefly describes the primary recommendations as they relate to the objectives originally set forth for this study, which are described in Chapter 1.

6.2 Study Recommendations

A wide range of actions has been recommended in this study to address existing, short-term and long-term corridor needs. A summary of study recommendations along the U.S. Route 13 and Route 175 corridors are summarized in Table 6-1 and graphically displayed in Figure 6-1, sheets 1 through 15. For each proposed action, the table also presents a summary of how the improvement satisfies each of the study objectives. In many cases, each recommendation may either directly or indirectly satisfy more than one objective. In general, corridor-wide actions were developed to address either safety concerns or access management concerns. Many actions were identified to better accommodate heavy vehicles, such as tractor-trailers serving existing businesses and school buses. A few actions would result in significant increases in roadway capacity, such as a bypass, an interchange, and a significantly improved roadway cross section (i.e., wider shoulders). The most significant actions recommended in this study are those that help to implement a coordinated access management policy that:

- Involves close coordination between VDOT and the Eastern Shore local government bodies,
- Results in more cost-effective solutions, and
- Maximizes the useful life of the U.S. Route 13 and Route 175 corridors.

6.2.1 Rationale for Recommendation of Specific Alternative Concepts

The recommendations presented in this chapter generally present improvements on existing alignment (referred to as Alternative 1), as this was a major focus of the study. There were several locations, however, where alternatives were considered that either left the existing alignment or were developed in response to public comments received during the study. The potential impacts and benefits of these alternatives were discussed in great detail in Chapter 5. A discussion is presented below for those locations where Alternative 1 was not recommended.

In the Oak Hall/Temperanceville area, a total of five alternatives were evaluated. Alternative 4, the relocation of U.S. Route 13 onto a western bypass roadway (four-lane divided, limited-access), was recommended based on two factors: 1) strong public sentiment for a bypass of their communities, and 2) concerns of the potential impacts to homes and businesses along existing U.S. Route 13. This alternative would start to the south of Route 175 with a simplified interchange connecting existing U.S. Route 13 with a westerly bypass. This alternative would leave U.S. Route 13 in a southwesterly direction, heading south across Route 703 (Withams Road) and Route 702 (Horsey Road) at at-grade intersections, passing west of the Tysons plant in Temperanceville, connecting with existing U.S. Route 13 south of the Tysons plant.

South of Onley, two improvement alternatives were presented in the area of the existing median crossover near Suburban Propane. Alternative 1 left the existing median open with improved turn lanes. Alternative 2 which closes the existing median crossover and provides a 1,000 foot local connector road on the eastside of U.S. Route 13 connecting Suburban Propane and Edward Seafood Shoppe with the median crossover serving the YMCA. Alternative 2 provides better median spacing and is recommended.

In the town of Exmore, two improvement alternatives were presented for the Shore Plaza area. Alternative 1 proposed a new local roadway connection between Route 618 (Bayside Road) and Route 652 (Broadwater Road), while Alternative 2 proposed the relocation of the existing Shore Plaza traffic signal to 400 feet north of its existing location with the intent to improve signal spacing and provide access for future commercial development, expected on both sides of U.S. Route 13 over the next 20 years, to use this signal. The current location is constrained on the east side of U.S. Route 13 due to the placement of the Riteaid and Shore Bank buildings and parking lots. The recommended improvements through this area were a combination of both alternatives by: 1) providing the local roadway connection between Route 618 and Route 652, and 2) relocating the Shore Plaza traffic signal.

A total of five alternatives were developed for the Machipongo area, several in response to public comments. The intent of all alternatives was to consolidate crossover locations through this area while widening the median to better accommodate school bus traffic (from Northampton Middle School). Alternative 2 was recommended because it did the best job with minimumal improvements while providing good service to the school and existing businesses. Alternative 2 relocates Route 627 on the eastside south of the Clam Shack oppose Young Street (Route 627) on westside of U.S. Route 13. The median crossover at Route 626 is converted to a southbound U.S. Route 13 only left turn median opening. Alternative 2 also maintains a median crossover at Route 628 (Wilsonia Neck Road).

Two alternatives were developed for the Martins Siding area (just south of Machipongo). Alternative 2 was developed based on public comment, and involves the reconstruction of U.S. Route 13 through a horizontal curve to flatten out the curve and allow for the construction of a one-way frontage road on northbound U.S. Route 13 north of Bell Lane (Route 1701) in lieu of a reverse frontage road recommended in Alternative 1.

At the intersection of Route 184 with U.S. Route 13 two alternatives were developed. Alternative 1 provided a grade separation of the Eastern Shore Railroad but did not provide any separation between U.S. Route 13 and Route 184 traffic. Alternative 2 favored by the Citizens Advisory Committee provides separation of U.S. Route 13 traffic from the railroad and Route 184 and is recommended.

6.2.2 Improvement Costs

The implementation of all study recommendations will take many years to complete using conventional funding mechanisms, and are unlikely to be implemented all within the twenty-year planning horizon of this study. Table 6-2 presents a summary of the total costs associated with all recommended actions. In total, the study recommendations are projected to cost $139.3 million dollars (current dollars), with approximately 60 percent of the improvements occurring in Accomack County and the remaining 40 percent occurring in Northampton County.

Table 6-2
Summary of Recommended Improvement Costs

Accomack County – U.S. Route 13

Milepost From	Milepost To	Opinion of Probable Cost	Milepost From	Milepost To	Opinion of Probable Cost
137	138	$630,000	118	119	$3,483,000
136	137	$2,200,000	117	118	$3,404,000
135	136	$305,000	116	117	$1,165,000
134	135	$3,200,000	115	116	$474,000
133	134	$93,000	114	115	$1,040,000
132	133	$3,720,000	113	114	$1,301,000
131	132	$3,825,000	112	113	$1,107,000
130	131	$4,360,000	111	112	$2,506,000
129	130	$5,270,000	110	111	$463,000
128	129	$1,256,000	109	110	$1,870,000
127	128	$2,500,000	108	109	$3,756,000
126	127	$3,413,000	107	108	$1,128,000
125	126	$4,575,000	106	107	$4,007,000
124	125	$900,000	105	106	$2,606,000
123	124	$2,735,000	104	105	$1,174,000
122	123	$2,336,000	103	104	$420,000
121	122	$1,375,000	102	103	$1,811,000
120	121	$1,570,000	101	102	$523,000
119	120	$973,000			
Route 175 between U.S. Route 13 and Mosquito Creek					$6,100,000
Total Accomack County					**$83,574,000**

Northampton County – U.S. Route 13

Milepost From	Milepost To	Opinion of Probable Cost	Milepost From	Milepost To	Opinion of Probable Cost
100	101	$1,149,000	84	85	$1,065,000
99	100	$560,000	83	84	$424,000
98	99	$1,960,000	82	83	$361,000
97	98	$131,000	81	82	$193,000
96	97	$712,000	80	81	$463,000
95	96	$2,971,000	79	80	$20,155,000
94	95	$1,152,000	78	79	$1,216,000
93	94	$769,000	77	78	$1,251,000
92	93	$381,000	76	77	$259,000
91	92	$1,990,000	75	76	$2,839,000
90	91	$1,482,000	74	75	$811,000
89	90	$4,357,000	73	74	$814,000
88	89	$1,921,000	72	73	$3,200,000
87	88	$546,000	71	72	$239,000
86	87	$1,653,000	70	71	$351,000
85	86	$193,000	69	70	$127,000
Total Northampton County:					**$55,695,000**

6.3 Action Plan

The mismatch between the costs for all study recommendations and the amount expected to become available clearly indicates a need for prioritization of these improvements. Short-term improvements have been identified that address existing safety concerns and/or begin to implement the access management guidelines. Table 6-3 provides a summary of the short-term recommendations including the estimated costs of these actions.

Table 6-3
Summary of Short-term Recommendations

Recommended Action	Milepost Location	Cost by County Accomack	Cost by County Northampton
Corridor-wide Actions			
Adoption of Access Management Guidelines	NA	NA	NA
Adoption of Highway Corridor Overlay District Ordinances by localities	NA	NA	NA
Adoption of Recommended Concept Plan	NA	NA	NA
Install rumble strips in outside shoulders	NA	$ 74,000	$ 64,000
Install raised pavement markers in center dashed line only at 80 feet spacing	NA	$ 242,000	$ 208,000
Install milepost markers – every mile	NA	$ 8,000	$ 7,000
Drainage grate reconstruction in median at 120 Accomack and 82 Northampton locations	NA	$ 562,000	$ 226,000
Headwalls – 50-Accomack and 10-Northampton	NA	$ 70,000	$ 14,000
Turn lane Improvements	NA	$ 500,000	$ 500,000
Site-specific Actions – Accomack County			
Clear vegetation within clear zone			
— North of Route 710 near the Welcome Center	138-136	$ 26,500	
— North of Route 692	129	$ 6,500	
— Between Route 662 and Business 13/Route 659	117-115	$ 31,500	
Intersection improvement – Route 175 at Route 679		$ 300,000	
Intersection improvement – Route 175 at Route 798		$ 300,000	
Localized median widening – U.S Route 13 at Route 738		$ 750,000	
Construct reverse frontage road – Route 738		$ 250,000	
Site-specific Actions – Northampton County			
Clear vegetation within clear zone			
— Between Route 617 and Route 620	94-92		$ 10,500
— Between Route 703 and Route 630	88-87		$ 18,800
— Between Route 624 and Route 646	75-73		$ 18,000
Construct one-way frontage road – south of Route 628	89-88		$ 575,000
Localized median widening – U.S. Route 13 at Route 684	78		$2,250,000
Total Short-term Improvements Cost		**$3,120,500**	**$3,891,300**

The intent of this study was the development of a plan that included a vision, the tools and a framework for preserving the vital function of the U.S. Route 13 and Route 175 corridors well into the future. While improvements along the entire corridor may not be realized in twenty years, there will be a plan in place to deal with anticipated and unanticipated growth in the future wherever it does occur. As such, while the actual funding of some of the longer-range improvements may come from private sources through future development ventures, VDOT and the localities will have already defined the vision of how the U.S. Route 13 and Route 175 corridors can be accessed and improved and have clear and enforceable tools to maintain the integrity of the access management plan.

Table 6-1
Summary of Study Recommendations

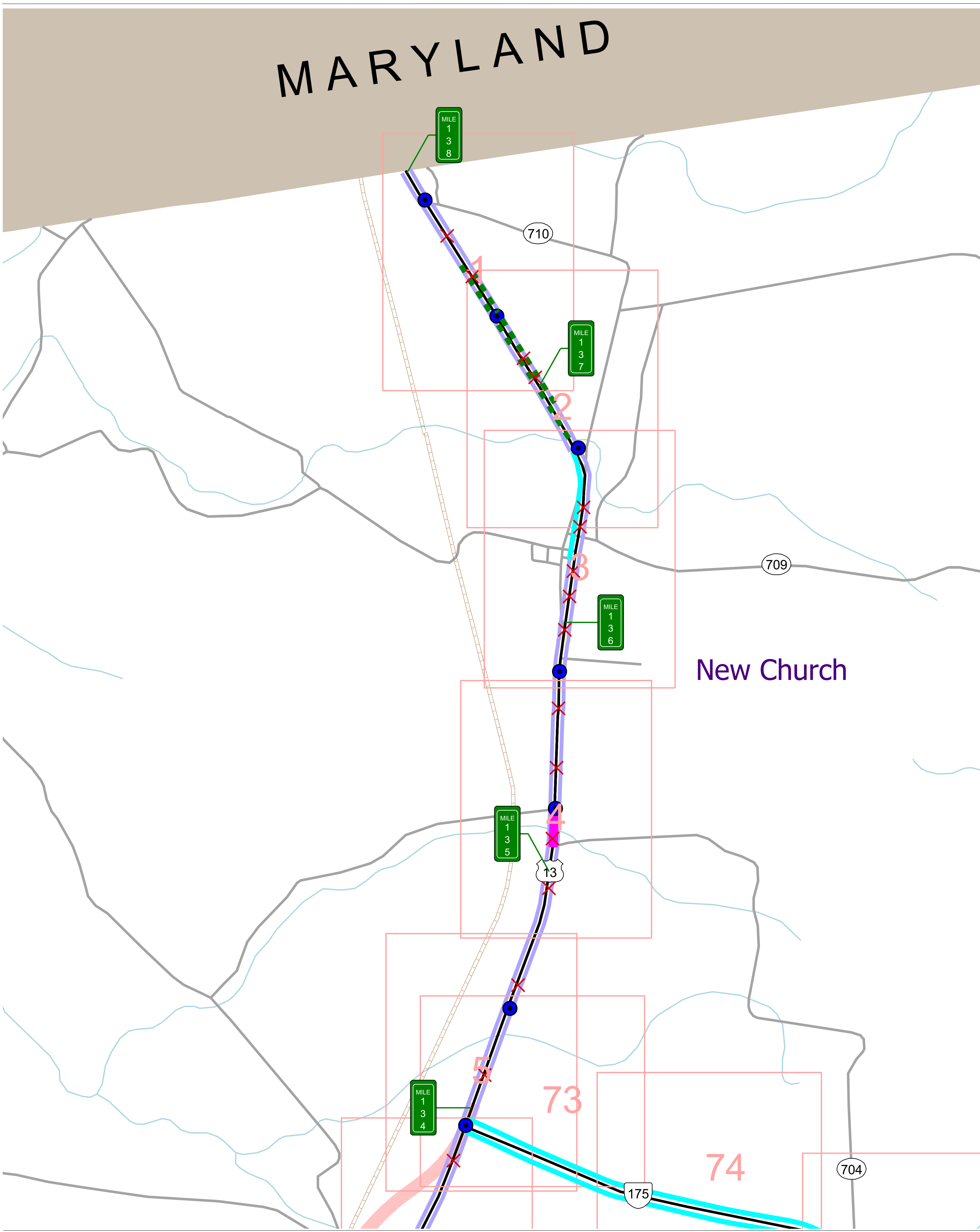
Location and Study Recommendation	Improvement Satisfies the Following Study Objective: Improve Intersections	Improve Entrances and Exits	Improve Roadway Geometrics	Provide Additional Safety Features	Accommodation of: Farm Vehicles and Buses	Local and Through Traffic	Bicycles and Pedestrians	Increases Capacity
Corridor-wide Actions								
Policy Actions								
— Adoption of U.S. Route 13 Access Management Guidelines by VDOT		✔	✔					
— Adoption of Highway Corridor Overlay District Ordinance by Localities		✔	✔					
— Adoption of Recommended Concept Plan to guide future access decisions		✔	✔					
Physical Improvements								
— 10-foot outside shoulders on U.S. Route 13 as a minimum				✔	✔		✔	✔
— Rumble strips – outside and inside shoulders				✔				
— Raised pavement markers – center line only at 80-foot spacing				✔				
— Milepost markers – every mile				✔				
— Relocation or Removal of Hazards in Clear Zone				✔				
— Drainage Grate Reconstruction in Median – 202 total structures				✔				
— Move/consolidate crossovers – 70 locations		✔	✔			✔		✔
— Turn lane improvements at major intersections	✔		✔			✔		✔
Maryland State Line to Route 175								
Clear vegetation in clear zone north of Route 710, near Welcome Center				✔				
Provide 12-foot shoulder on southbound U.S. Route 13 through New Church		✔	✔	✔		✔	✔	✔
Localized median widening – U.S. Route 13 at Route 710 in New Church	✔		✔		✔			✔
Realign Route 704 (east) intersection with U.S. Route 13	✔		✔			✔		
Localized median widening – U.S. Route 13 at Route 704	✔		✔		✔			✔
Route 175 to Route 692 (Oak Hall and Temperanceville)								
Construct improved intersection on U.S. Route 13 at Route 175	✔		✔					✔
Construct four-lane, divided bypass between Route 175 and Route 692			✔			✔		✔
Realign Route 702 intersection with U.S. Route 13	✔		✔			✔		
Clear vegetation in clear zone north of Route 692				✔				
Route 692 to Route 729 (Mappsville)								
Provide 12-foot shoulders on northbound U.S. Route 13 between Route 692 and Route 691		✔	✔	✔		✔	✔	✔
Localized median widening – U.S. Route 13 at Route 691	✔		✔		✔			✔
Construct median through Mappsville		✔	✔					✔
Provide 12-foot shoulders on northbound and southbound U.S. Route 13 through Mappsville			✔	✔		✔	✔	✔
Realign Route 689 intersection with U.S. Route 13	✔		✔			✔		
Route 729 to Route 681 (Nelsonia)								
Provide 12-foot shoulders on northbound and southbound U.S. Route 13 through Nelsonia		✔	✔	✔		✔	✔	✔
Construct medial through Nelsonia			✔					✔
Realign Route 681 intersection with U.S. Route 13	✔		✔			✔		

Table 6-1
Summary of Study Recommendations (Cont'd.)

	Improvement Satisfies the Following Study Objective:				Accommodation of:			
Location and Study Recommendation	Improve Intersections	Improve Entrances and Exits	Improve Roadway Geometrics	Provide Additional Safety Features	Farm Vehicles and Buses	Local and Through Traffic	Bicycles and Pedestrians	Increases Capacity
Route 681 to Route 679								
Localized median widening – U.S. Route 13 at Route 680	✔		✔		✔			✔
Localized median widening – U.S. Route 13 at Route 738	✔		✔		✔			✔
Construct reverse frontage road – northbound at Route 738		✔			✔	✔		
Route 679 to Route Business 13/Route 663 (Mary N Smith Area)								
Realign Route 679 intersection with U.S. Route 13	✔		✔			✔		
Construct median in North Accomac area, between Route 661 and Route 663			✔					✔
Improve roadway alignment and widen median from Route 661 to Route 663	✔		✔		✔			✔
Construct one-way frontage roadson southbound U.S. Route 13 at two locations		✔			✔	✔		
Business 13/Route 663 to Route 639 (Accomac and Onley)								
Clear vegetation in clear zone between Route 662 and Business 13				✔				
Realign Business Route 13 and Route 659 at Whispering Pines	✔			✔	✔	✔		
Construct reverse frontage road – northbound at Route 648		✔				✔		
Construct access road between Route 179 and Chesapeake Square Shopping Center					✔	✔		
Construct two-way frontage road – northbound at Route 1616		✔			✔	✔		
Localized median widening – U.S. Route 13 at Route 680 (Nandua HS)	✔		✔					✔
Provide 12-foot shoulders on southbound U.S. Route 13 north of Route 639		✔	✔	✔		✔	✔	✔
Route 639 to Route 607 (Melfa, Keller, Painter)								
Relocate railroad right-of-way in Melfa, Keller and Painter to the east to allow for roadway widening			✔					
Construct 16-foot-wide median through Melfa, Keller and Painter			✔					
Localized median widening – U.S. Route 13 north and south of Melfa	✔		✔		✔			✔
Construct directional median access at community college	✔					✔		
Realign Route 734 (east) to intersect with industrial park access	✔		✔			✔		
Localized median widening – U.S. Route 13 north and south of Keller	✔		✔		✔			✔
Localized median widening – U.S. Route 13 at Central Middle School	✔		✔		✔			✔
Route 607 to Route 618 (Exmore)								
Localized median widening – U.S. Route 13 at Bundick's Kuzzen's	✔		✔		✔			✔
Provide 12-foot shoulder on southbound U.S. Route 13 north of Route 181		✔	✔	✔		✔	✔	✔
Construct access road to serve Food City plaza and Trawler restaurant		✔				✔		
Construct local road connection between Route 618 and Route 652						✔		
Future relocation of existing traffic signal			✔					
Route 618 to Route 617 (Nassawadox)								
Provide 12-foot shoulder on southbound U.S. Route 13 through Nassawadox		✔	✔	✔		✔	✔	✔
Relocate railroad right-of-way in Nassawadox to the east to allow for roadway widening			✔					
Localized median widening – U.S. Route 13 through Nassawadox	✔		✔		✔			✔

Table 6-1
Summary of Study Recommendations (Cont'd.)

Location and Study Recommendation	Improvement Satisfies the Following Study Objective: Improve Intersections	Improve Entrances and Exits	Improve Roadway Geometrics	Provide Additional Safety Features	Accommodation of: Farm Vehicles and Buses	Local and Through Traffic	Bicycles and Pedestrians	Increases Capacity
Route 617 to Route 628 (Treherneville and Machipongo)								
Construct one-way frontage road on southbound U.S. Route 13 in Weirwood		✔			✔	✔		
Clear vegetation in clear zone between Route 617 and Route 620				✔				
Construct one-way frontage road on southbound U.S. Route 13 in Treherneville		✔			✔	✔		
Construct access road between Route 622 and Route 625				✔		✔		
Provide 12-foot shoulder on southbound U.S. Route 13 south of Route 622		✔	✔	✔		✔	✔	✔
Localized median widening – U.S. Route 13 at Route 627	✔		✔		✔			✔
Realignment of Young Street (Route 627)	✔		✔			✔		
Route 628 to 630 (Martin Siding)								
Construct one-way frontage road on southbound U.S. Route 13 in Martins Siding		✔			✔	✔		
Construct one-way frontage road on northbound U.S. Route 13 in Martins Siding		✔			✔	✔		
Localized median widening – U.S. Route 13 at Route 1701	✔		✔		✔			✔
Clear vegetation in clear zone between Route 1703 and Route 630				✔				
Localized median widening – U.S. Route 13 at Route 630	✔		✔		✔			✔
Route 630 to Route 642 (Cape Charles)								
Construct interchange on U.S. Route 13 at Route 184	✔	✔	✔		✔			✔
Construct access road between Route 642 at Food Lion Shopping Center		✔			✔			
Route 642 to Route 624 (Cape Center)								
Localized median widening – U.S. Route 13 at Route 684 (Kiptopeke ES)	✔		✔		✔			✔
Construct one-way frontage road on northbound U.S. Route 13 between Route 643 and Route 644		✔			✔	✔		
Construct one-way frontage road on southbound U.S. Route 13 between Route 643 and Route 644		✔			✔	✔		
Localized median widening – U.S. Route 13 at Cape Center	✔		✔		✔			✔
Construct reverse frontage road – northbound at Cape Center		✔				✔		
Route 624 to Route 600 (Kiptopeke)								
Clear vegetation in clear zone between Route 624 and Route 646				✔				
Provide 12-foot shoulder on southbound U.S. Route 13 north of Route 646		✔	✔	✔		✔	✔	✔
Localized median widening – U.S. Route 13 at Route 645	✔		✔		✔			✔
Close Route 704 access onto U.S. Route 13	✔		✔			✔		
Construct access road improvements on Route 645		✔	✔					
Route 175 from U.S. Route 13 to Mosquito Creek								
Provide left-turn lanes as needed between U.S. Route 13 at Route 798		✔	✔			✔		
Provide 12-foot shoulder on eastbound and westbound Route 175		✔	✔	✔		✔	✔	✔



Median Closing
Clear Vegetation
Intersection/Turnlane Improvement
Relocated Railroad
Frontage/Reverse Frontage Improvements
Median Construction
Median Widening
12' Wide Right Shoulder
Roadway Improvement
Route 13 Bypass
10' Wide Right Shoulder
Aerial Photo Number

Figure 6-1
Sheet 1 of 15
Summary of Roadway Improvements

N

Scale: 1" =2000'

Route 13/Wallops Island Access Management Study

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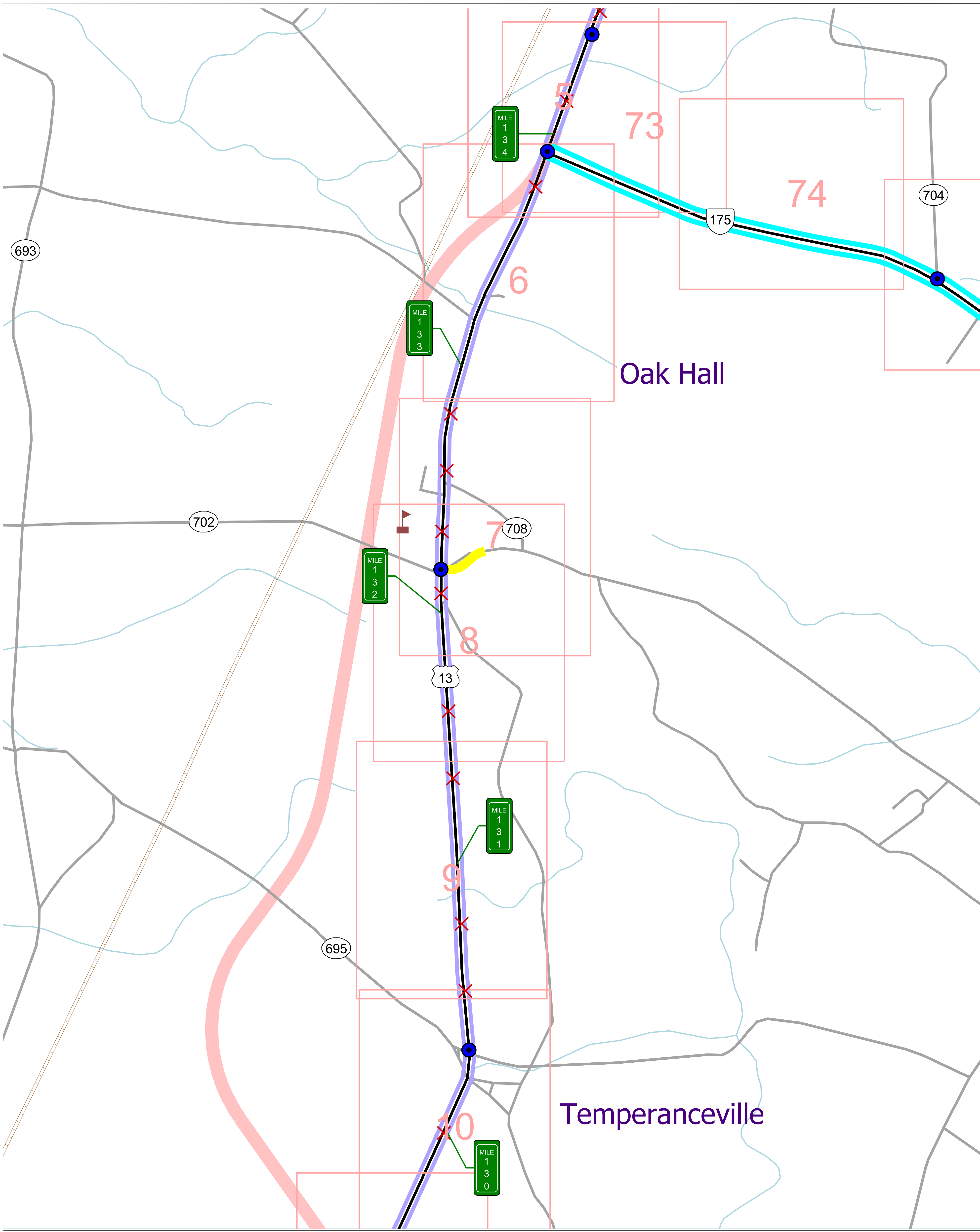

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Figure 6-1
Sheet 2 of 15
Summary of Roadway Improvements

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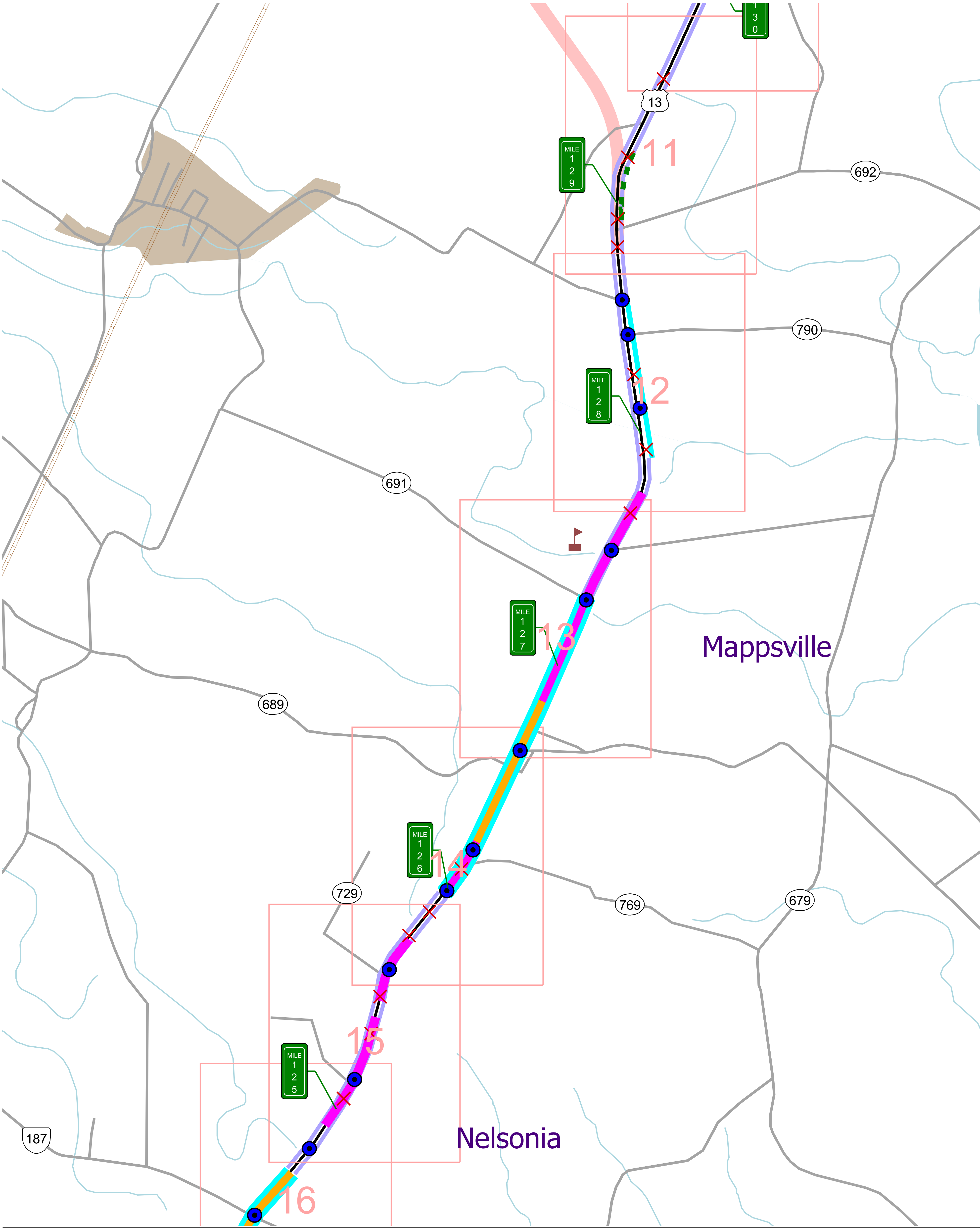

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Figure 6-1
Sheet 3 of 15
Summary of Roadway Improvements

Route 13/Wallops Island Access Management Study

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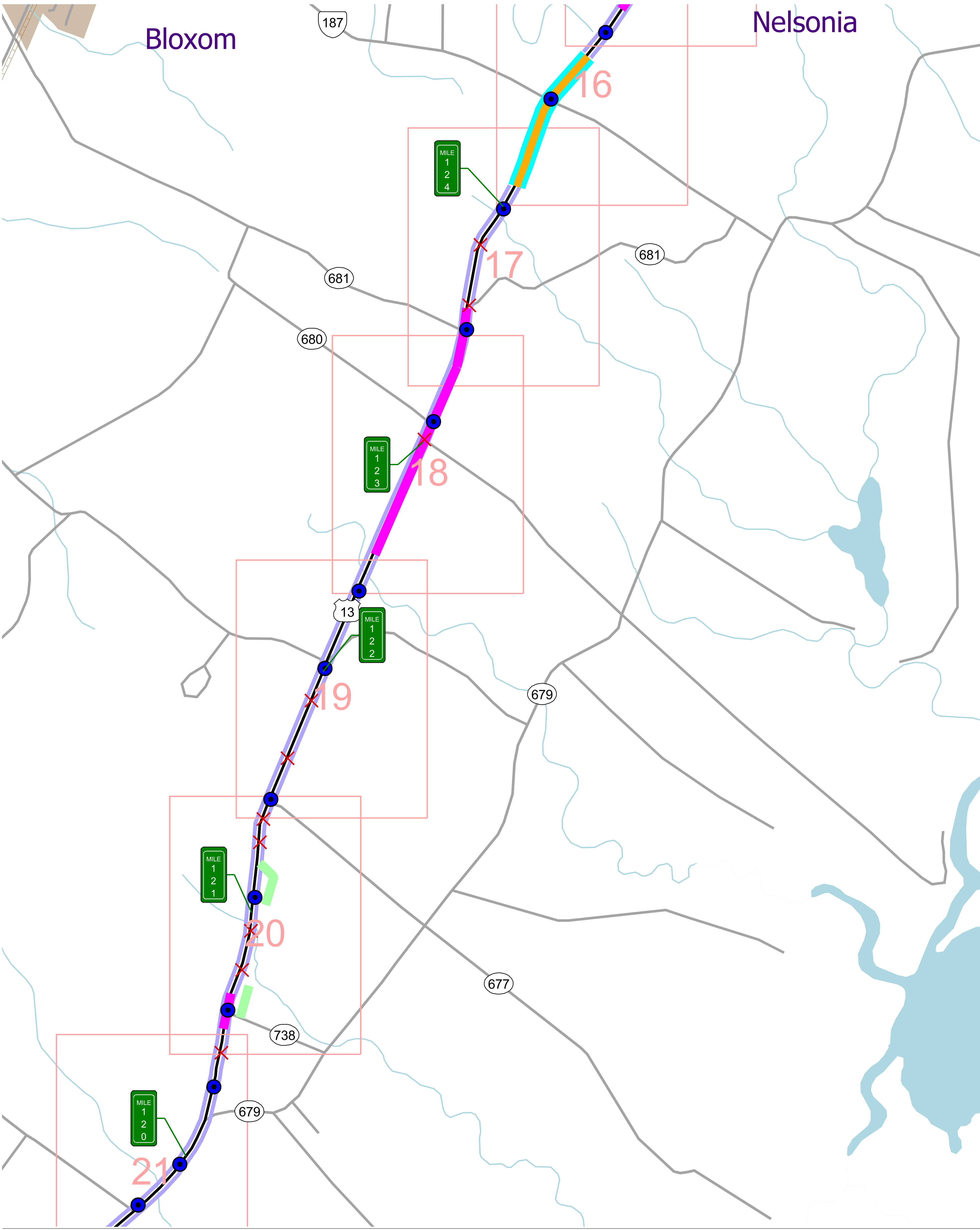

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Roadway Improvement
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Figure 6-1
Sheet 4 of 15
Summary of Roadway Improvements

Route 13/Wallops Island Access Management Study

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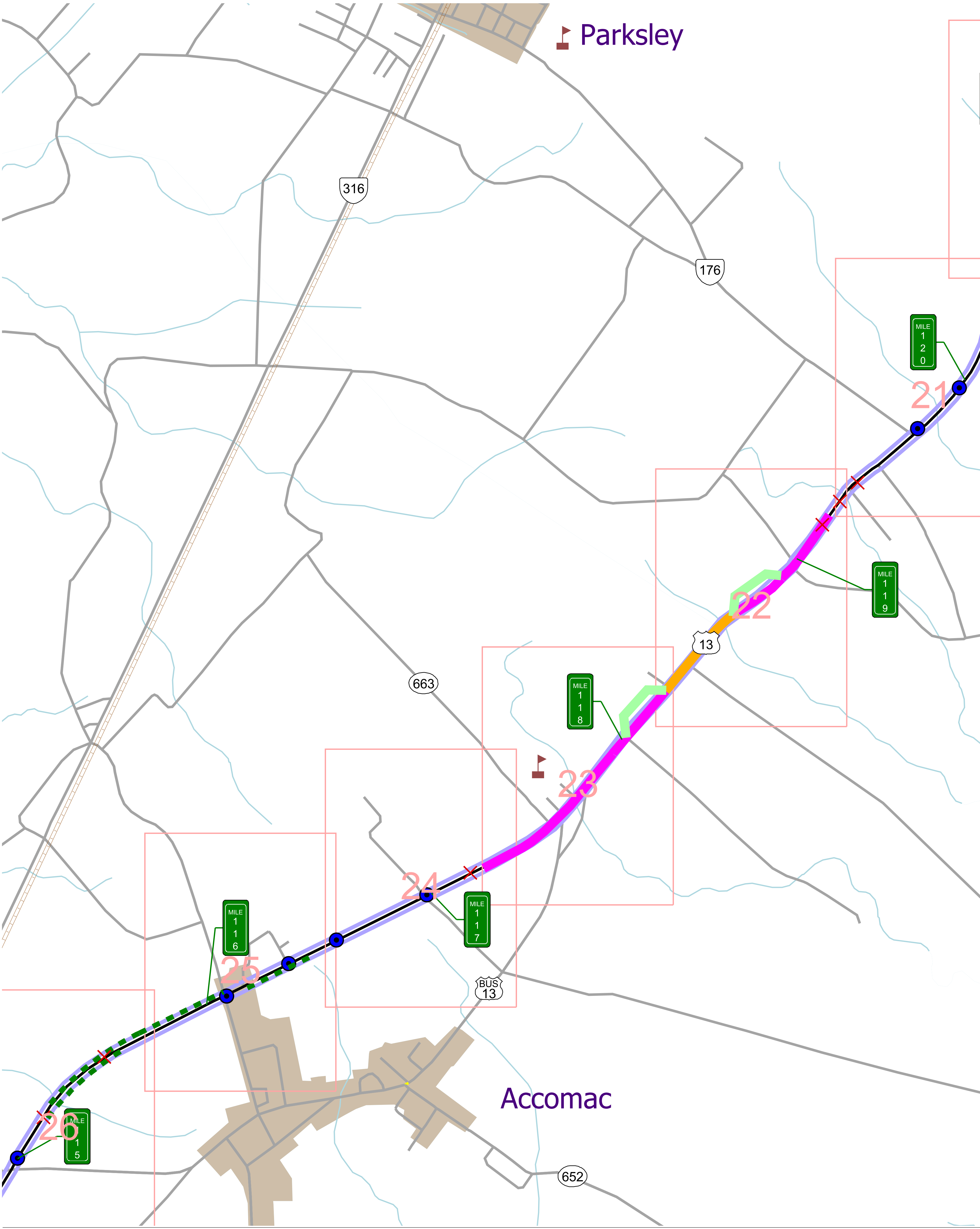

Median Closing

Clear Vegetation

Intersection/Turnlane Improvement

Relocated Railroad

Frontage/Reverse Frontage Improvements

Median Construction

Median Widening

12' Wide Right Shoulder

Roadway Improvement

Route 13 Bypass

10' Wide Right Shoulder

Aerial Photo Number

Figure 6-1
Sheet 5 of 15
Summary of Roadway Improvements

N

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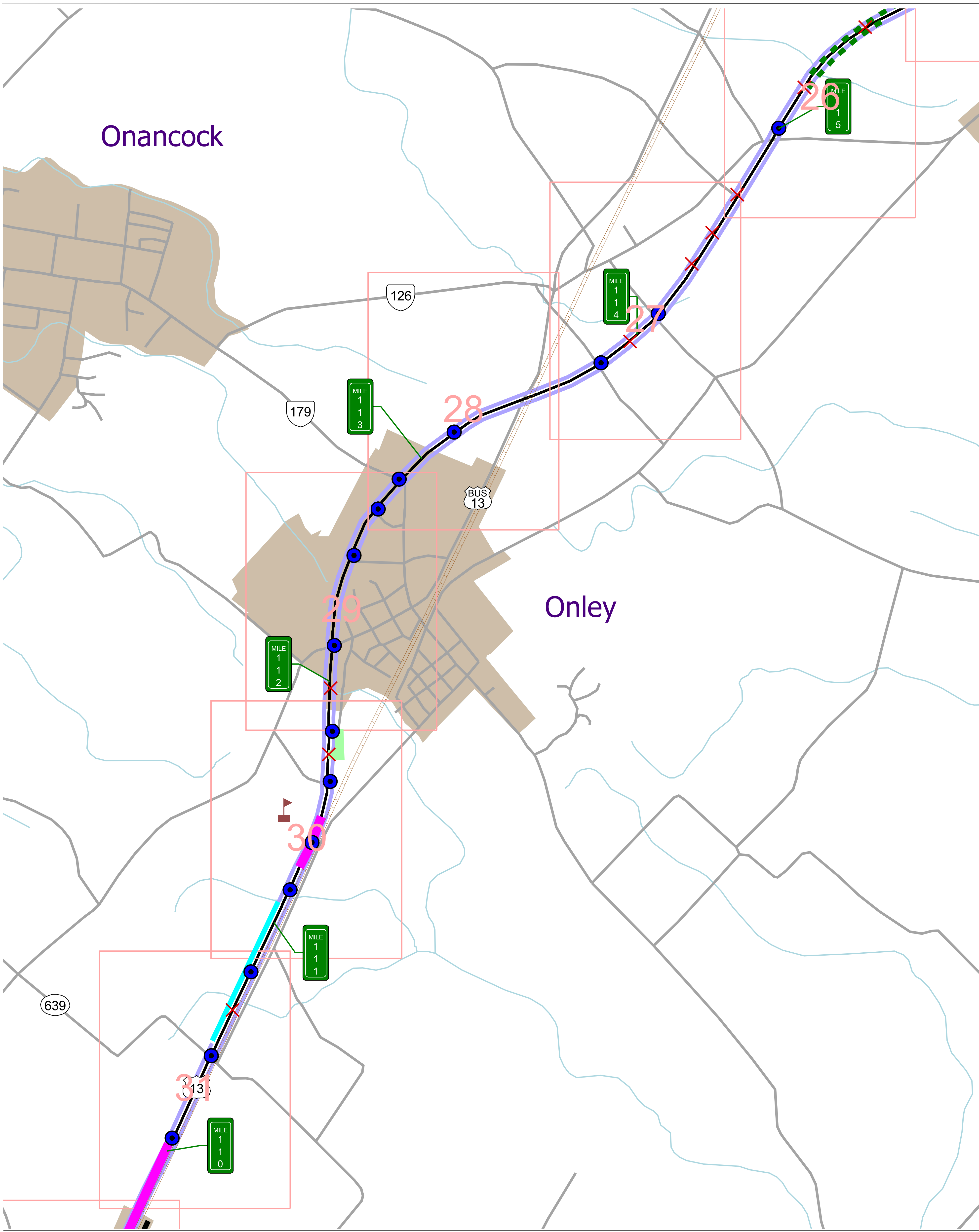

Route 13/Wallops Island
Access Management Study

VDOT
We Keep Virginia Moving

Median Closing
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Roadway Improvement
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Figure 6-1
Sheet 6 of 15
Summary of Roadway Improvements

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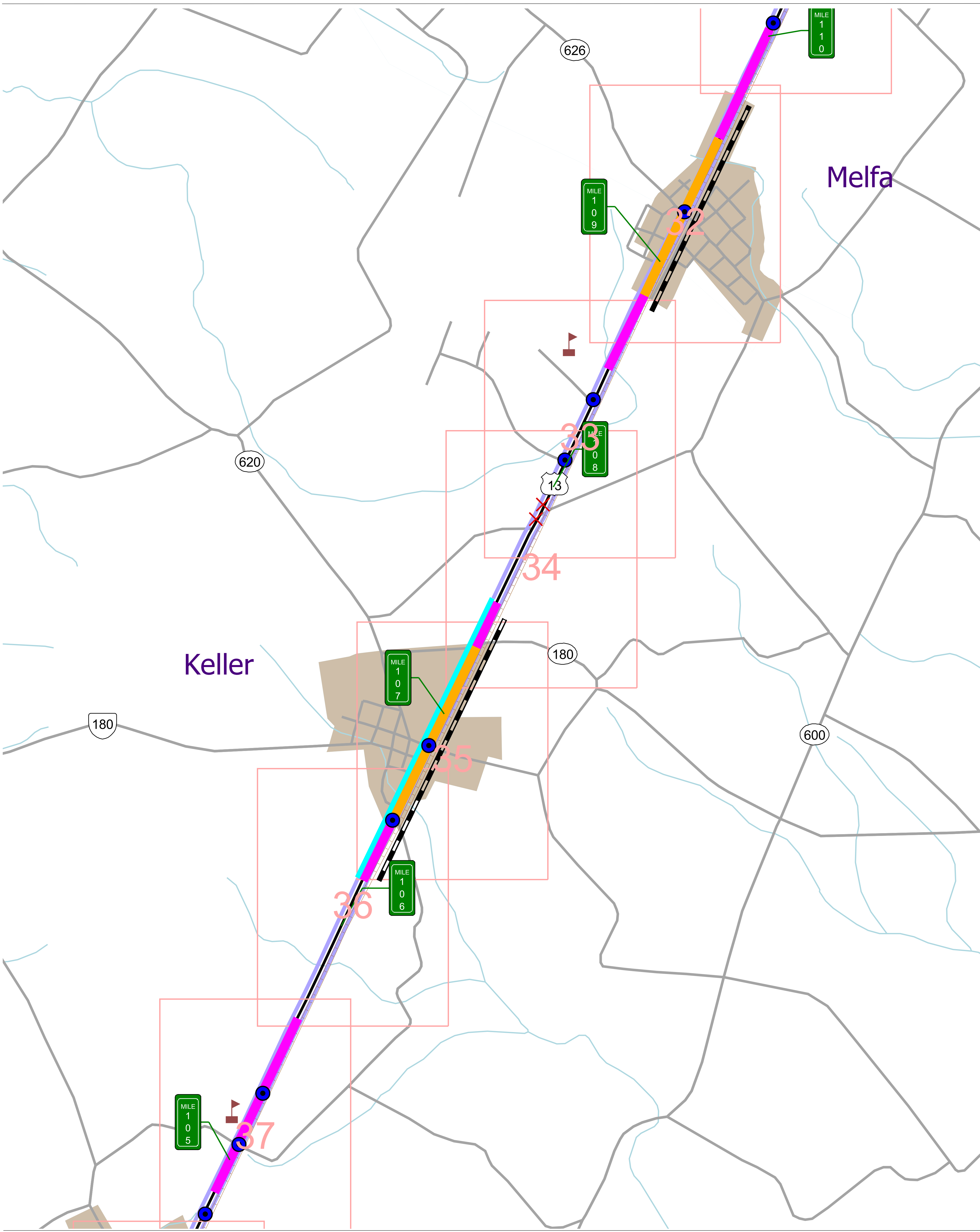

Route 13/Wallops Island Access Management Study

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Figure 6-1
Sheet 7 of 15
Summary of Roadway Improvements

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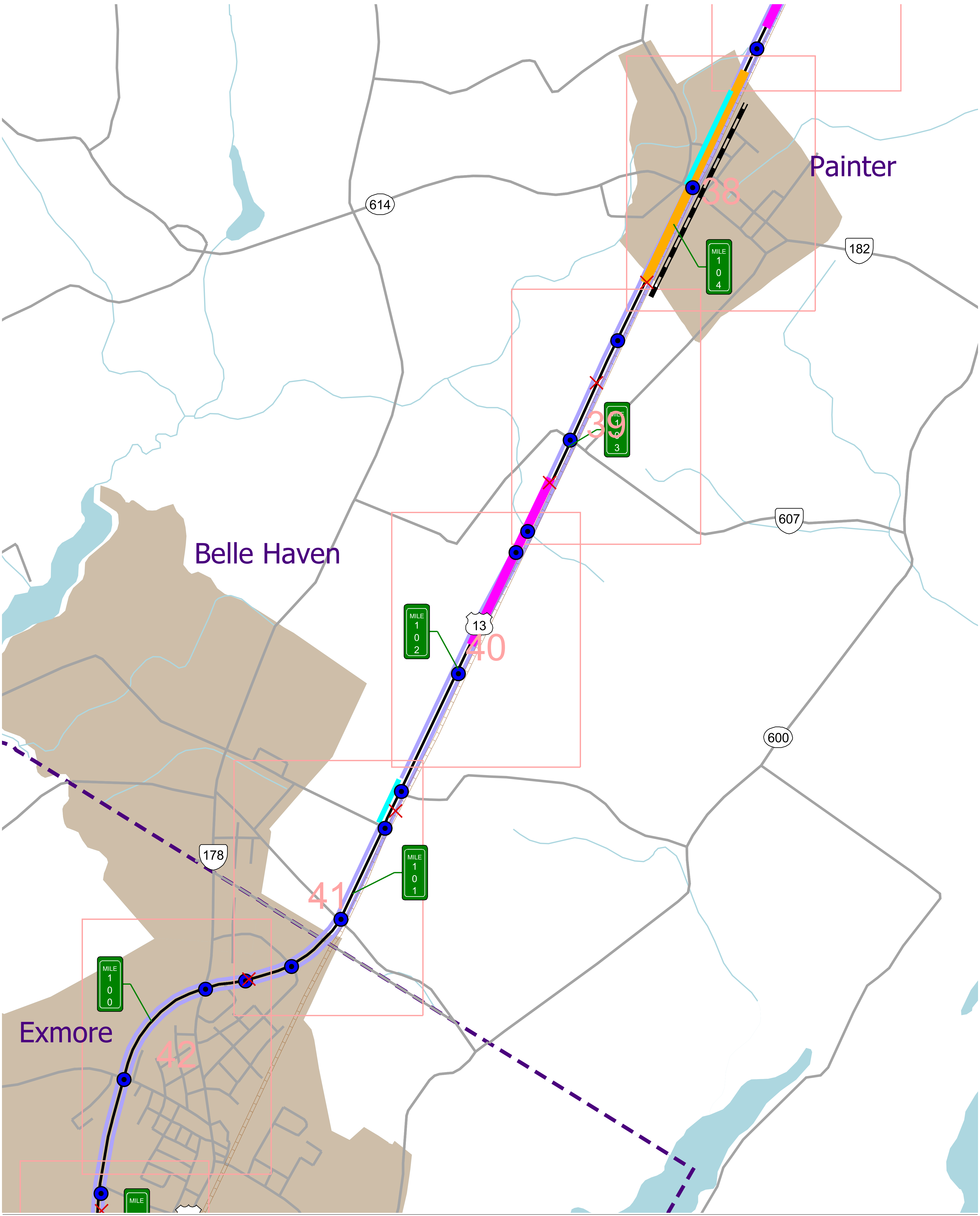

Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

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- # Aerial Photo Number

Figure 6-1
Sheet 8 of 15
Summary of Roadway Improvements

N

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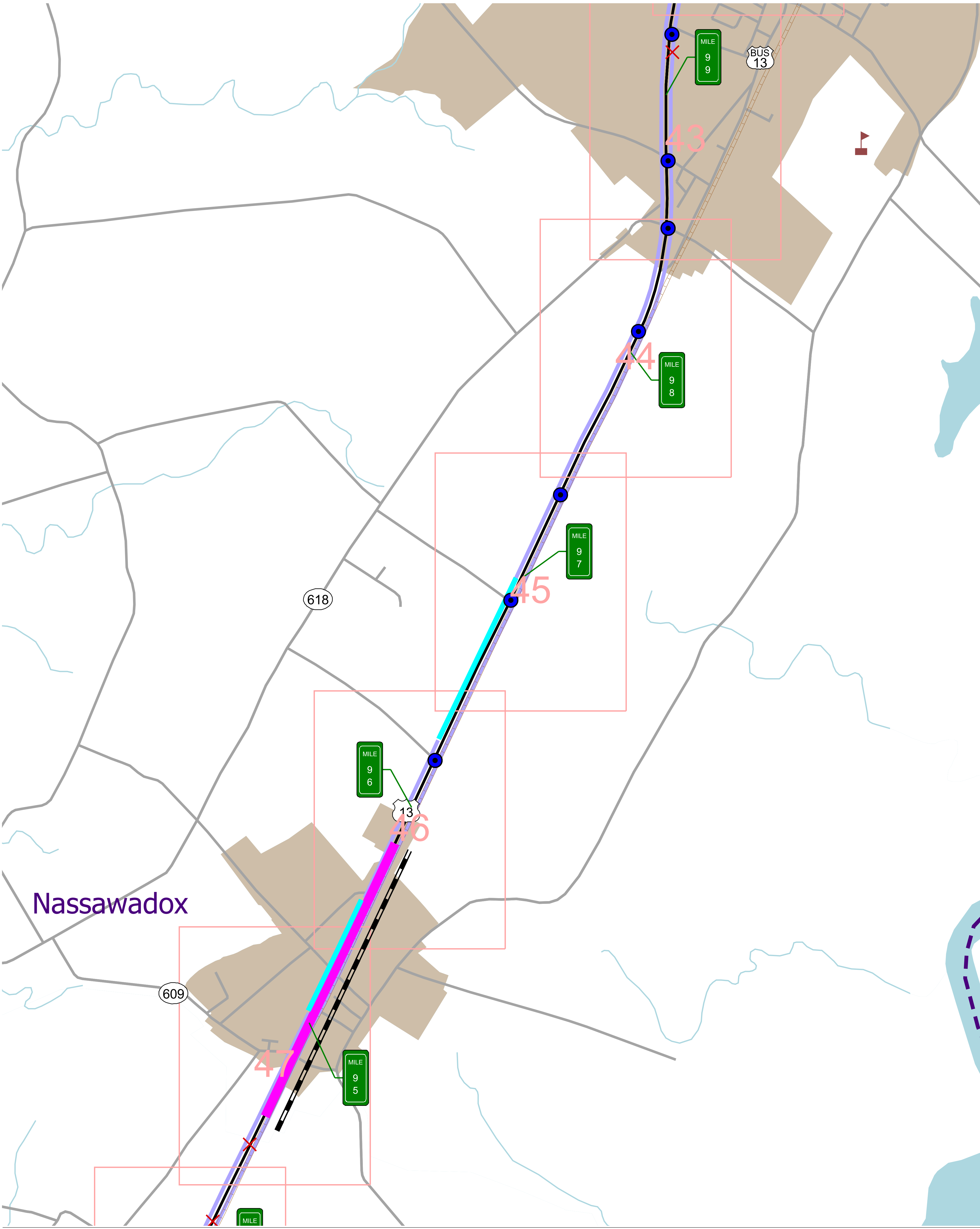

Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

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Route 13 Bypass
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Figure 6-1
Sheet 9 of 15
Summary of Roadway Improvements

N

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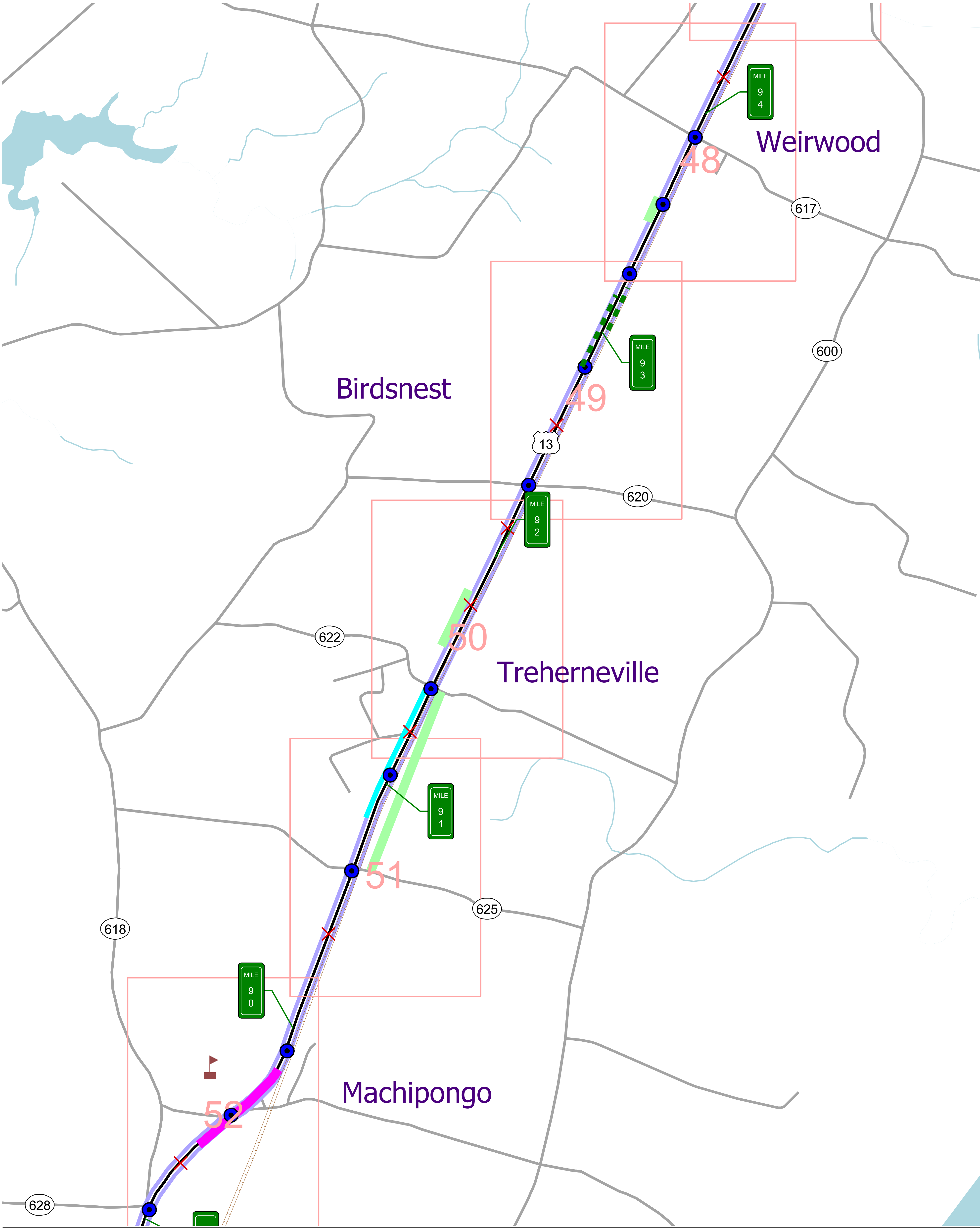

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Roadway Improvement
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Aerial Photo Number

Figure 6-1
Sheet 10 of 15
Summary of Roadway Improvements

Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

N

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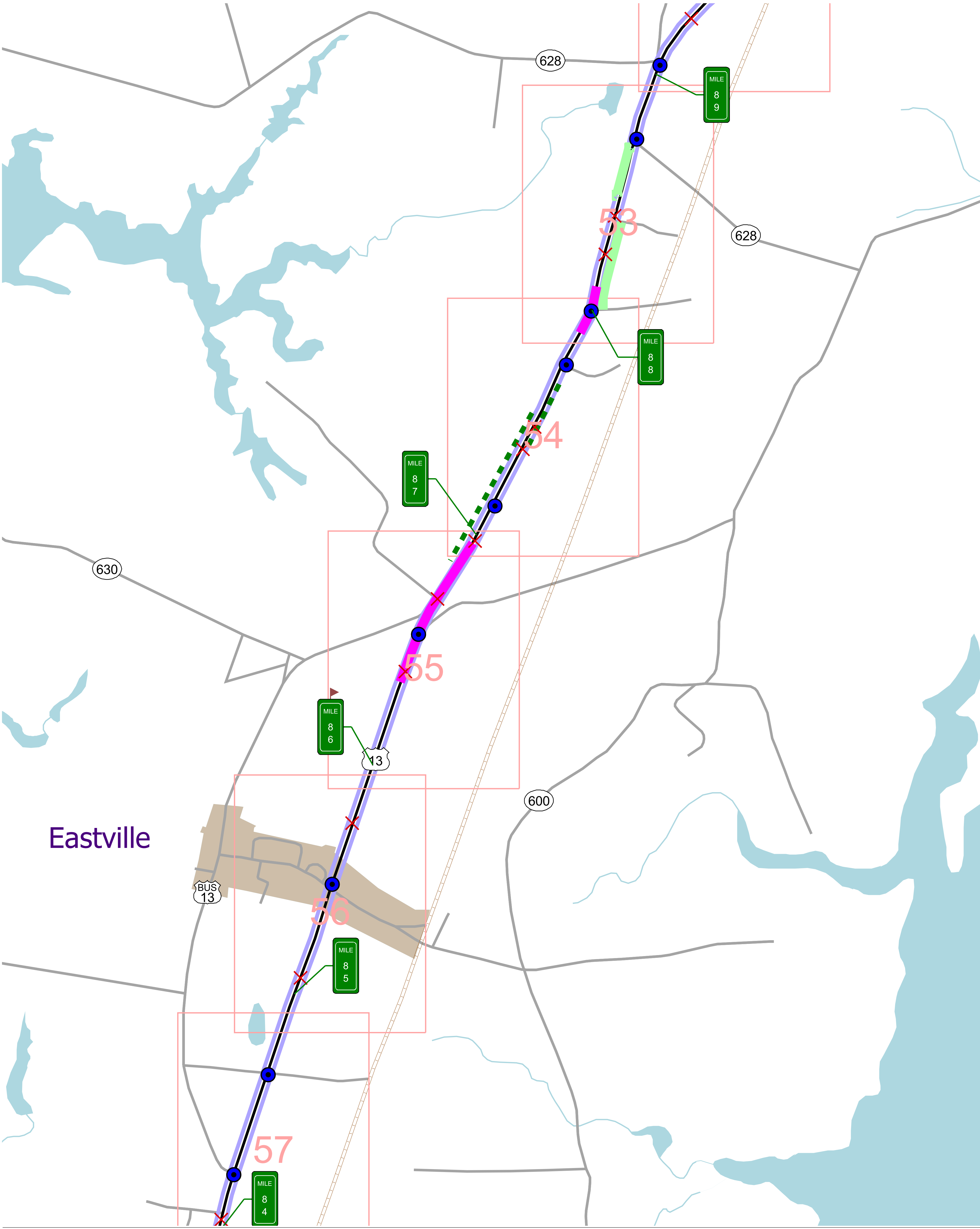

- Median Closing
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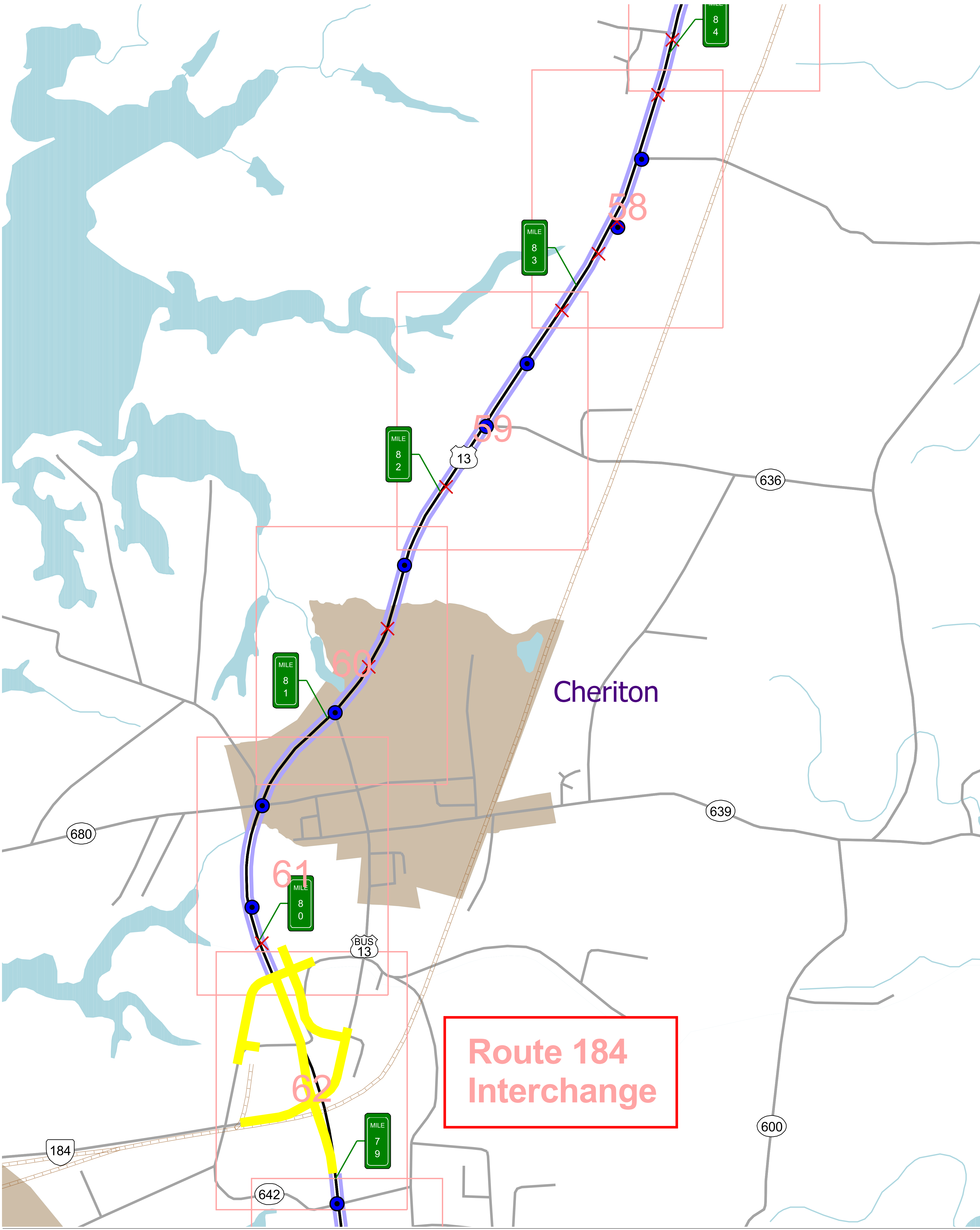
- Route 13 Bypass
- 10' Wide Right Shoulder
- # Aerial Photo Number

Figure 6-1
Sheet 11 of 15
Summary of Roadway Improvements

N

Scale: 1" =2000'



- Median Closing
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Figure 6-1
Sheet 12 of 15
Summary of Roadway Improvements

N

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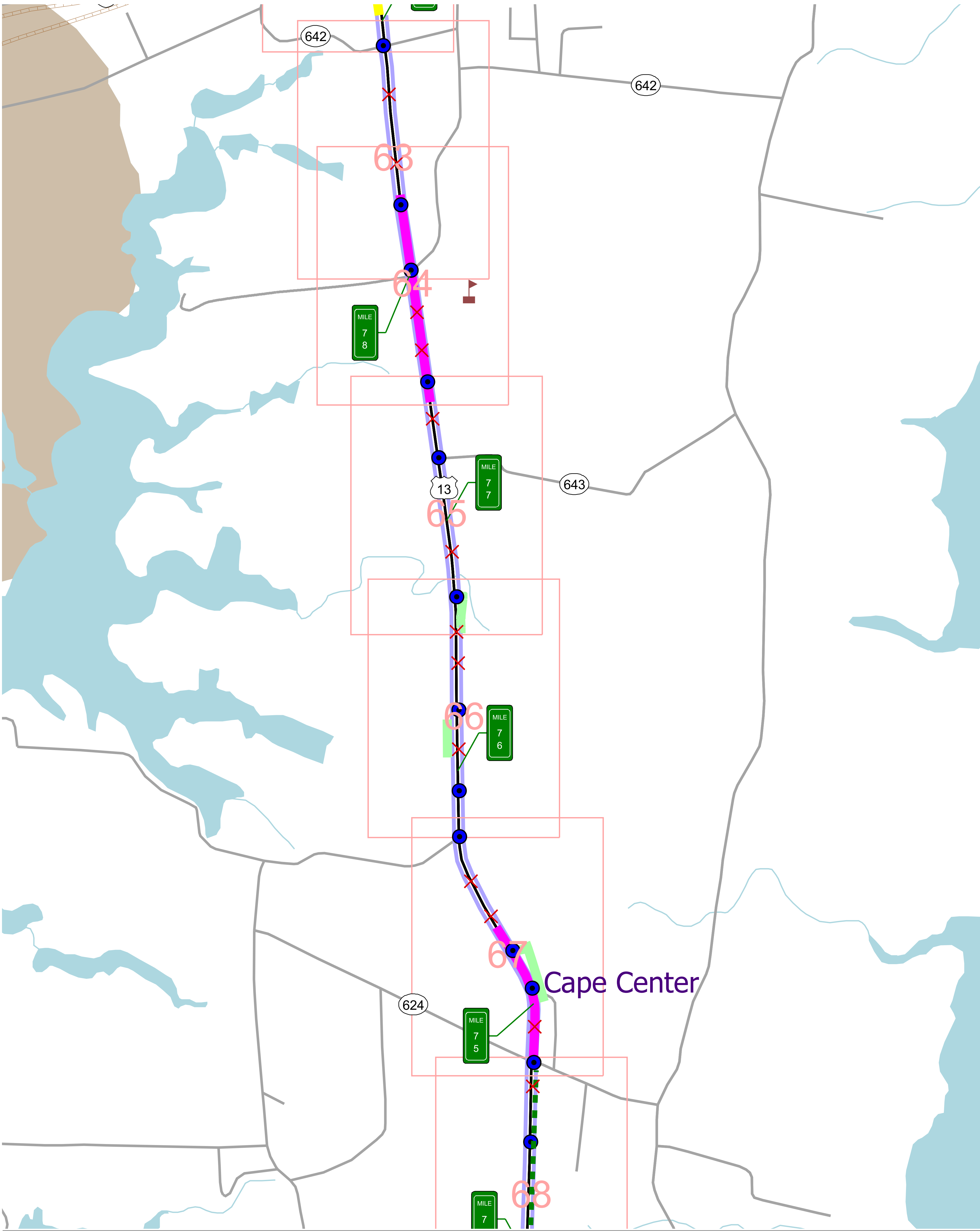

Route 13/Wallops Island Access Management Study

VDOT We Keep Virginia Moving

Median Closing
Clear Vegetation
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Roadway Improvement

Route 13 Bypass
10' Wide Right Shoulder
Aerial Photo Number

Figure 6-1
Sheet 13 of 15
Summary of Roadway Improvements

N

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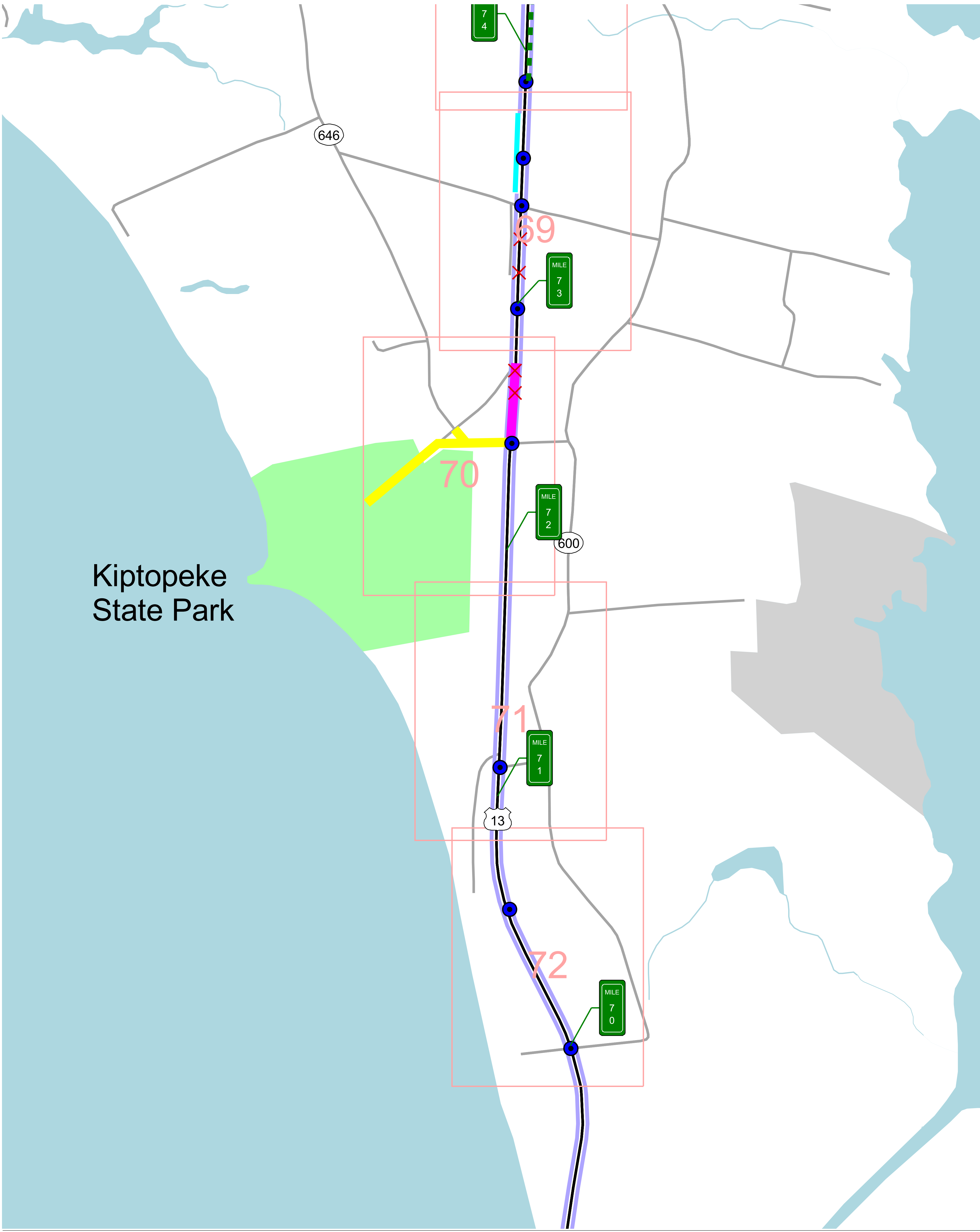

Median Closing
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Roadway Improvement

Route 13 Bypass
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Figure 6-1
Sheet 14 of 15
Summary of Roadway Improvements

N

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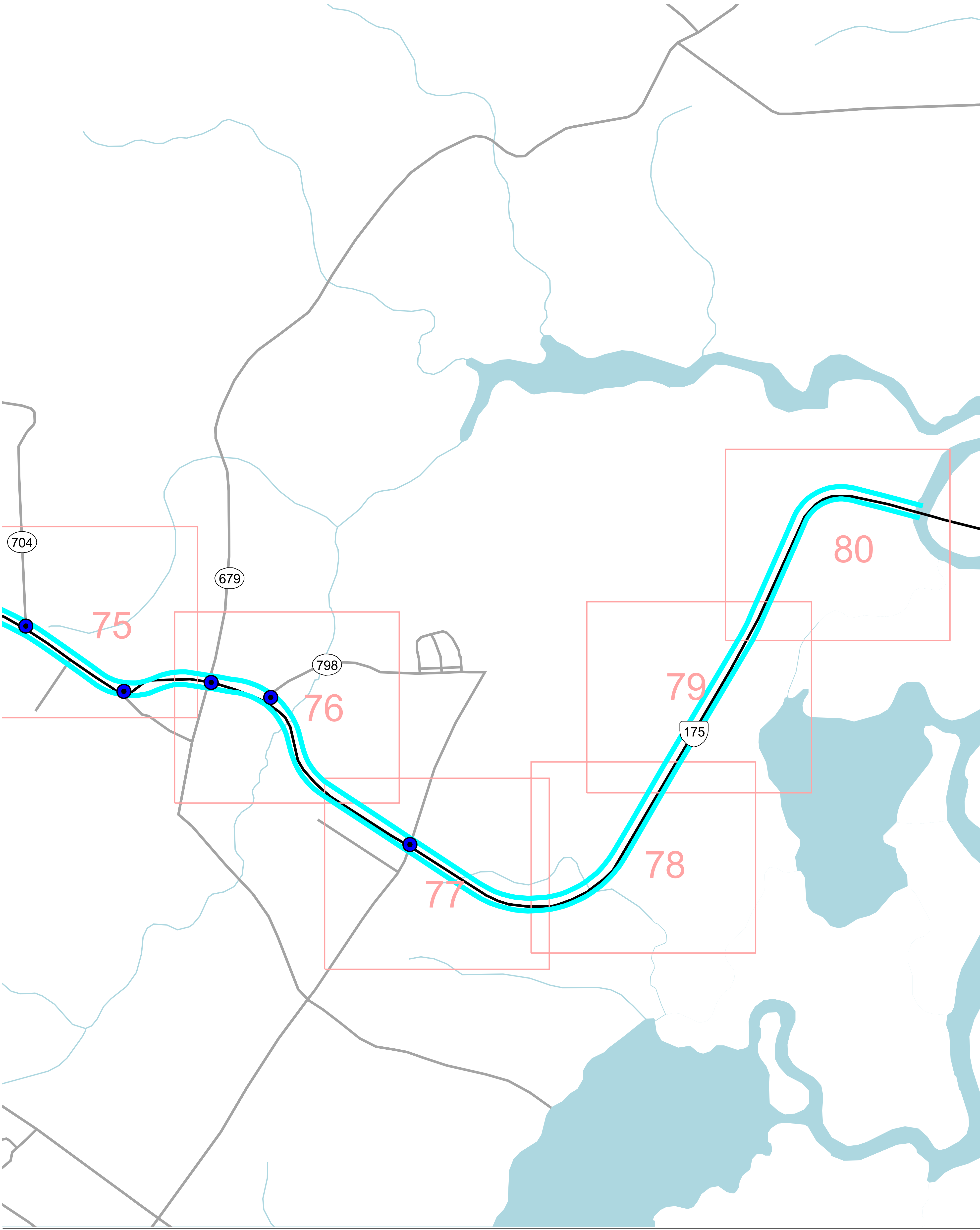


Route 13/Wallops Island Access Management Study

We Keep Virginia Moving

- Median Closing
- Clear Vegetation
- Intersection/Turnlane Improvement
- Relocated Railroad
- Frontage/Reverse Frontage Improvements
- Median Construction
- Median Widening
- 12' Wide Right Shoulder
- Roadway Improvement
- Route 13 Bypass
- 10' Wide Right Shoulder
- # Aerial Photo Number

Figure 6-1
Sheet 15 of 15
Summary of Roadway Improvements

N

Scale: 1" =2000'

Route 13/Wallops Island
Access Management Study

13

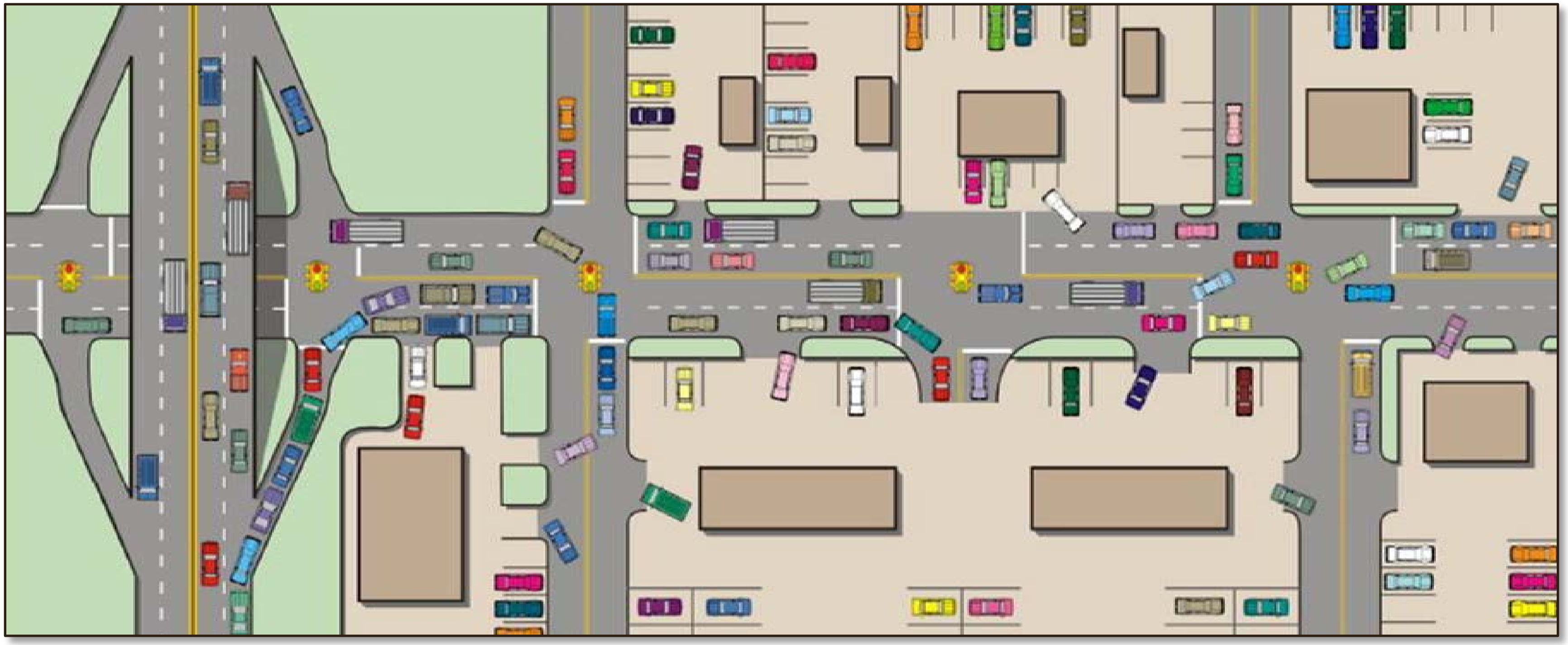
Virginia Department of Transportation

Access Management Regulations and Standards

January 2014

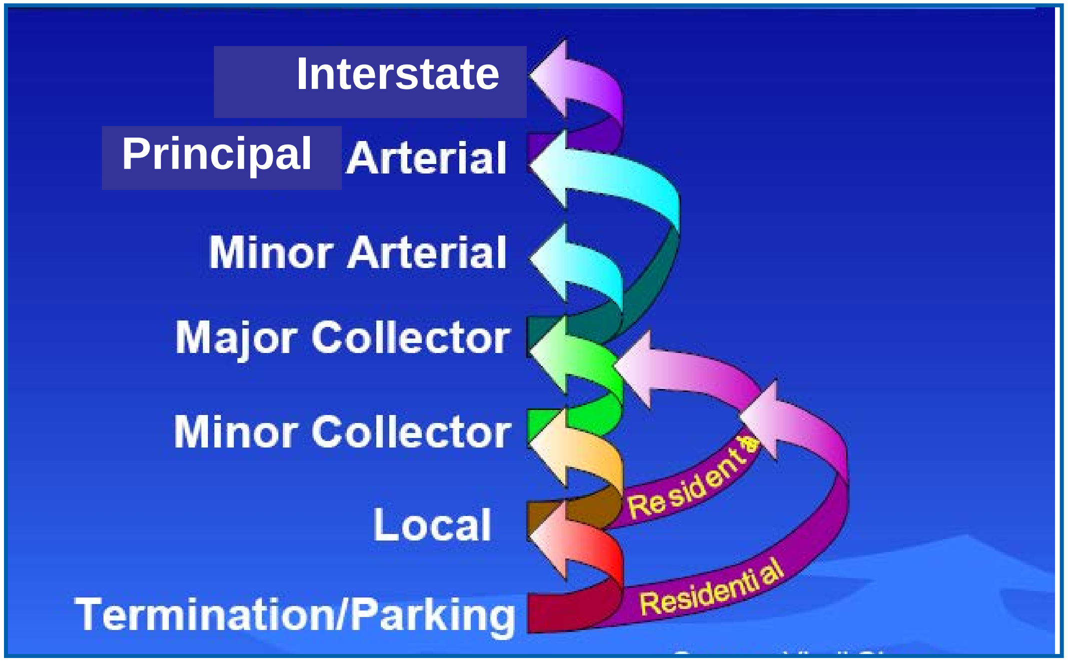
Concept of Access Management

"The way to manage access to land development while preserving the flow of traffic on the surrounding road system in terms of safety, capacity and speed."



Roads Have Different Functions

- Travel involves movement through a network of roads
- Each road serves a distinct function



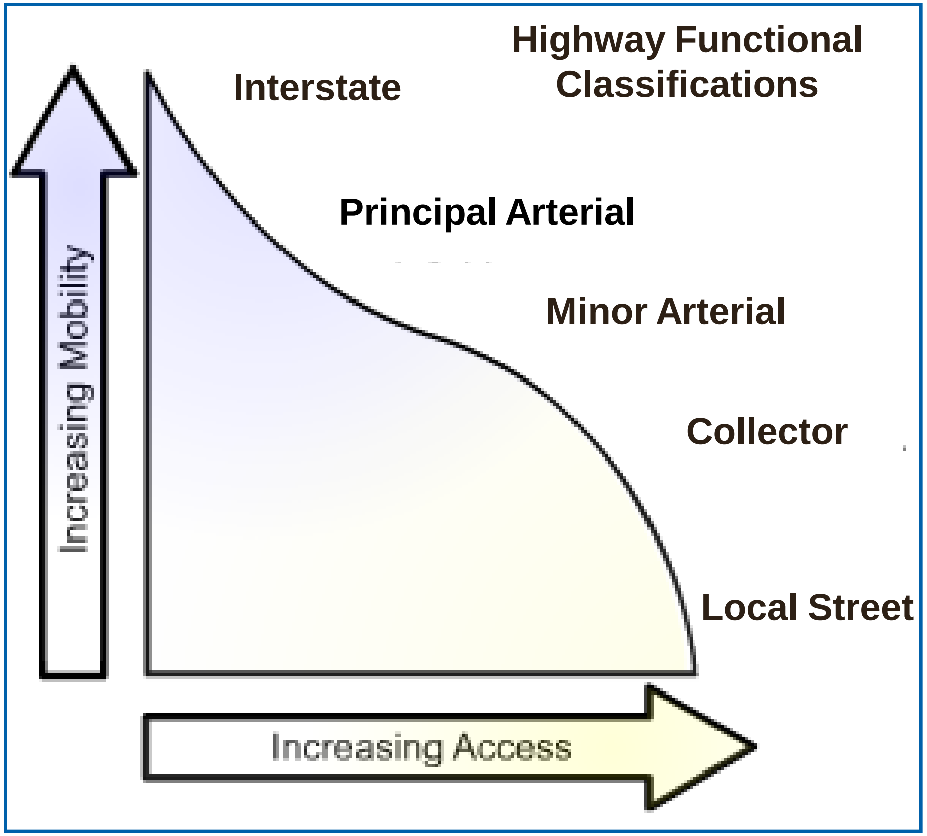
Access Management

Managing the location, number, spacing, and design of

- Commercial entrances
- Intersections/median openings
- Traffic signals
- Entrances near interchange ramps

According to the highway's functional classification

- Arterials
  - Function: Efficient flow of traffic
- Collectors
  - Function: Both traffic circulation in an area and access to property
- Local streets
  - Function: Provide access to property



Access Management: Purpose

- Reduce traffic congestion, motorist’s time waiting in traffic
- Lower the number and severity of traffic crashes
- Preserve critical roadway capacity
  - Maximize the performance of existing highways, reducing the need for new highways & adding lanes to highways
  - Protect taxpayer investment in highways
- Support economic development
  - Better mobility expands the market reach of businesses and lowers the cost of transporting goods
- Provide property owners with reasonable access to the highway

Access Management: National Research Findings

"The lack of access control along arterial highways has been the largest single factor contributing to the obsolescence of highway facilities"

NCHRP Report 121 Protection of Highway Utility, 1971

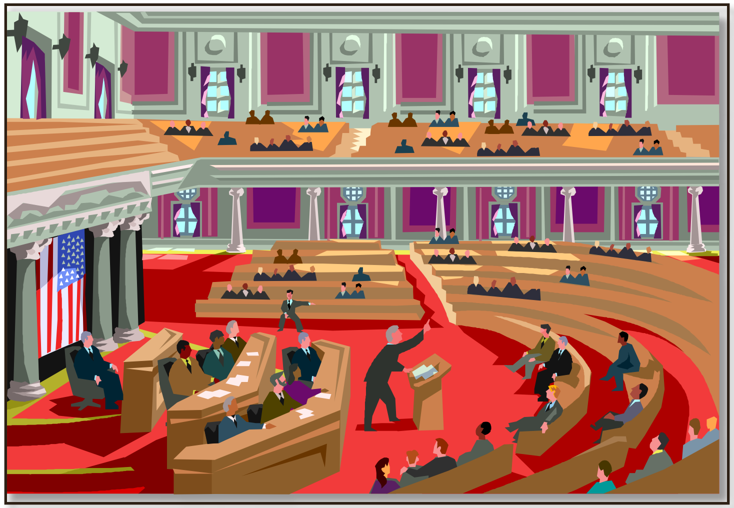
"Every study since the 1940s has indicated a direct and significant link between access frequency and accidents"

International Right-of-Way Association Report, 1999

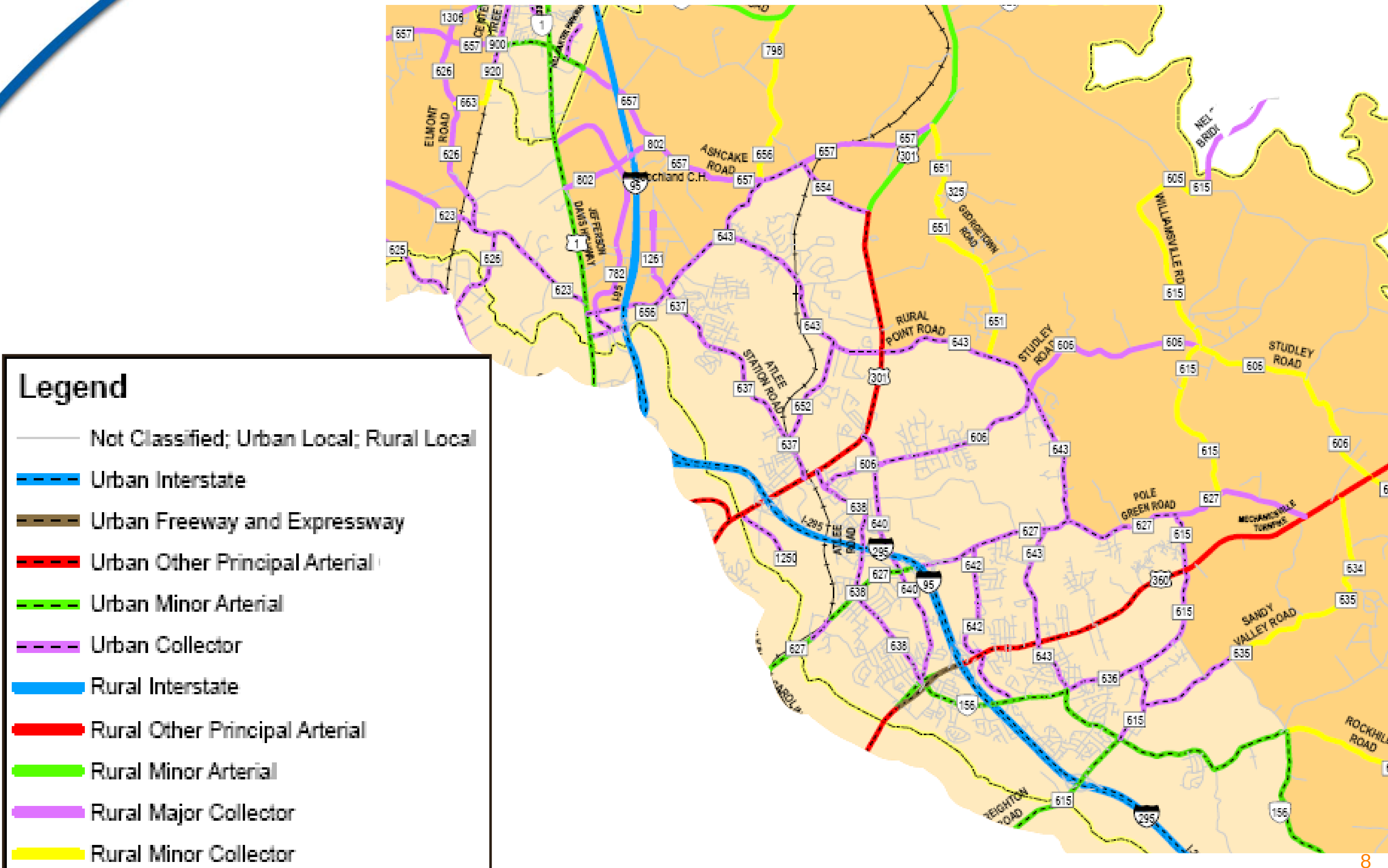
Authority for the Regulations and Standards

§ 33.1-198.1 of the Code requires VDOT to implement access management regulations and standards

- For state maintained highways
- <u>Do not apply</u> to roads maintained by cities, certain towns and counties (Arlington, Henrico)
- For principal arterials, minor arterials, collectors, and local streets



Example of Principal & Minor Arterial, Collector, Local Street Network



Development of the Regulations and Standards

Policy Committee reviewed and refined drafts during 2007

- VA Association of Counties
- Home Builders Association of VA
- Piedmont Environmental Council
- VA Commercial Real Estate Association
- VA Section, Institute of Transportation Engineers

Public comments

- Five public hearings throughout the state
- Over 450 comments received
- Regulations/standards revised based on public comments

Training/Information Sessions

- Nine sessions; one in each VDOT District
- Over 600 people attended

Access Management - Implementation

Access Management Regulations 24 VAC 30-73

- Apply to all highway functional classifications

Access Management Design Standards,
Appendix F of VDOT's Road Design Manual

- Standards for spacing and design of entrances

Access Management Regulations

VDOT will permit reasonably convenient access to the highway

- **Fewest number of entrances to reduce turning movements**
- **Focus on side streets**
- **Use of right-in/right-out entrance design**
- **Demonstrate safety of proposed entrance & its impact**
- **Mitigate any impacts on highway operation and safety.**

Too many entrances can lead to a reduction in the flow of traffic and potential collisions

Regulations: Section 120

Access Management Requirements

1. <u>Keep entrances out</u> of the functional area of intersections and <u>away from</u> interchange ramps

2. <u>Share the entrance</u> with adjoining property owner

3. Provide connections to property line for <u>vehicular and pedestrian circulation</u> between land uses

4. <u>Control</u> traffic movements at entrances

5. Comply with <u>spacing standards</u> to separate signals, intersections, median openings, and commercial entrances

<u>Exceptions</u> to the requirements are referenced in the Regulations.

Application to Entrance Types

The Access Management Requirements

The five requirements apply to commercial entrances

- **Entrances to land uses that generate more than 50 vehicles per day (VPD)**
- **Examples: businesses, offices, residential developments, schools**

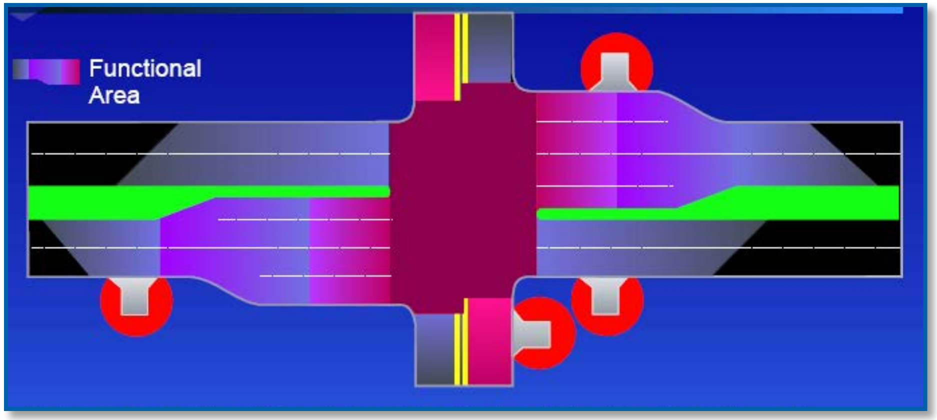
The five requirements do not apply to:

- **Private entrances – driveway entrances to 1 or 2 homes, cell towers, uses that generate 10 or fewer VPD**
- **Low volume commercial entrances – for land uses with 50 or less VPD such as a 4 or 5 lot private road entrance to the highway**

See the Regulations and Appendix F Design Standards for more information.

1. Keep Entrances Away from Intersections

Protect the Functional Area of Intersections



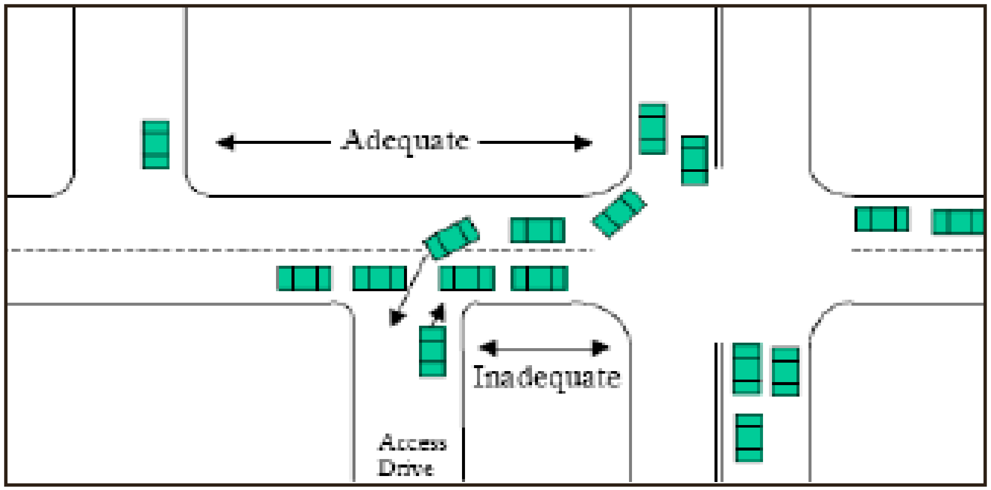
Entrances (collision points) in the right turn lane

Exiting entrance and cutting across lanes of traffic

EXCEPTION: **Approval of a traffic study documenting the entrance will not affect the intersection movements or public safety.**

Protect Traffic Movements at Intersections

Corner Clearance on Minor Side Street



Motorists stopping in the intersection through lanes to turn at entrances can cause crashes, congestion, vehicles backing up on to main highway.

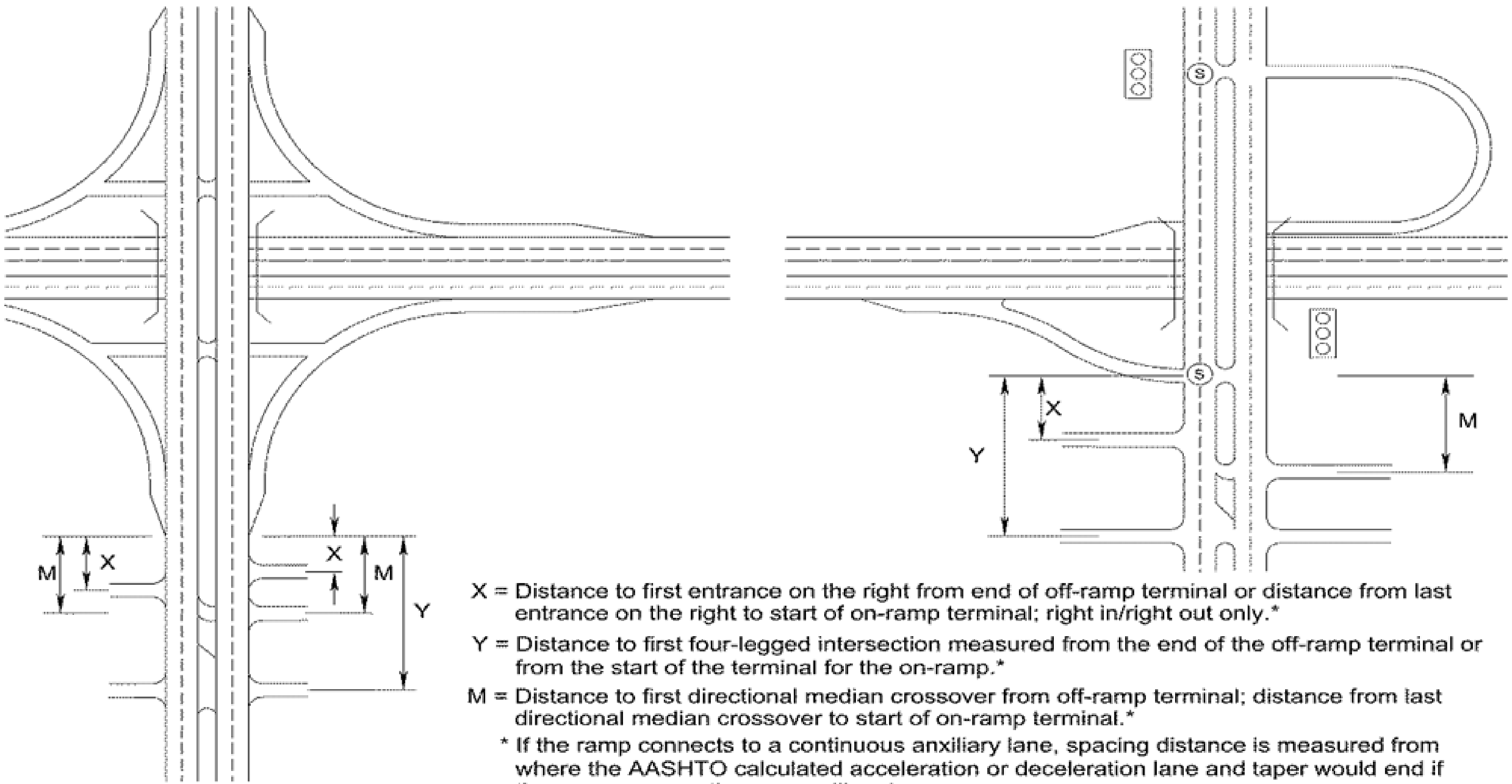
Keep Entrances & Intersections Away From Interchange Ramps

- Prevents traffic backups onto ramps
- Reduces crash potential near the ramps

Keep Entrances & Intersections Away From Interchange Ramps

Traffic backing up on the off ramp creates safety issues for motorists exiting the highway

Spacing Distances for Entrances & Intersections Near Interchange Ramps



X = Distance to first entrance on the right from end of off-ramp terminal or distance from last entrance on the right to start of on-ramp terminal; right in/right out only.*

Y = Distance to first four-legged intersection measured from the end of the off-ramp terminal or from the start of the terminal for the on-ramp.*

M = Distance to first directional median crossover from off-ramp terminal; distance from last directional median crossover to start of on-ramp terminal.*

* If the ramp connects to a continuous anxiliary lane, spacing distance is measured from where the AASHTO calculated acceleration or deceleration lane and taper would end if there were no continuous anxiliary lane.

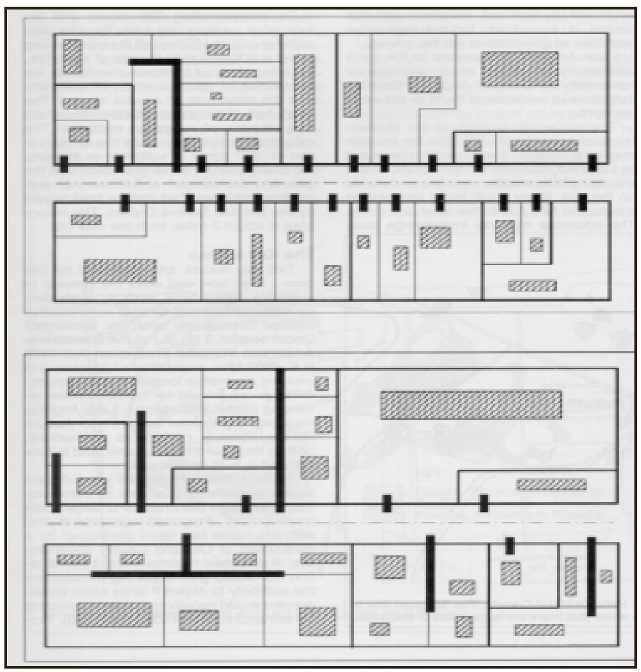
Spacing Dimension			
X	Y	Z	M
750’	1320’	750’	990’

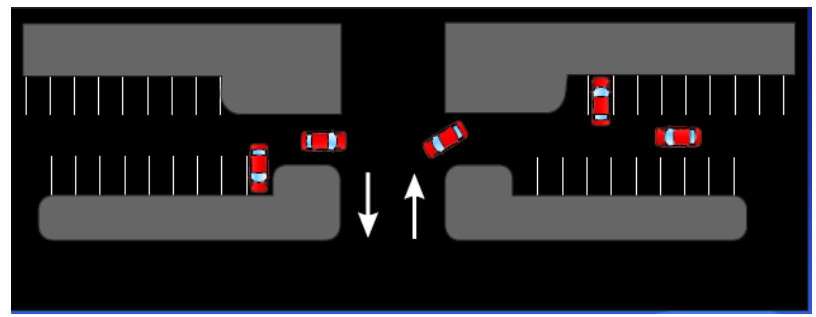
2. Share Entrances

- Reduces the number of entrance/exit points along the highway
- Businesses can share (gain) customers; share construction cost
- Record agreement for joint use and maintenance of the entrance

Top Right:
23 entrances,
28 parcels

Bottom Right:
10 entrances,
29 parcels





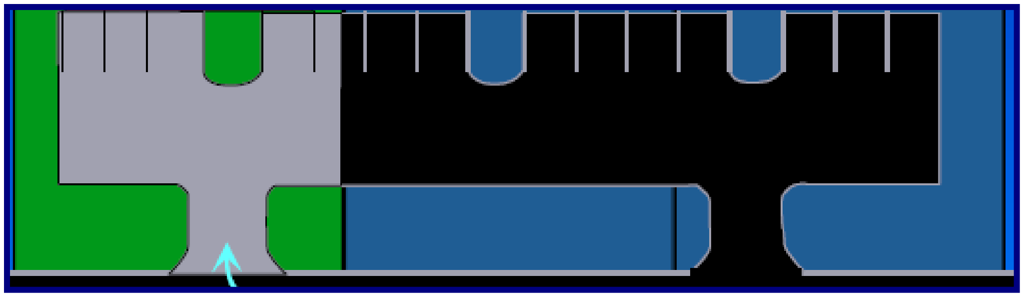
EXCEPTIONS

- Physical constraints such as topography, environmental, hazardous land uses
- Adjoining property owner will not agree to share entrance

3. Vehicular Circulation between Adjoining Properties

Vehicles travel on site; less traffic on the highway

Facilitate customer circulation between businesses



- **Record access easement, construct connection to adjoining undeveloped parcel boundary**
- **Adjoining parcel connects when developed**

EXCEPTION: Physical constraints to the connection such as topography, environmentally sensitive areas, adjacent hazardous land use

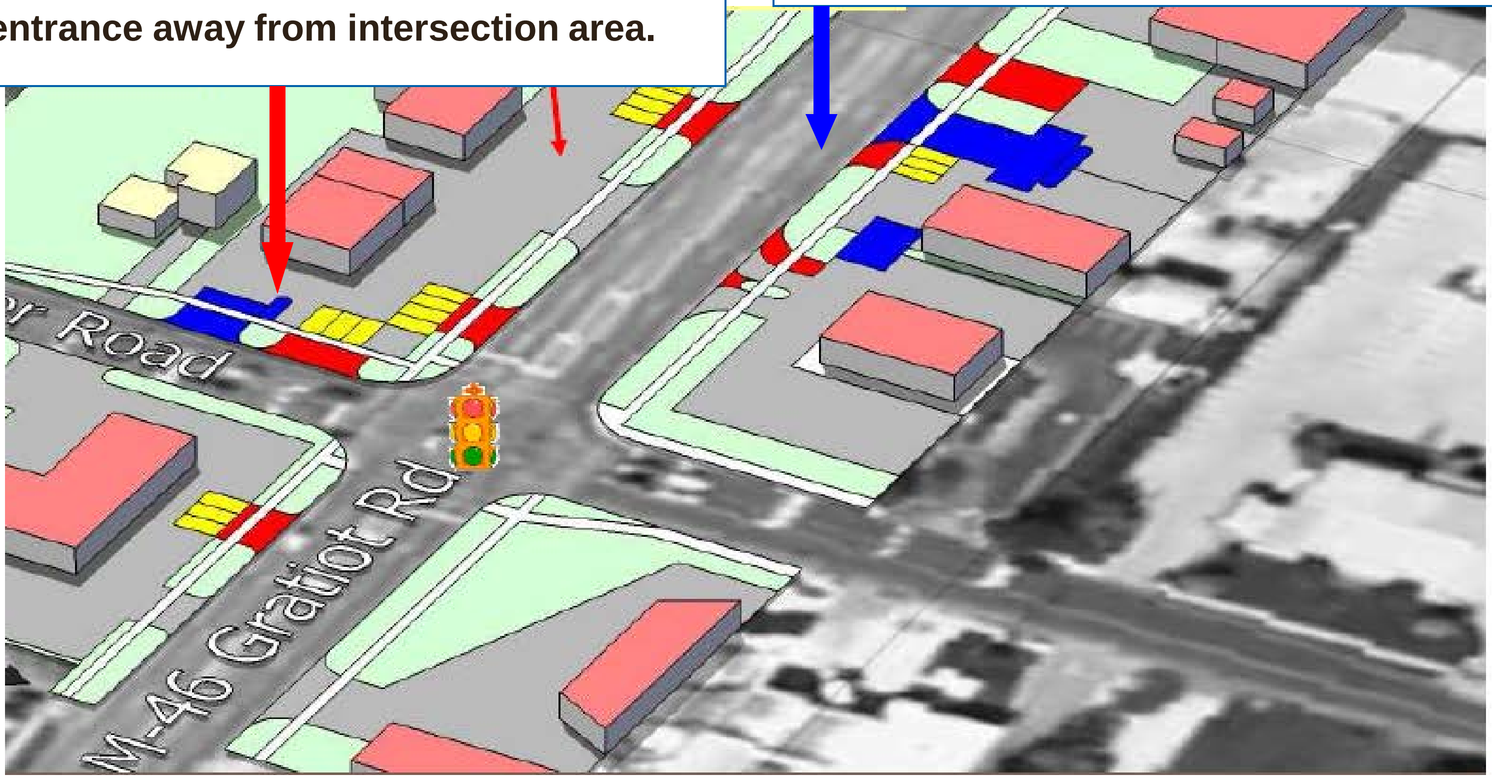
Examples

Blue shared entrance instead of two red entrances.

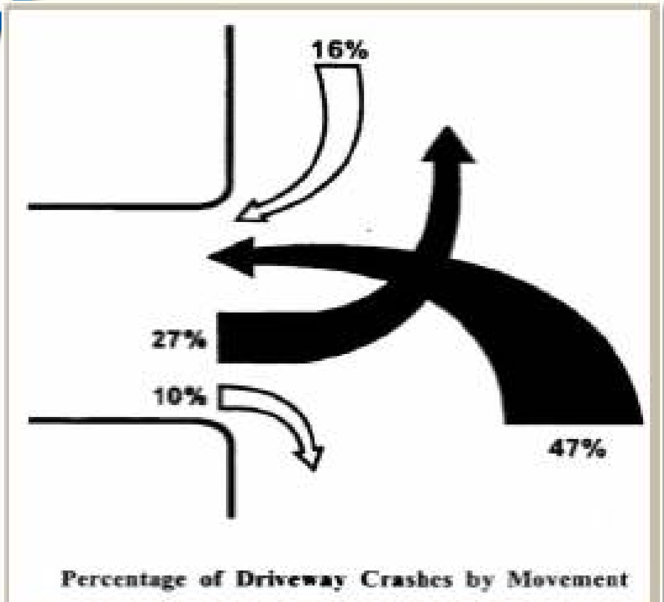
Blue connection to allow vehicle & pedestrian circulation between businesses.

Three red entrances too close to intersection.

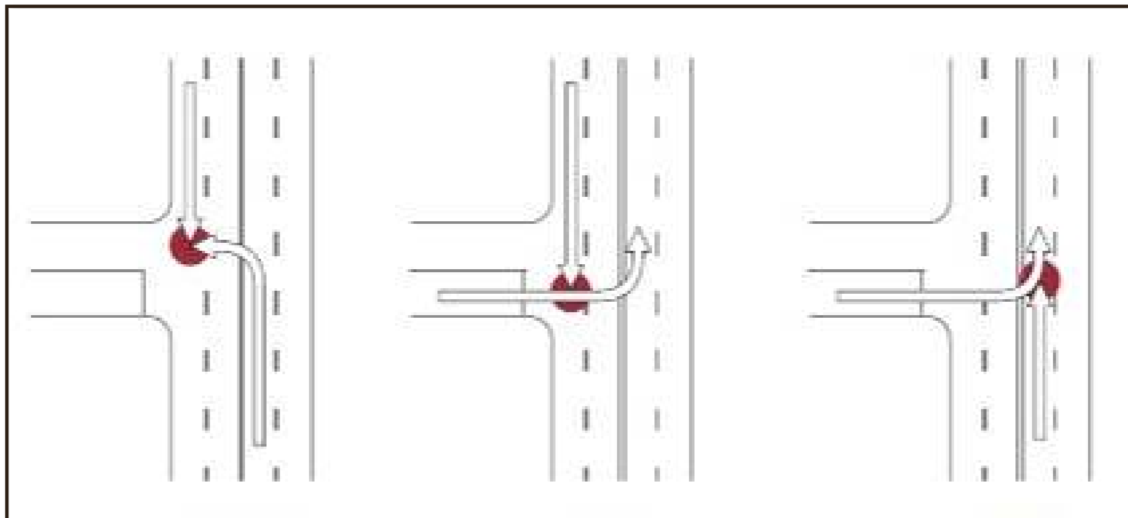
Blue entrance away from intersection area.



4. Control Turning Movements at Entrances



Source: National Highway Institute

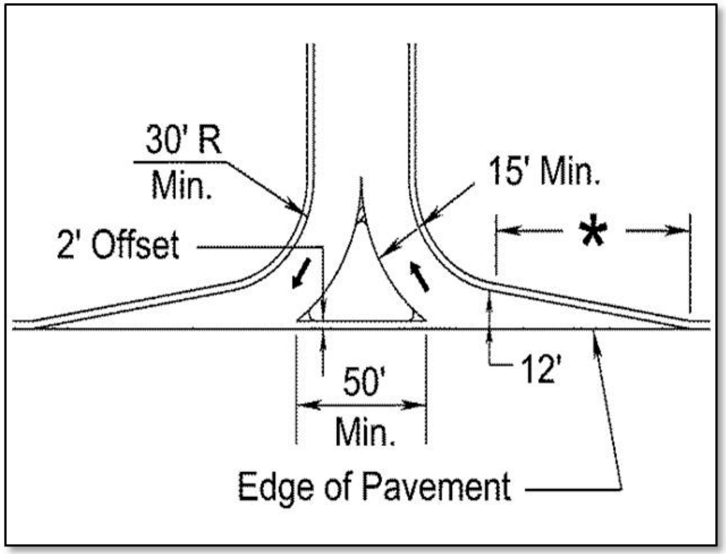


74% of Crashes at Entrances Involve Left Turns

Control Turning Movements at Entrances

Technique:

- Right-in/right-out entrance design
- Prevents left ingress & egress turning movements



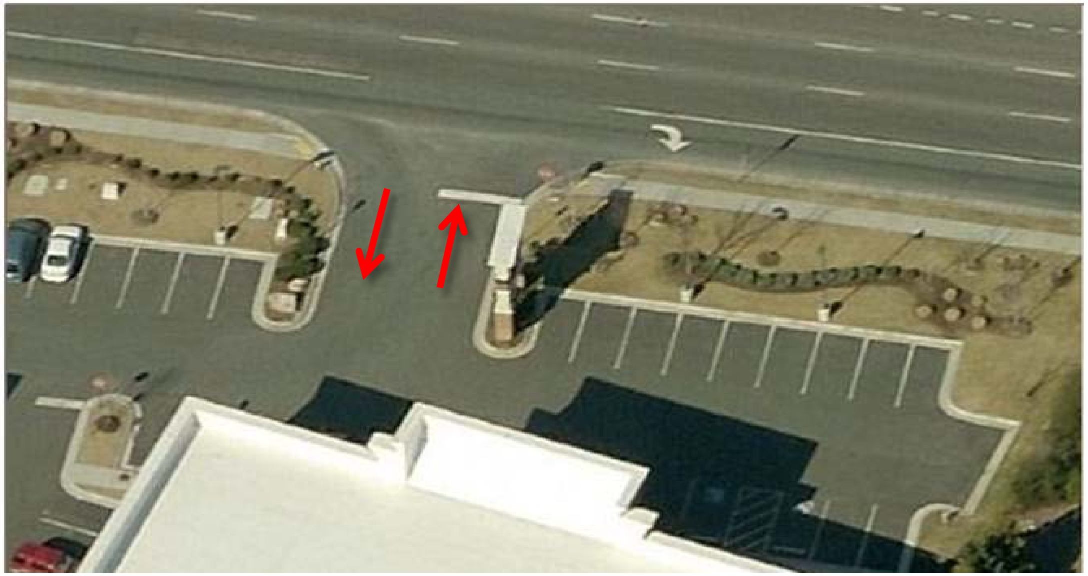
Entrance Island to Limit Left Turns

Median to Prevent Left Turns

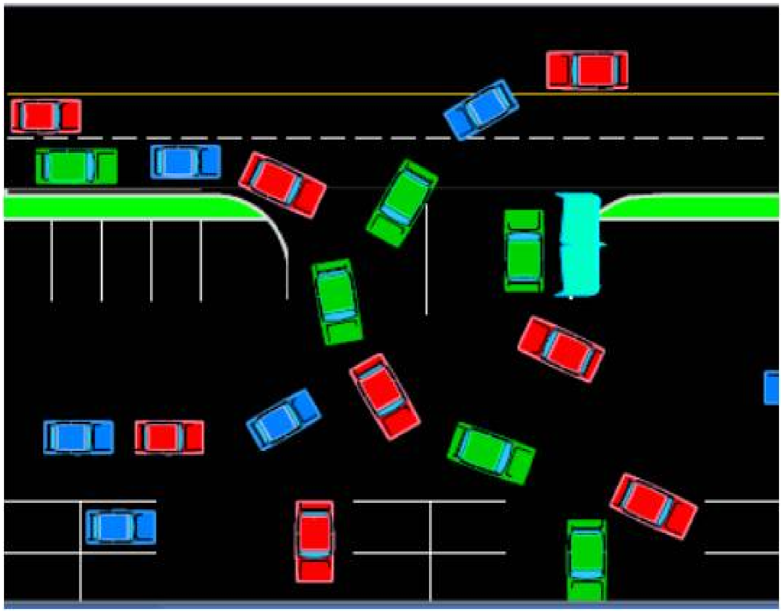
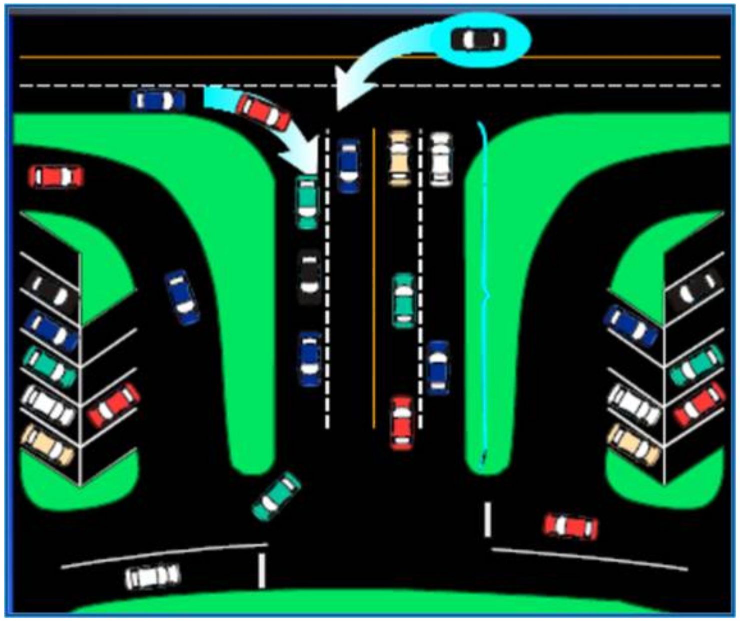
Control Turning Movements at Entrances

Technique:

Design entrance so ingress & egress points easily identified



Control Turning Movements at Entrances

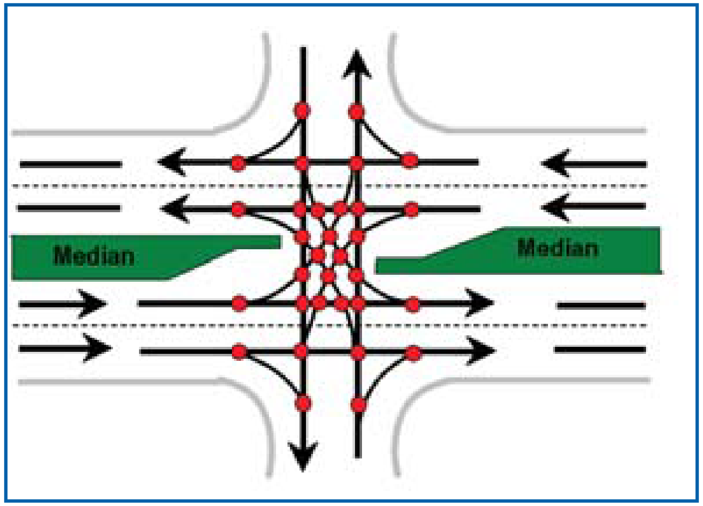
Technique: Entrance Throat

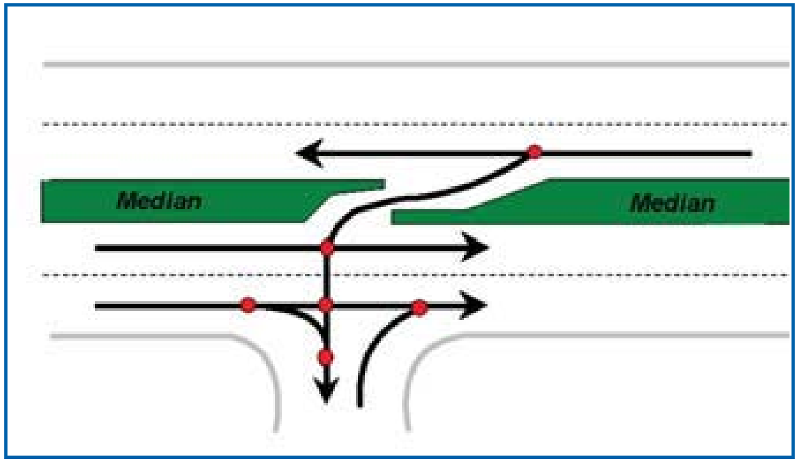
- **Prevents vehicles from backing up on to the highway**
- **Helps protect on-site circulation**

5. Entrance & Intersection Spacing

As the number of turning movements and traffic conflict points* increase, so does congestion and traffic crashes

32 conflict points
Greater spacing is needed





6 conflict points
Less separation needed

*** Traffic conflicts occur where vehicle paths intersect. Each conflict point is the location of a potential collision.**

Entrance Spacing

Separation between entrances so motorists do not have to react to multiple, overlapping ingress/egress turning movements

NCHRP Report 420

Crash rate **average for entrance spacing of 150 ft was:**

1.7 times greater than for 265 ft spacing

2.5 times greater than for 550 ft spacing

Separation between Traffic Signals

- More efficient traffic progression
- Reduces stop & go delay
- Simplifies signal synchronization
- Use less gas; less vehicle emissions

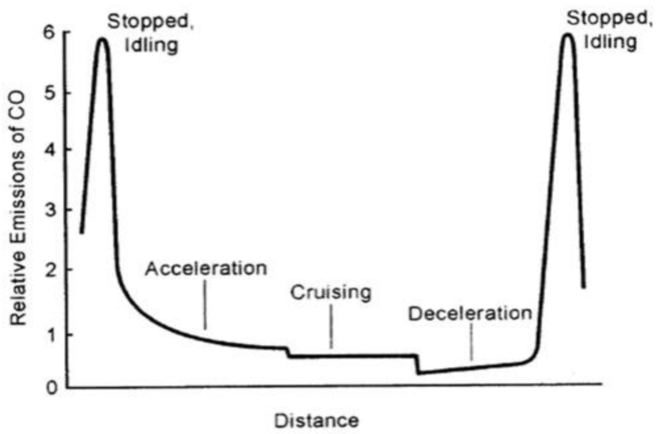
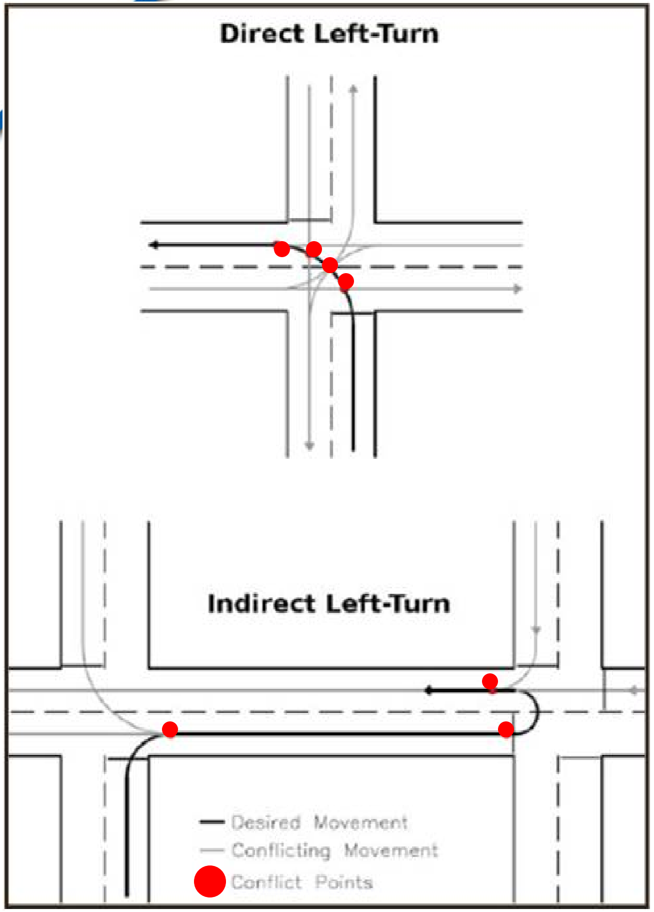
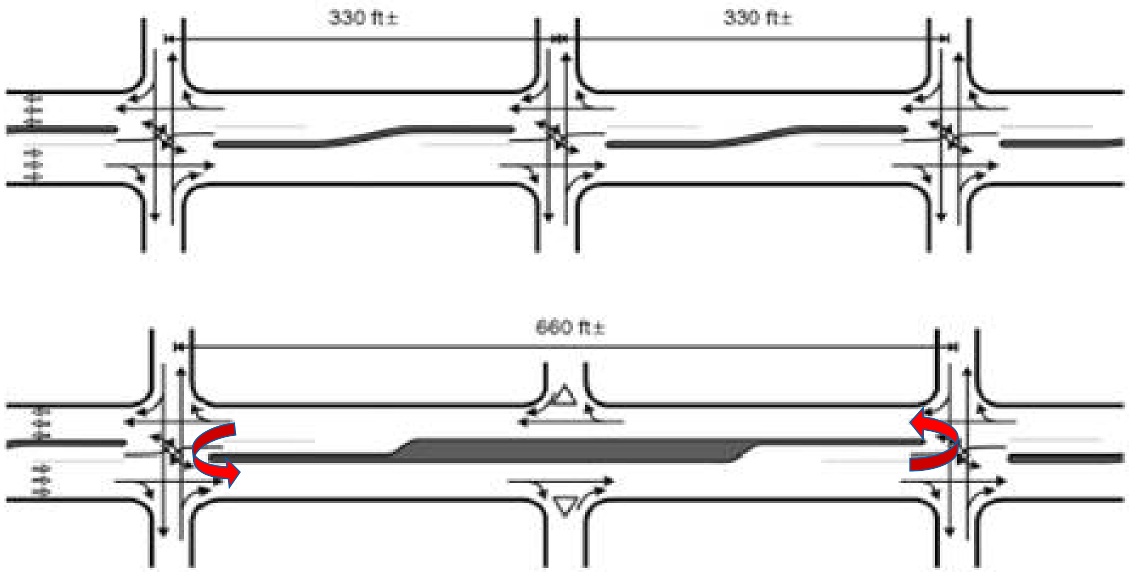


Figure 4–14. ***Relative Emissions of Carbon Monoxide During Vehicle Operation***

Fewer Intersections: U-Turns vs. Left Turns





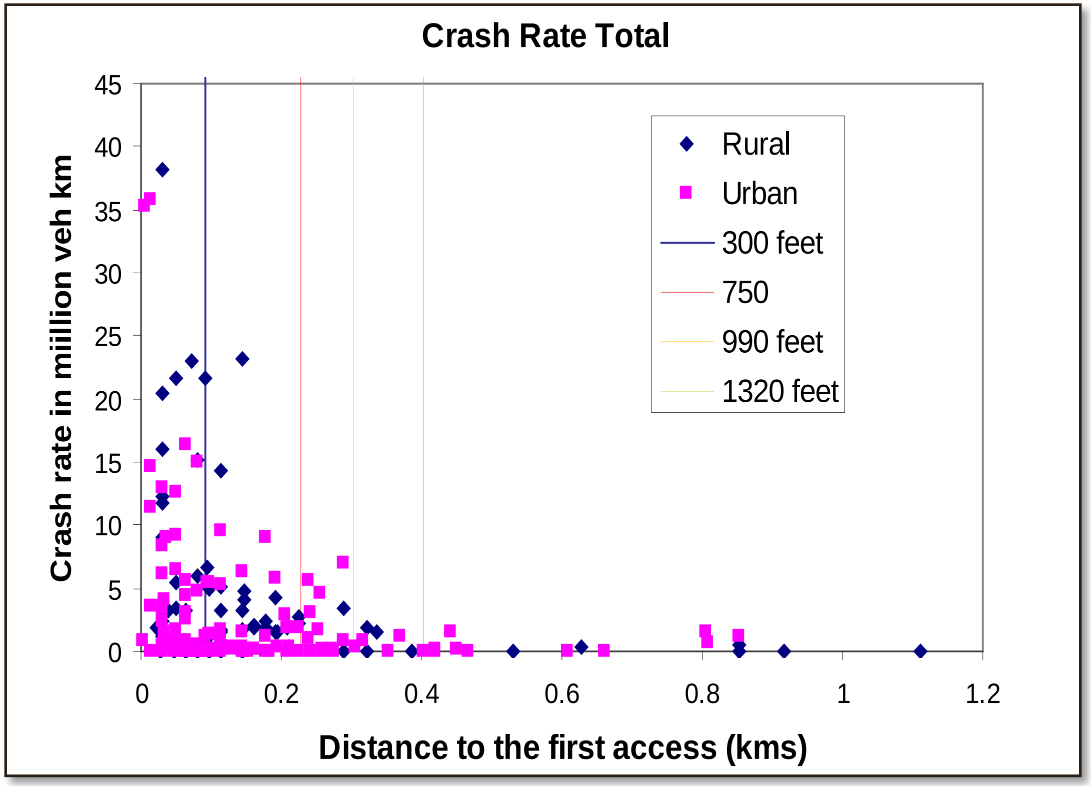
Making a U-Turn at an Intersection is <u>25% Safer</u> than a Left Turn Across Highway Lanes*

*** 2001 Research Study for Florida Dept of Transportation**

Entrance/Intersection Spacing Research

VA Tech 2007 Access Spacing Study

- Analyzed crash data at 186 intersections
- Over a 5 year period
- 2,277 crashes
- Lower crash rate at 750 to 1,320 ft distance



Research Findings

<u>Greater spacing</u> reduces the crash rate resulting in fewer fatalities, injuries, and property damage.

VDOT Criteria for Spacing Standards

Functional classification of highway

Mobility vs. access to property

Highway speed limit

Higher speed - longer distance needed to slow down to react to vehicles turning in or out of an entrance or at an intersection

Traffic signal

Separation of signals for efficient traffic progression

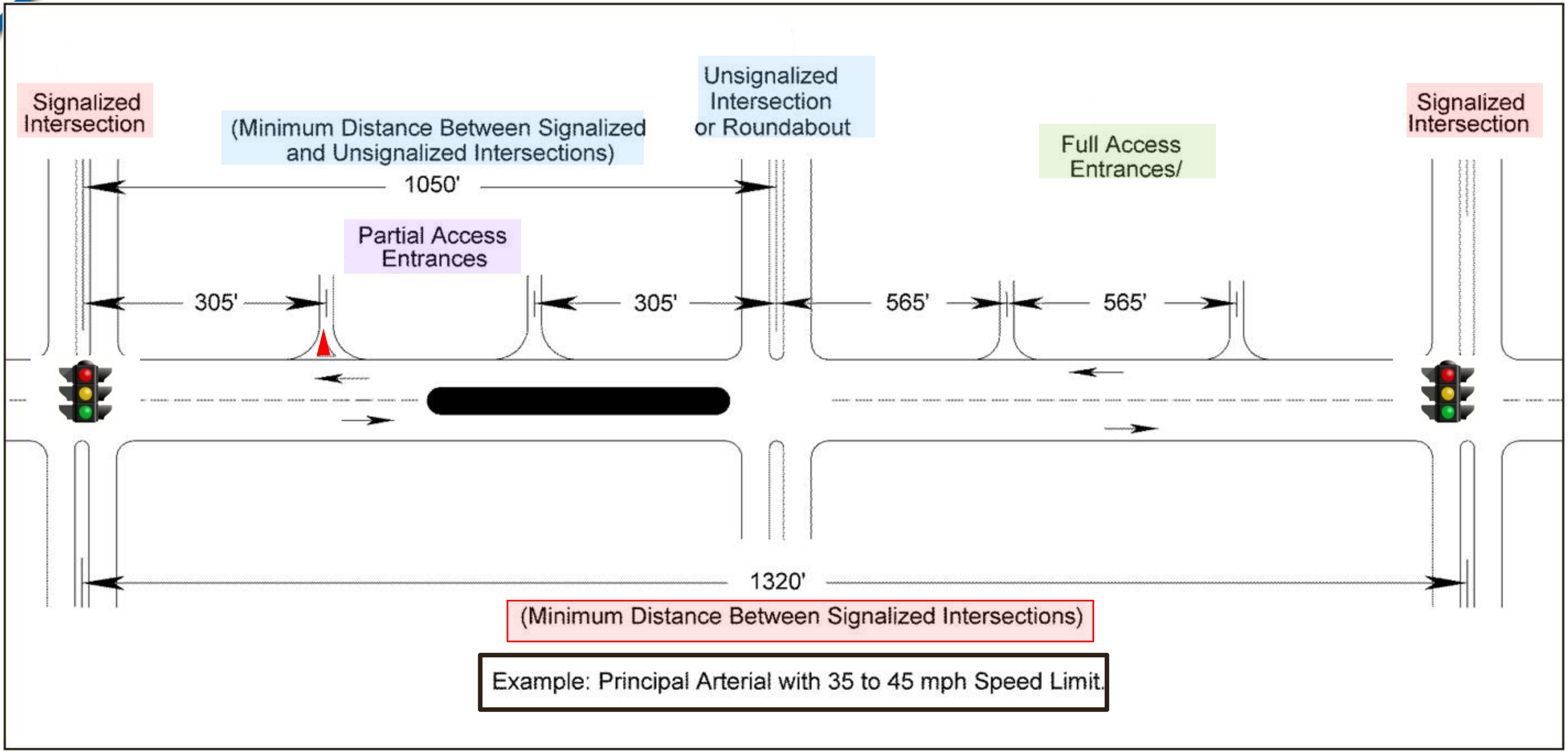
Type of entrance

More turning movements, more conflict points

VDOT Spacing Standards

Highway Functional Classification	Legal Speed Limit (mph)	Minimum Centerline to Centerline Spacing (Distance) in Feet			
		Spacing from Signalized Intersections to Other Signalized Intersections	Spacing from Unsignalized Intersections & Full/Directional Median Crossovers to Signalized or Unsignalized Intersections& Full/Directional Median Crossovers	Spacing from Full Access Entrances to Other Full Access Entrances and Any Intersection or Median Crossover	Spacing from Partial Access One or Two Way Entrances to Any Type of Entrance, Intersection or Median Crossover
Principal Arterial	≤ 30 mph 35 to 45 mph ≥ 50 mph	1,050 1,320 2,640	880 1,050 1,320	440 565 750	250 305 495
Minor Arterial	≤ 30 mph 35 to 45 mph ≥ 50 mph	880 1,050 1,320	660 660 1,050	355 470 555	200 250 425
Collector	≤ 30 mph 35 to 45 mph ≥ 50 mph	660 660 1,050	440 440 660	225 335 445	200 250 360
Local Street⑥	Commercial entrance spacing: See Figure 4-11.				

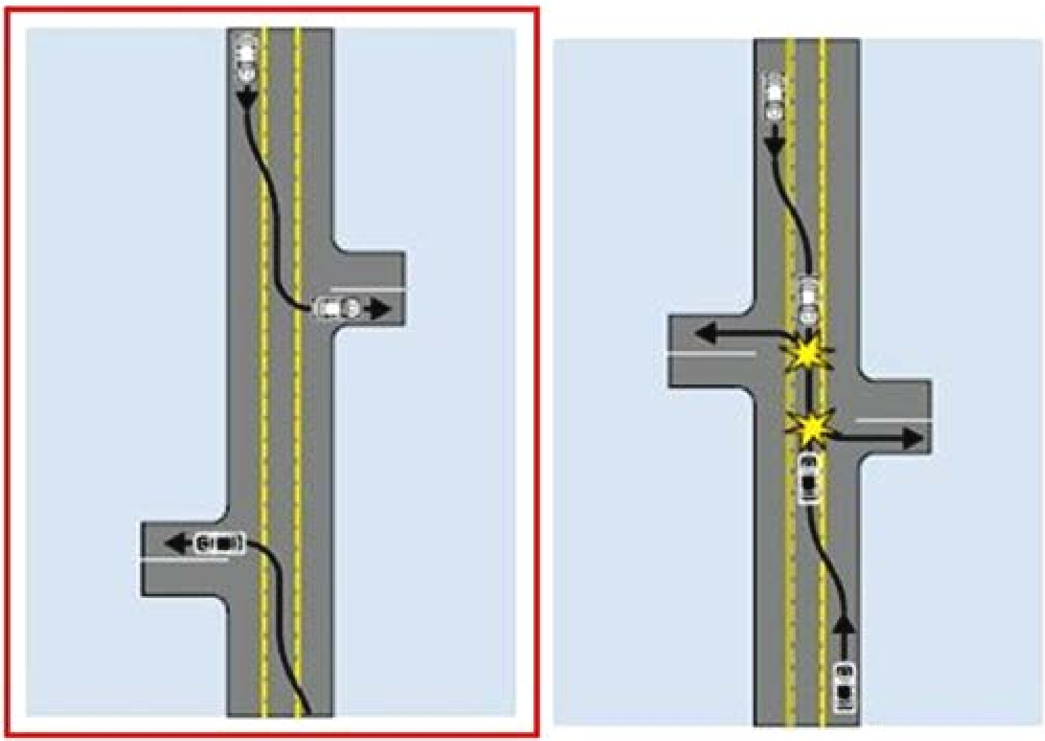
See Appendix F, Table 2-2, VDOT Road Design Manual


Signalized Intersection
(Minimum Distance Between Signalized and Unsignalized Intersections)
Unsignalized Intersection or Roundabout
Full Access Entrances/
Signalized Intersection
1050'
Partial Access Entrances
305'
305'
565'
565'
1320'
(Minimum Distance Between Signalized Intersections)
Example: Principal Arterial with 35 to 45 mph Speed Limit.

Entrance Spacing

Offsetting Entrances on Opposite Sides of the Road

Separates Entrance Left Turns to Reduce Crashes



Positive Offset

Negative Offset

Regulatory Exceptions to the Spacing Standards

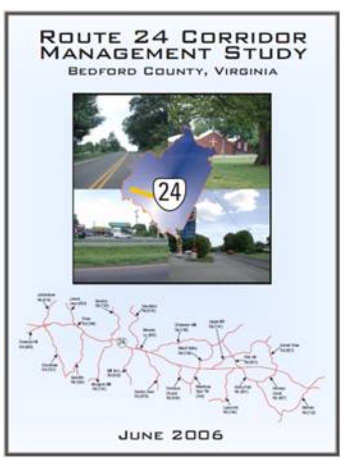
On an established business corridor

Existing spacing does not meet standard

Not enough property frontage

Entitled to right-in/right-out access

Located on a highway with a corridor access management plan



Within a mixed use “town” type development

Exceptions to the Access Management Requirements

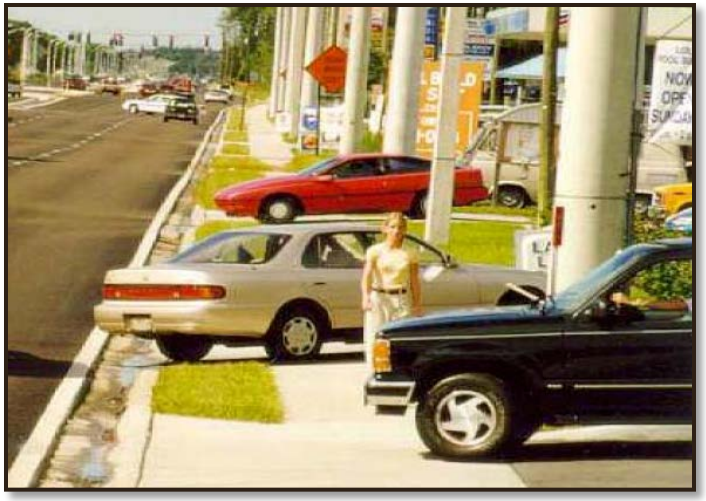
Rules & Procedures to Request an Exception

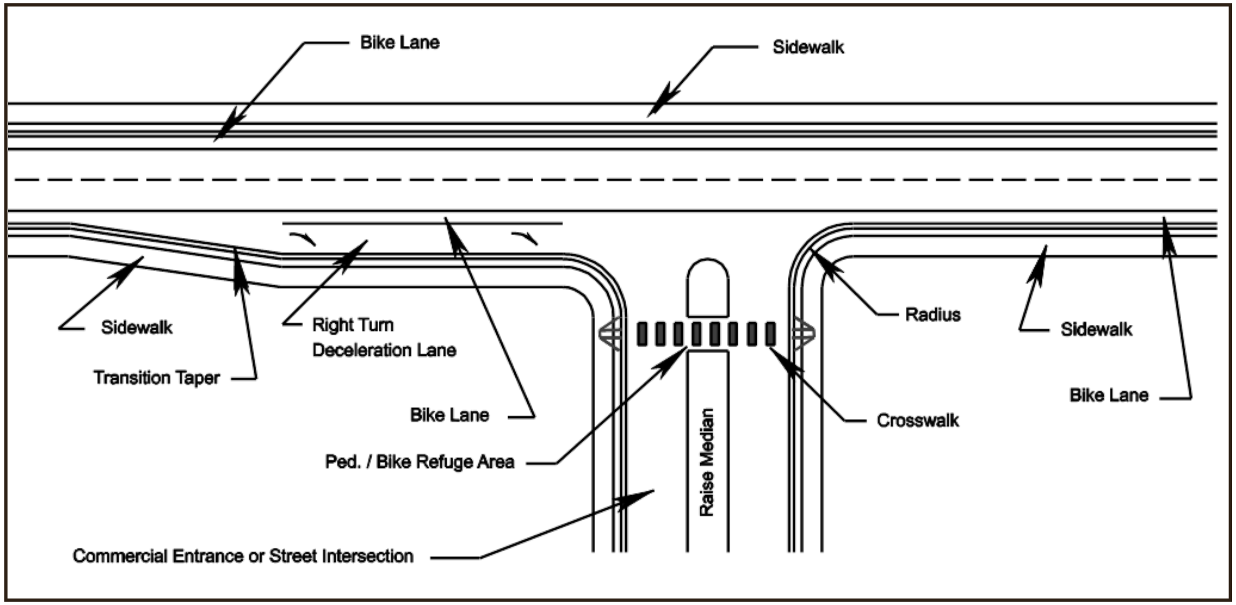
- Submit in writing to VDOT District Area Land Use Engineer using the Exception Request Forms*
- The request should:
  - Identify the type of exception (shared entrance, spacing, interparcel connection)
  - Describe reasons for the request
  - Include all required justification (traffic engineering study)

* Available on VDOT access management web site

Access Management: Pedestrians and Bicyclists

- Entrance design should accommodate pedestrians and bicyclists
- Fewer entrances improve safety - reduce vehicular conflicts with pedestrians/bicyclists
- Design criteria for sidewalks, crosswalks, and bicycle lanes VDOT Road Design Manual





Summary: Virginia's Access Management Program

Property owners have a right to reasonable access to the highways

Roadway users have the right to:

- **Freedom of movement,**
- **Safety, and**
- **Efficient expenditure of public funds.**

Balancing these interests is the goal of access management

For more information or questions contact:

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