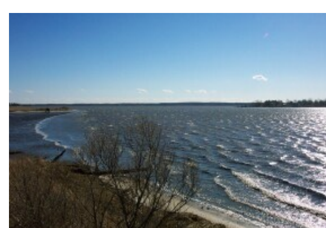
King and Queen County, Virginia



2030 Comprehensive Plan

www.kingandqueenco.net

Approved by the Board of Supervisors on March 11, 2019

Introduction

The Purpose of the Plan

The Comprehensive Plan represents the County's "vision for the future" and serves as its most important document for coordinating growth and development in the years ahead. It establishes goals, policies and initiatives to be used to guide both civic and public activities related to land use and resource utilization. The Plan establishes the foundation upon which many fundamental governmental plans, programs and decisions are based, including: zoning and subdivision actions, capital improvement programs, transportation, environmental and historical resource initiatives, and County policies affecting distribution of revenues to a multitude of programs and agencies. It is designed to be a fair and equitable balance between individual property rights and the public good. This plan is not a detailed plan for the development of individual parcels of land. Looking towards the future, the Comprehensive Plan defines it goals for future development as well as the specific actions which should be taken to achieve its vision.

"The Comprehensive Plan represents the County's "vision for the future" and serves as its most important document for coordinating growth…."

Comprehensive Planning in King and Queen County

As a place recognized for its natural beauty, King and Queen County strives to preserve its rural atmosphere while encouraging new development of appropriate scale and character. The County's Comprehensive Plan recognizes this fundamental objective. It is the intent of the Plan and its Land Use Map to reflect this foundational principle in a meaningful, creative, and progressive manner.

The Plan represents only the fifth long-range planning effort by the County in the past thirty-four years. It is a significant refinement to and expansion of the work done on earlier plans. In building upon the County's earlier Comprehensive Plans, it recognizes that King and Queen County holds and will continue to hold a unique place in Virginia. With this in mind, steps have been taken with the revised Plan to reflect the traditions and culture of King and Queen County as well as to provide for its orderly growth. Most importantly, it encourages diverse economic development activities with sensitivity to both the rural community and natural environment.

"The Plan reflects the traditions and culture of King and Queen County as well as provides for its orderly growth. It encourages diverse economic development activities with sensitivity to both the rural community and natural environment"

The County's last Comprehensive Plan was completed in 2006. In hindsight, the 2006 Plan was deficient in providing growth management strategies to adequately address sustainable economic development areas. By year 2010 it became readily apparent that the Plan needed to be updated in order to account for recent demographic and social trends which were impacting real estate and commercial development throughout the region. The King and Queen County Planning Commission determined it was imperative to carefully update its earlier plan (as well as its zoning and subdivision regulations) in order to best respond to the changing market conditions with contemporary planning and growth management strategies and tools.

As a result, the updated Comprehensive Plan emphasizes integrating modern planning analysis and implementation techniques into the Comprehensive Planning process. Much emphasis has been placed on establishing a "smart growth" philosophy for King and Queen County by encouraging quality planning practices and sensitivity to King and Queen County's natural environment and rural community atmosphere. The King and Queen County Planning Commission diligently worked for a 2-year period on revising the current Zoning and Subdivision Ordinance. One of the major achievements was to create and incorporate new zoning district classifications within its permitted use table, among other revisions/additions to better plan for "smart growth".

The "Ten Commandments" of Planning

Virginia law requires every municipality in the Commonwealth to adopt a comprehensive plan for the physical development of its territory. It also requires that the Comprehensive Plan be reviewed every five years in order to ensure that the Plan is consistent with community views and is addressing current issues impacting the community. Although the State requirements for a Comprehensive Plan are very generalized in order to grant localities the necessary flexibility to respond to local concerns and trends, the requirements do mandate focusing on a number of key areas. As extracted from current State enabling legislation, the following "ten commandments" of comprehensive planning summarize these areas of focus:

1. The County shall prepare and recommend a Comprehensive Plan for the physical development of King and Queen.

2. The King and Queen County Board of Supervisors shall adopt a Comprehensive Plan for all of the geographical areas within the County.

3. The Comprehensive Plan shall be drawn so as to promote the health, morals, order, convenience, prosperity and general welfare of its citizens.

4. The Comprehensive Plan shall be made with the purpose of guiding and accomplishing the coordinated, adjusted and harmonious development of the County.

5. The County shall first make careful and comprehensive surveys of existing conditions, natural resources, population and economic growth trends, and probable future requirements of King and Queen and its citizens.

6. The Comprehensive Plan shall be made in accord with both the present and future needs of its resources, trends and requirements.

7. The Comprehensive Plan shall be general in nature and shall designate the location, character, type, and density for the long-range land uses and public improvements within the County.

8. The Comprehensive Plan shall designate areas to promote affordable housing as well as housing for those of all income levels.

9. The Comprehensive Plan shall designate a long-range plan for transportation, including streets, roads, parkways, sidewalks, bridges, airports, drainage systems and the like.

10. The Comprehensive Plan shall designate geographical areas of the County for various types of public and private development and land uses (including historic areas, preservation areas, parks, schools, and open spaces.)

"The Great Commandment:" Upon adoption of the Comprehensive Plan, the Planning Commission shall act on matters related to the location, character, and extent of each feature contained therein in a manner that is in substantial conformity and consistent with the Comprehensive Plan.

"The People's Plan": The Public Participation Process

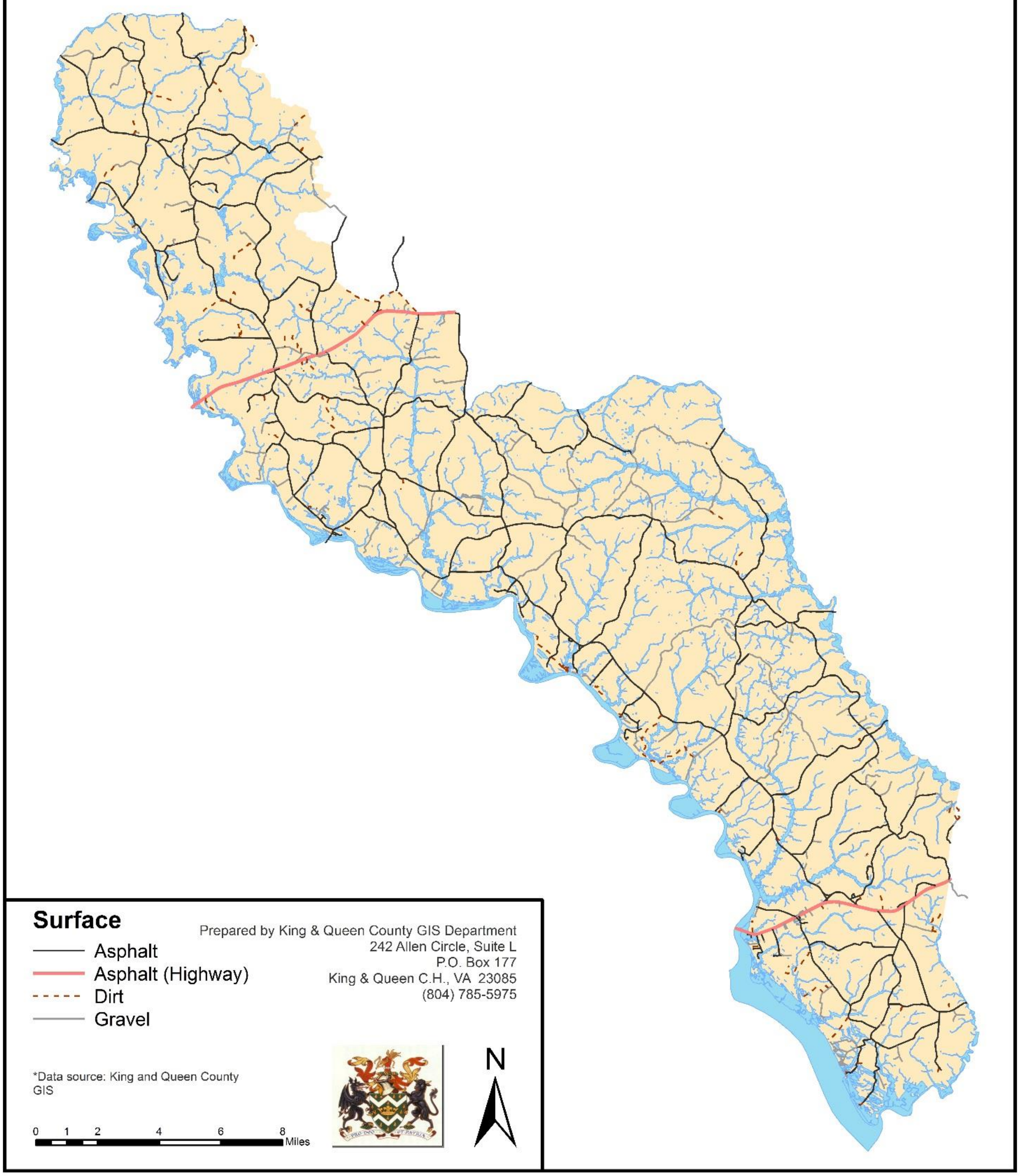
Civic involvement has been fundamental to the preparation of the Plan. The two year planning process has included many opportunities for public participation in an attempt to make the Comprehensive Plan truly the "people's plan." On July 25, 2011, the King and Queen County Planning Commission first met with the King and Queen County Board of Supervisors during their regular scheduled workshop to discuss challenges facing the County and the Board's vision for the revised Comprehensive Plan. In the spring of 2012, the Planning Commission, with the help of staff, created a public survey that was mailed out in the citizen's personal property tax forms as a first step in obtaining the public's input on development and needs of the County. During this time, the Planning Commission directed staff to prepare a working draft of the revised Plan for them to review and later to invite the public for review and comments. The resulting draft Comprehensive Plan was presented during 5 public meetings in order to provide additional opportunities for public comment on the Plan.

The local print media also helped by promoting public participation in the planning process and by educating local residents on the new planning concepts introduced by the updated Plan. The text of the draft Plan was also made available to residents at the County's official website www.kingandqueenco.net.

"The door is open for business in King and Queen County"

King & Queen County, Virginia

County Map | **Map 1**



Goals for the Future Development of King and Queen County

The updated Comprehensive Plan is designed to serve as a guide for the physical development of King and Queen County into the early decades of the new century. The Comprehensive Plan addresses the entire County, and is intended to positively influence all of the physical elements which make up its form. Towards this end, the overriding purpose of the Plan is to encourage the continued development of a safe and healthy community by offering a distinctive "vision" for the continued growth of King and Queen County. Many factors will affect the new ideas and decisions that will mold the optimal future land use within the County. The Plan focuses on those particular areas on which the County, can and should have a progressive impact, defining what is the best public interest while ensuring the preservation of private property rights.

"The updated Plan is designed to serve as a guide for the physical development of King and Queen County into the early decades of the new century."

The Comprehensive Plan is graphically represented by the Land Use Map. An intelligent and comprehensible plan cannot be structured without energetically seeking and taking the necessary steps to define the common components of the locality's vision for its future. The first steps taken towards establishing the tools of the planning process were (1) to define future goals, (2) to translate those goals into objectives by which they would be realized and (3) to establish policies and strategies to implement the goals for the benefit for the community.

The goals and objectives outlined in this document describe a range of policy statements that will serve to establish the physical, social, economic and cultural framework around which the Future Land Use Plan and Map were designed. These goals and objectives reflect input received from the public meetings conducted with the Planning Commission. In turn, they will be used to guide the analysis of future land use alternatives within the County. The County's Comprehensive Plan goals are grouped into eight general categories. The primary goals for each category are summarized below:

1. **Community Character, Culture, and History**

   Protect and preserve the County's rich agricultural and historical heritage which positively enhances the sense of place in King and Queen County, and improves the overall well-being of the community.

2. **Economic Development**

   Support and promote the County's existing economic base while exploring other economic development opportunities in the areas of tourism, retail, and industry in order to strengthen and expand the economy.

3. **Transportation**

   Ensure that the location, character, and capacity of the County's transportation facilities (including arterial highways, local streets, parking facilities, and the Regional Airport) are compatible with the Future Land Use Plan. Planning for future street improvements should be compatible with emerging land uses. The improvements should also provide adequate capacities to serve future growth.

4. **Land Use**

   By embracing the principles of "smart growth", promote a balanced mix of residential, commercial, and economic development uses which will accommodate the projected demands for housing, shopping and tourism, as well as encourage well-planned development opportunities for present and future County residents.

5. Housing and Neighborhoods

Promote opportunities for a wide variety of safe, sanitary and affordable homes and neighborhoods for King and Queen County residents of all income groups with an emphasis on quality site planning in future residential development areas.

6. Natural Resources

Enhance, protect, and preserve King and Queen County's valuable environmental resources through the establishment of environmental design guidelines (Chesapeake Bay Overlay District) while promoting a greater awareness of the scenic beauty and other positive physical attributes of the County.

7. Public Services and Infrastructure

Provide adequate levels of public services and infrastructure to all the people in the County, recognizing that the regional aspects of certain facilities and services necessitate regional planning and cooperation.

8. Plan Implementation

Implement the goals, objectives, and strategies of the Comprehensive Plan by updating and strengthening zoning, subdivision, and site plan controls. Stress a "smart growth" design ethic and promote greater accountability within the private sector to achieve the most appropriate scale, form, function, and density of new development.

Chapter 1: Community Character, Culture and History

King and Queen County, as it is known today, resulted from a series of re-arrangements of the boundaries of other political jurisdictions. The County was first formed from New Kent County in 1691, New Kent having been created from portions of the original Counties of York (1643) and James City (1634). Other counties or parts thereof were later formed from King and Queen County including King William (1701) and Spotsylvania (1720). The County was named in honor of King William III and Queen Mary of England.

Today, King and Queen County comprises 318.1 square miles of land area and 8.9 square miles of water area. It is part of the Middle Peninsula of Virginia's Coastal Plain and bounded on the southwest by the York and Mattaponi Rivers which separate King and Queen from King William and New Kent Counties. Caroline, Essex, Middlesex and Gloucester Counties are separated by the Dragon Swamp and Poropotank River.

Although the land now occupied by King and Queen County was first settled in 1625, it is one of the most rural counties in Virginia today. In 1990 its population density was only 20 persons per square mile. Three-fourths of the County's land is in timberland and of that approximately one-third is owned by private forest industries.

The population is relatively small, less than 7,000 in the 2010 census, and continues to grow very slowly. (The population is actually less now than in the first census in 1790.) There are no towns or significant concentrations of people. The rapid growth of adjacent counties has not yet reached King and Queen, but is approaching. The two main traffic arteries, routes 360 and 33, are across the short axis of the County. There is relatively little through traffic along the long axis on routes 14/721, which have been designated a scenic by-way. Except through County government, schools, and a few County wide civic organizations, there is relatively little contact between citizens at the two ends of the County, which makes it sometimes difficult to create a County wide cohesive community. In spite of the modest tax base, County finances have been well managed in recent years and taxes have been maintained at a low level.

The Census and State statistical data provided for King and Queen County reflect the unique demographics, social, and economic characteristics of the people who live in the County and in the surrounding area. Population estimates for the County and surrounding areas were developed specifically for this Plan in conjunction with the County Staff and are based upon figures published by the 2010 U.S. Census. These figures indicate a population of 6,945 for the County of King and Queen.

The 2010 Census information led to the redistribution and drawing of voter election districts. The 2010 Census showed greater growth in the northern and southern areas of the County. The Newtown and Shanghai districts had the greatest increases in population, which led to the requirement of preparing a redistricting plan for King and Queen County. The redistricting plan and map were formally adopted on April 11, 2011 by the King and

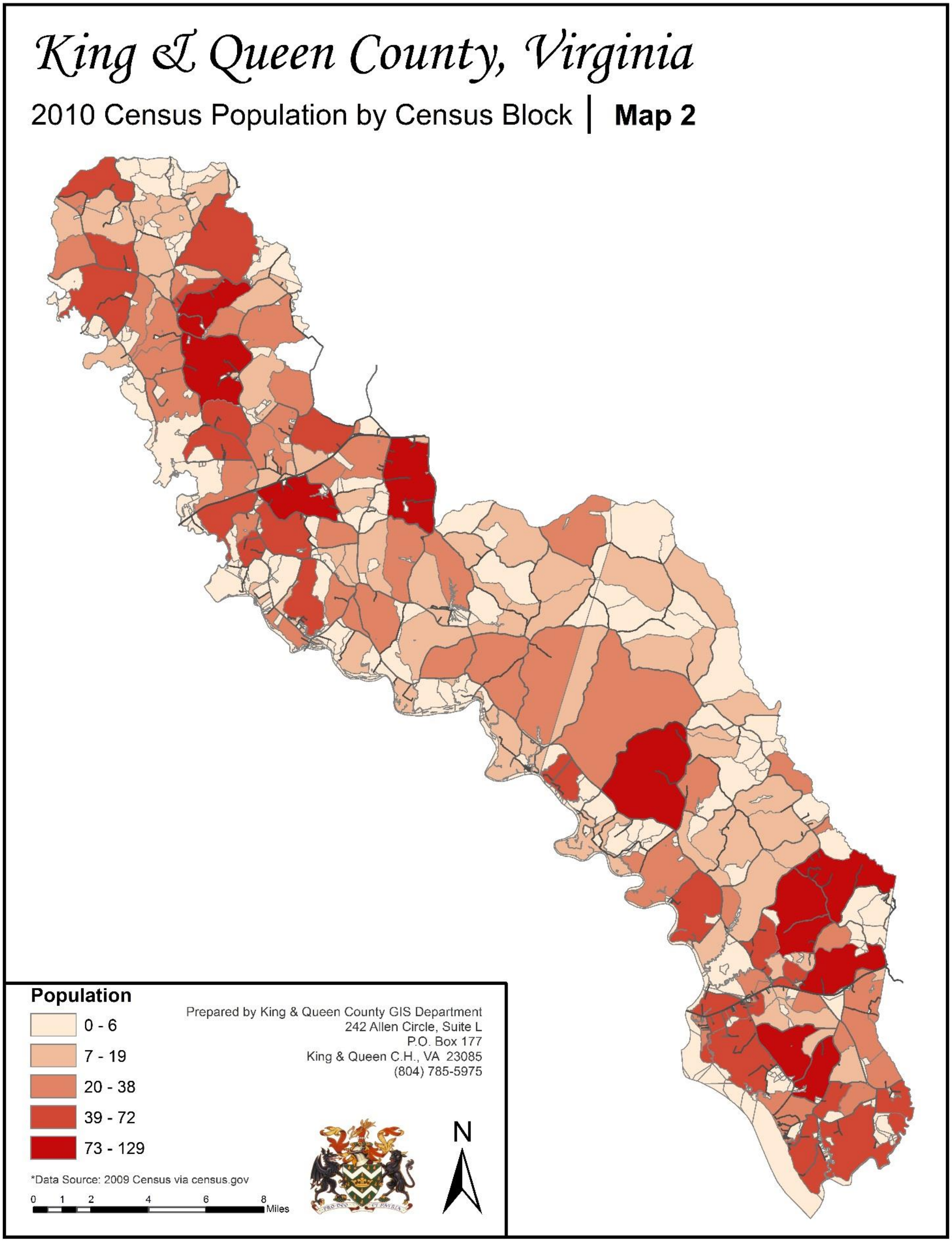
Queen County Board of Supervisors during their public hearing. The adopted 2011 redistricting plan for King and Queen County was submitted to the Attorney General and was approved by the Department of Justice on May 26, 2011. The current voter election districts are displayed below in Map 3, as well as appearing in Appendix F.

Demographic analysis of King and Queen County in relation to the surrounding region provides the basis for future strategic planning decisions. The following characteristics were the most influential in developing recommendations for the Comprehensive Plan:

- The 2010 Census computes the average household size for the County of King and Queen (2.46) to be slightly lower than that of the surrounding counties, King William (2.62) and Caroline (2.65) and the State average of 2.56. The phenomenon may be attributed to more affordable housing within the surrounding counties, which is more attractive to larger families.
- The average household size within the County of King and Queen has declined over the study period, from 2.48 persons per household in 2000 to 2.46 persons per household in 2010.
- In King and Queen County, the largest percentage (24.3%) of households fall within the $50,000 - $74,999 income range.
- The median household income for King and Queen County ($42,022) is far below the State median of $59,372.
- Due to the aging "baby boom" population, the rapidly growing proportions of elderly will increase the demand for elderly care, independent living communities, and retirement facilities. King and Queen County has 17.1% of citizens over the age of 65 compared to the State of the Virginia at 12.2%.
- Relative to demographic growth in the State of Virginia at 13%, King and Queen County has a much slower rate of population growth at 4.8%. However according to the July 2013 Population Estimates of Virginia Counties and Cities provided by the Weldon Cooper Center for Public Service Demographics Research Group, King and Queen County is the fastest growing county in the entire Middle Peninsula with a growth rate of 6.7%.

**Source: http://www.coopercenter.org/demographics/virginia -population-estimates*

For a complete report relating to the Demographic, Economic and Education profiles for King and Queen County, Virginia, provided by the Virginia Employment Commission, Economic Information Services Division, see Appendix A.


King & Queen County, Virginia
2010 Census Population by Census Block | Map 2
Population
0 - 6
7 - 19
20 - 38
39 - 72
73 - 129
*Data Source: 2009 Census via census.gov
Prepared by King & Queen County GIS Department
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P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
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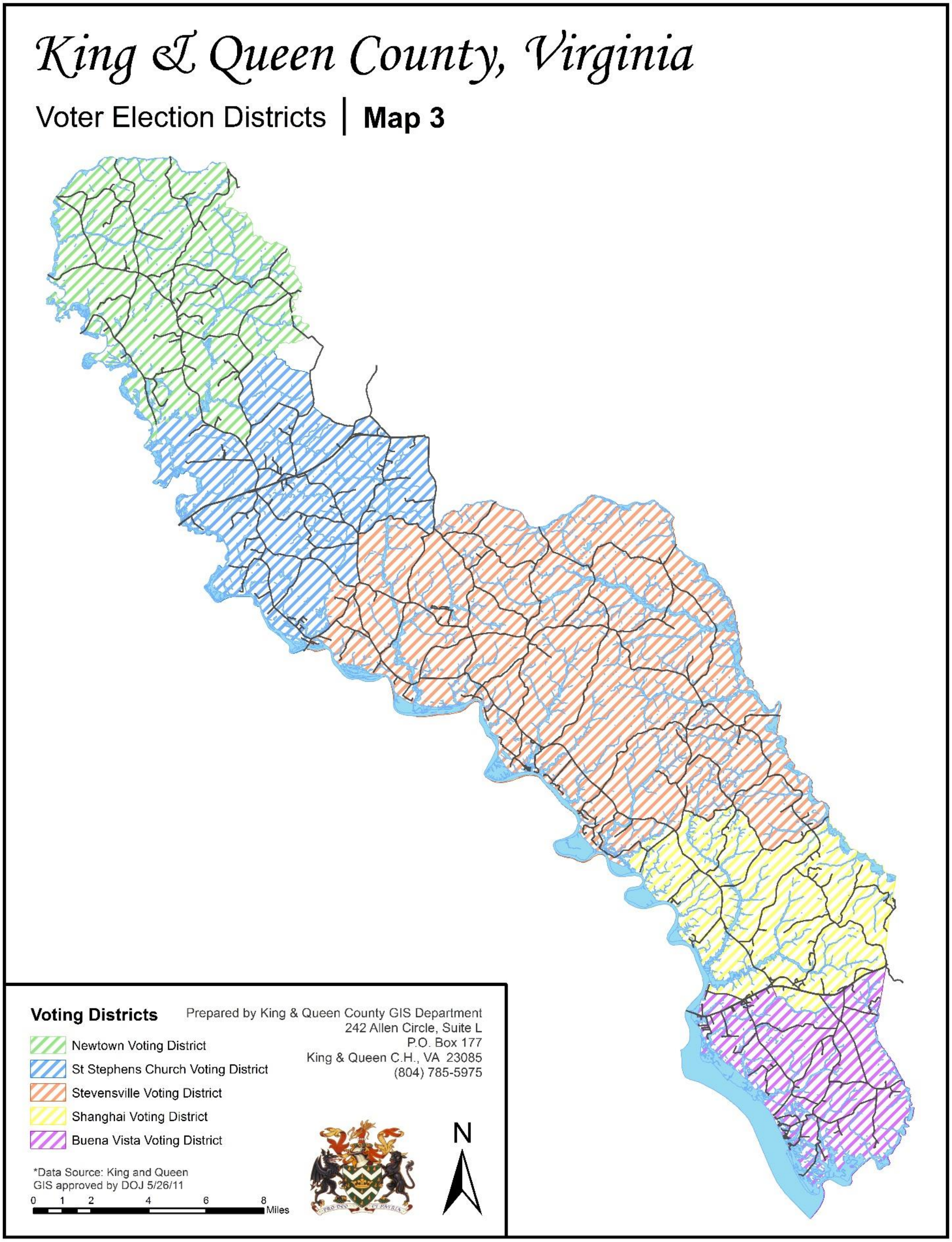
King & Queen County, Virginia
Voter Election Districts | Map 3
Voting Districts
Newtown Voting District
St Stephens Church Voting District
Stevensville Voting District
Shanghai Voting District
Buena Vista Voting District
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: King and Queen
GIS approved by DOJ 5/26/11
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Chapter 2: Economic Development

Economic Development is critical to the prosperity and quality of life of the citizens of King and Queen County. The creation and retention of jobs and financial investment in the County generates the revenues to pay for services necessitated by all forms and parts of the residential and commercial development.

The Virginia Employment Commission (VEC) maintains statistics on a number of economic factors affecting the Commonwealth of Virginia and its communities, which can be measures of the economic health of a community. Such statistics allow a community to compare itself with other communities in the region, as well as to Virginia as a whole.

Economic development, tourism, and the administration of the Industrial Development Authority are the responsibility of the Department of Economic Development. The goal of the King and Queen County Department of Economic Development is to operate to attract, retain and facilitate the expansion of business and industry in the County, resulting in a stable, diverse economy and an improved quality of life for the citizens of the County. Specifically, the Department of Economic Development's goal is to help provide an expanded tax base and employment opportunities for the citizens of King and Queen County.

Community Strengths

- ***Quality of life*** is often underutilized as an argument for business investment in a rural community. While the lack of shopping opportunities, cultural amenities and high performing schools can negate the rural advantage, a rural quality of life also indicates lack of traffic congestion, quicker commutes, and lower transportation costs. It can also mean lower security, insurance, and construction costs. A quality of life argument that translates into cost savings and higher profits becomes a basis for sound business site decisions. The lifestyle in King and Queen County is unique and offers a quality of life that is unparalleled. With a rich history, open fields, and vast forests, the County is a paradise to the historian, environmentalist and sportsman. Wild turkey, deer, waterfowl and even bald eagles are all prevalent in the County. In addition, the Mattaponi and York Rivers and the Dragon Run Watershed boarders the County allowing water activities to play a major role in the daily recreational activities of the citizens.

- ***Interstate highway access*** is a highly positive factor for business recruitment. King and Queen County is situated between the metropolitan areas of Richmond, Hampton Roads and Northern Virginia/Washington D.C. With excellent access to these areas by way of interstate 64, 295 and 95, King and Queen County is a convenient location for companies seeking to locate in a rural setting. Major airports in Richmond, Newport News/Williamsburg and Northern Virginia/Washington D.C. serve the county and along with the major roadways, place the County within 500 miles of 55% of the total population of the United States.

- ***A substantial internal road network*** provides alternate travel and commuting options outside of King and Queen County. Routes 14, 721, 360 and 33 have strong potential and will be attractive for business development.

- ***Large undeveloped tracts of land*** offer the opportunity to recruit larger projects. King and Queen County has a great number of large tracts throughout the County, including along Routes 33 and 360.

- ***A strong communications infrastructure*** is in place in many parts of the County. King and Queen County Wireless Authority and Gamewood Technology Group, Inc. have partnered to bring residents of King and Queen County Virginia high-speed Internet service using wireless technology. The King and Queen County Wireless Authority (KQWA) provides wireless broadband Internet service to County residents who wish to subscribe. Named KQVA.net, the system is capable of providing broadband Internet speeds from 512kbps to 6Mbps throughout most of the County

- ***Geographic location*** places King and Queen County in the center of Virginia, as well as the eastern seaboard of the United States. King and Queen County is well connected by excellent highway access.

- ***Low taxes*** reduce business overhead and promote profit on a recurring basis. King and Queen County has one of the lowest real estate tax rates east of Interstate 95. This factor is very important in business recruitment.

- ***Natural Gas*** line has been installed on Route 360, Richmond Tappahannock Hwy. at the King William County line in Aylett. This resource can be extended into King and Queen County along Route 360 should a business opportunity warrant the need for such.

Community Challenges

- ***A population of less than 8,000*** is insufficient to draw the attention of many business investors to King and Queen County. Labor availability is crucial to any business prospect. King and Queen County's population suggests that only a small number of qualified employees may be available, even though the regional labor market is well qualified. Most prospects do not look deeply into the County's statistical profile before eliminating it from consideration.

- ***The lack of developed commercial or industrial sites*** gives the County little to sell for business recruitment. Available sites are all privately owned and subjected to uncontrollable factors, such as pricing and personalities. Most sites are undeveloped and reflect a lack of investment by the owners.

- ***The lack of industrial/commercial buildings*** leaves King and Queen County with an empty sales floor to show prospective businesses. Inquiries for buildings are frequent, while calls for raw land are limited.

- ***The lack of public sewer and water*** for industrial processes and fire flow force investors to seek private alternatives to public services. More often, King and Queen County is simply eliminated from consideration.

- ***A lack of shopping opportunities and cultural amenities*** also inhibit the business location decision. While this type of development is generally population dependent, previously discussed factors tend to overwhelm retail decisions.

Development Strategies

In an effort to encourage development at a scale and intensity that retains the rural character of the County, the following development approaches are encouraged. Use of these tactical approaches will encourage economic development in the immediate future, while long-term steps are taken to address the weaknesses identified previously in this chapter.

1. **Pursue Well-Financed Business and Industrial Prospects**

   This approach has been the basis of several successful recruitment efforts. These firms have found niche locations with existing zoning, enough water to meet their needs, and land that is distant enough from the interstate to keep real estate prices low, yet close enough to ensure convenient delivery of products to their customers. If the full cost of development is to be borne by industry, the firms must be financially viable to support the cost burden.

   While this idea seems obvious, many firms seeking to relocate may do so because of financial challenges elsewhere or a need for relief from overhead costs. These firms are more marginal and can be poor County investments. Until all infrastructure investment has been made, seeking outstanding firms is essential.

2. **Recruit Industrial Investors for Land Development in Order to Address Costly Infrastructure Investment Normally Obligated to the County**

   Roads and other infrastructure improvements become an investment for profit through this approach. Willingness on the part of the County to speculatively zone property is essential for this approach to succeed.

3. **Create Artificial Populations to Attract Commercial and Retail Development**

   King and Queen enjoys the benefit of a temporary population of 26,000+ on any given day, solely due to Route 360 and Route 33 corridor traffic. (According to the 2016 Virginia Department of Transportation Daily Traffic Volume Estimates) Though most of this population is only in the County for about 15 minutes, with tourism investment and direct marketing to retail and commercial developers, King and Queen can make the case to investors that with the proper attraction and advertisement, this temporary population will stay much longer than 15 minutes and spend their money in the County. The amount of road frontage along the Route 360 and Route 33 corridor's totals 34 miles of dual lane highway located within the economic development corridor. Great potential for future business development.

Future Strategies

While offsetting strengths and weaknesses allows the County to remain competitive in the near term, certain long term decisions must be made and actions taken to ensure the sustained viability of the economic development program. Such strategies address deficiencies in the current program, as previously identified. The Board of Supervisors should evaluate the weaknesses and consider the following strategies to help address program deficiencies:

- Utilize the EDA (Economic Development Authority) to create County owned industrial & commercial parks with infrastructure for immediate use, where the private sector is either unable or unwilling to develop such facilities.

- Utilize the EDA to construct speculative industrial and distribution buildings.

- Develop sufficient water and sewer capacity to meet the needs of large industrial and commercial users.

- Invest in industrial access roads through public-private partnerships to expand the availability of marketable industrial sites.

- Partner with the business community and school system to invest in the education system, including the identification of needed skill sets and development of appropriate curriculums.

A successful and sustained economic development program can only be achieved if the weaknesses identified in this chapter are addressed.

An effective economic development program is the means to offset the impacts of residential growth and improve the quality of life for all County citizens. The County must continue its efforts to diversify and expand its nonresidential economic base, both through traditional economic development, as well as the through the expansion of its fledgling tourism industry. Its primary goal is to encourage compatible, high-quality industries offering semi-skilled, skilled and professional job opportunities. The County seeks industry that is capital intensive and conscious of the standards of local infrastructure. New industries meeting these characteristics will provide year-round, full-time jobs with benefits and raise the standard of living in our community.

Chapter 3: Transportation

Code of Virginia 15.2-2223 requires localities to identify “infrastructure needs and recommendations that include the designation of new and expanded transportation facilities and that support the planned development of the territory covered by the plan and shall include, as appropriate, but not be limited to, roadways, bicycle accommodations, pedestrian accommodations, railways, bridges, waterways, airports, ports, and public transportation facilities. The plan shall recognize and differentiate among a hierarchy of roads such as expressways, arterials, and collectors. In developing the plan, the locality shall take into consideration how to align transportation infrastructure and facilities with affordable, accessible housing and community services that are located within the territory in order to facilitate community integration of the elderly and persons with disabilities.”

The Lord Delaware Bridge crosses the Mattaponi River between the Town of West Point and King and Queen County

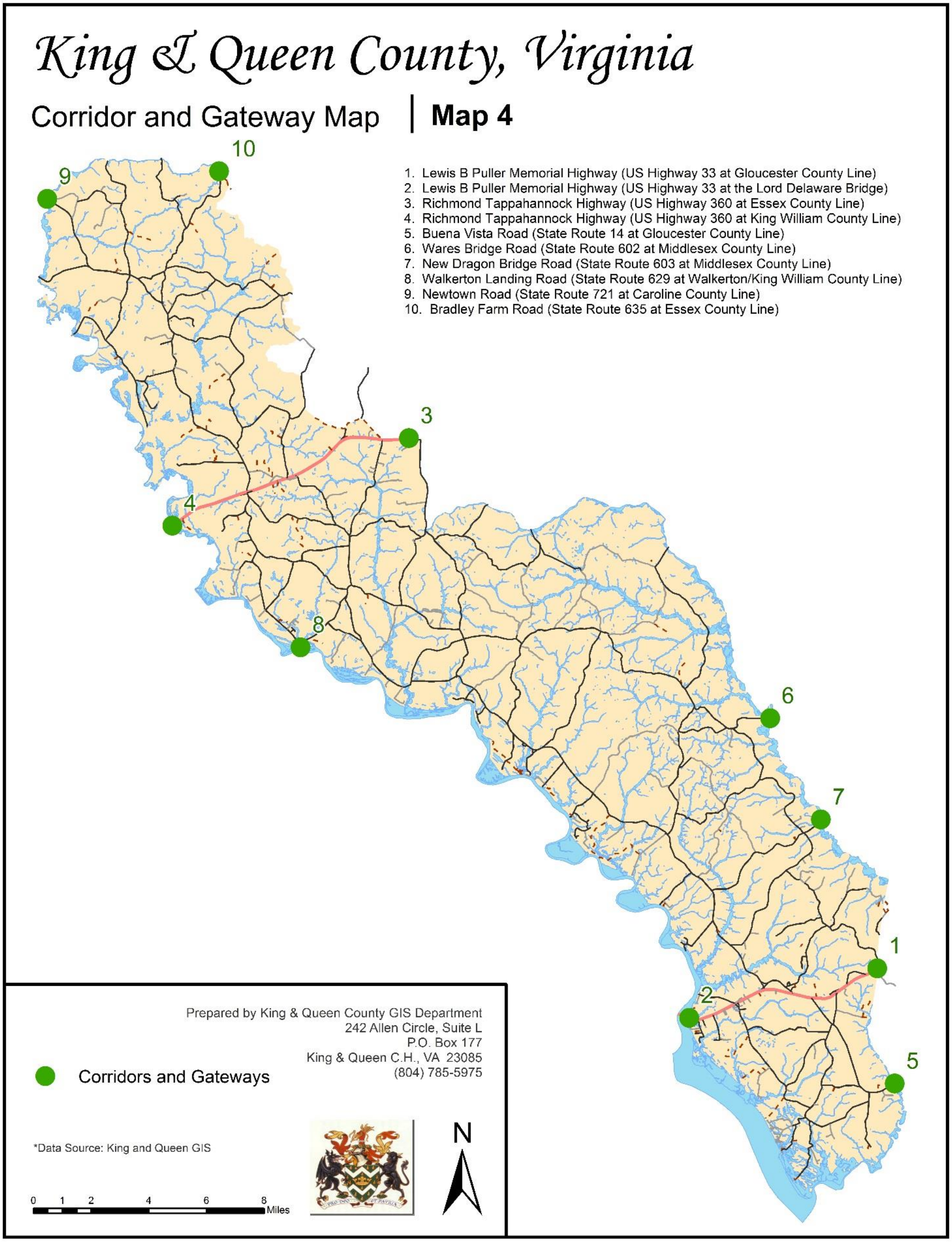
Corridors and Gateways

The perception of the image of the County is largely influenced by the impression one gains while traveling through the County along its major entrance corridors. The importance of these entrances has led the County to examine how these corridors can best be protected and enhanced to reflect citizens’ goals for improving the appearance and image of King and Queen County.

The design emphasis of the Comprehensive Plan has been to recognize the unique character of the County’s entrance corridors and arterial roads which serve as the gateways to King and Queen County’s points of tourism or cultural interest. Ten entrance corridors have been identified. Each of these corridors was selected because of its importance as an entrance to King and Queen County. Each corridor serves as a “gateway” into the County. King and Queen County’s corridors provide opportunities to establish a positive image and welcoming statement to both residents and visitors by means of physical, transportation, and landscaping improvements.

The entrance corridors and gateways identified by the accompanying King and Queen County Entrance Corridor and Gateway Map 4 include:

1. Lewis B Puller Memorial Highway (US Highway 33 at Gloucester County Line)
2. Lewis B Puller Memorial Highway (US Highway 33 at the Lord Delaware Bridge)
3. Richmond Tappahannock Highway (US Highway 360 at Essex County Line)
4. Richmond Tappahannock Highway (US Highway 360 at King William County Line)
5. Buena Vista Road (State Route 14 at Gloucester County Line)
6. Wares Bridge Road (State Route 602 at Middlesex County Line)
7. New Dragon Bridge Road (State Route 603 at Middlesex County Line)
8. Walkerton Landing Road (State Route 629 at Walkerton/King William County Line)
9. Newtown Road (State Route 721 at Caroline County Line)
10. Bradley Farm Road (State Route 635 at Essex County Line)


King & Queen County, Virginia
Corridor and Gateway Map | Map 4
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King & Queen C.H., VA 23085
(804) 785-5975
Corridors and Gateways
*Data Source: King and Queen GIS
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Corridor and Gateway Improvements

The section pertains to the improvements recommended for King and Queen County's entrance corridors and gateways. Corridor landscape improvements should focus on basic landscape enhancements to the public rights-of-way along the entrance corridors, including improvements/maintenance to existing signage and other forms of landscaping, i.e. grass cutting and mulched flower beds. Property maintenance compliance plays a key role in the visual esthetics of the County, including grass cutting, adhering to the sign ordinance, etc.

Hierarchy of Highways

Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. Most travel occurs through a network of interdependent roadways, with each roadway segment moving traffic through the system towards destinations. The concept of functional classification defines the role that a particular roadway segment plays in serving this flow of traffic through the network. Roadways are assigned to one of several possible functional classifications within a hierarchy according to the character of travel service each roadway provides. Planners and engineers use this hierarchy of roadways to properly channel transportation movements through a highway network efficiently and cost effectively.

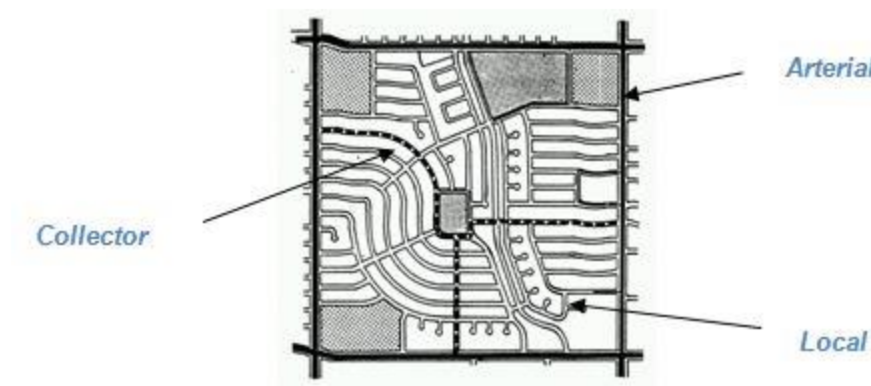
All functional classification categories now exist in both urban and rural areas and include:

A. Principal Arterial
   1. Interstate
   2. Other Freeways & Expressways
   3. Other

B. Minor Arterial

C. Collector
   1. Major Collector
   2. Minor Collector

D. Local



Federal Functional Classification began with the passage of the Federal Aid Act of 1921. It established a federal aid primary system and, more importantly, the foundation for a system of national defense roads, later known as the national interstate system. The absence of uniformity among states hindered federal efforts to determine national needs. Subsequently, the Federal Aid Highway Act of 1973 mandated the realignment of federal aid roads on the basis of a standardized functional classification system. This process remains in effect today.

The Virginia Department of Transportation's (VDOT) Transportation and Mobility Planning Division (TMPD) is responsible for maintaining the Commonwealth's official Federal Functional Classification System.

TMPD determines the functional classification according to federal guidance that takes into account type of trips, expected volume, what systems the roadway connects and whether the proposed functional classification falls within the mileage percentage thresholds established by the Federal Highway Administration (FHWA). A statewide review of functional classifications typically occurs following the decennial census. The most recent statewide update was completed and approved by FHWA in 2014.

Transportation Strategies and Initiatives

From the adopted transportation goals and objectives for traffic and transportation, there emerge a range of fundamental strategies and supporting initiatives which should guide King and Queen County in establishing priorities for future transportation improvements. These include the below key traffic and transportation policies upon which future improvements should be based:

1. **Compatibility with Comprehensive Plan**

To ensure adequate traffic carrying capacities, future transportation improvements should be commensurate with the anticipated development activities proposed within the Comprehensive Plan. The County should prepare and maintain a Transportation Improvements Program (TIP, Six Year VDOT Road Improvement Plan) that responds to and complements the adopted Future Land Use Plan.

King and Queen County has substantial influence on the Route 17 Corridor of Statewide Significance (Corridor A) and Hampton Roads Regional Network. In 2015, a project in King and Queen County was selected, on a statewide, competitive basis to receive funding through the Smart Scale Transportation Prioritization Process. The project provides a business/telework center at Route 33 and 14. The proposed development will provide the only alternative workforce location inside the Middle Peninsula for commuters traveling to employment centers outside the region for work. The business center will operate as a telework center with workstations equipped with complimentary high speed broadband internet. The proposed structure will also provide services to small business owners and flex office for small and home based businesses, such as meeting and virtual office space and printing, copying and fax services. The site will be developed with a designated multimodal lot that will reduce the demand on transportation facilities during park hours while supporting teleworking and alternative modes of transportation. Telework stations and multimodal transportation services provided through this development will further the goals of the Middle Peninsula Long Range Transportation Demand Management Plan by providing alternative modes of transportation to Middle Peninsula commuters and decreasing single car ridership and automobile dependency.

The proposed business service center and commercial office space supports creation and expansion of small businesses in the Middle Peninsula region and further the goals of the Comprehensive Economic Development Strategy adopted by the Middle Peninsula Planning District Commission in 2013. The proposed development is located in one of two commercial corridors identified by King and Queen's Comprehensive Land Use plan and is consistent with the local Zoning ordinance. King and Queen EDA proposes to manage the site which will be open to the general public. Fees for business services and rental of office space are proposed.

The functional classification of roads in King and Queen County are as follows:

Principal Arterial Highways

- Route 33
- Route 360

Minor Arterial Highway

- Route 14

Major Collector Road

All or portions of Routes:

- 601
- 605

- 608
- 610
- 614
- 619
- 620
- 621
- 629
- 632
- 633
- 634
- 635
- 678
- 721

Minor Collector Road

All or portions of Routes:

- 603
- 612
- 617
- 620
- 622
- 621
- 631

2. Coordination with VDOT

To better coordinate with VDOT, the County should take the lead in promoting contemporary traffic engineering standards and techniques for existing and new improvements, including the introduction of innovative street design criteria and integration of multimodal facilities.

For more information, please see the current VDOT Six Year Improvement Program in Appendix C.

3. Multimodal Elements

To enhance the County's viability as an inviting center for tourism, the County should develop a master planned multimodal system in order to properly integrate these facilities into the existing Transportation Plan.

4. Gateway and Corridor Planning

To create a more attractive "gateway" and "corridor" image for the County, proposed transportation improvements and new alignments, including the provision of landscaping, lighting, highway buffers, and multimodal facilities. Capital improvements plans should anticipate funding requirements for specific corridor improvements projects.

5. Traffic Impact Analysis

To ensure compatibility with the transportation plan, private development proposals should include traffic impact statements which identify the nature of future traffic conditions and analyze the impacts generated by any given land use proposal.

6. Subdivision and Site Plan Review

To ensure adequate street planning and design by private development, the County, along with VDOT, should carefully evaluate all future residential development proposals. The proper locations, alignments and rights-of-way for future roads, and integration of streets and multimodal pathways should be incorporated into an Official Map with the objective that future infrastructure improvements can be implemented with no public cost.

Rail Service

There is no rail service in King and Queen County, but passenger and freight options are available the surrounding areas of Williamsburg, Newport News and Richmond.

Air Service

King and Queen County is easily accessible by air. The Middle Peninsula Regional Airport is located in the County off State Route 33 in Mattaponi, VA, with a 5,000' runway. To view a copy of the Airport's Master Plan please see Appendix M. There are also many large airports within driving distance of the County including:

- Richmond International Airport
- Newport News/Williamsburg International Airport
- Norfolk International Airport
- Ronald Regan National Airport
- Washington/Dulles International Airport

Bus Service

Greyhound Bus Lines provide services in the Virginia Lower Peninsula, but no stations are specifically located within King and Queen County.

Other Services

Transportation Assistance is available from Bay Transit Transportation, a program of Bay Aging, and offers regional public and specialized transportation services to the residents of the Middle Peninsula and Northern Neck. New Freedom Mobility and MedCarry (both programs offered by Bay Transit) provide transportation assistance and services to residents in the County.

Currently, there are approximately 281 King and Queen residents in the Bay Transit customer database, and in the recent fiscal year of 10/1/15-9/30/16 78 of those customers utilized the service. Overall, Bay Transit provided a total of 4,355 trips and 163 New Freedom trips were completed in the last fiscal year.

Identified Transportation Needs and Traffic Problems

1. **Bradley Farm Rd (VA 635) from Caroline County line to Newtown Road (VA 721):**
   - Safety deficiency – Substandard roadway geometric conditions.
   - Poor intersection alignment at VA 721 and VA 627.
   - Drivers on VA 627 have to look over the shoulder to see on-coming traffic.

2. **Mount Olive Rd (VA 602) from Devils Three Jump Rd (VA 614) to Middlesex County line:**
   - Safety Substandard roadway geometric conditions.
   - Pavement markings missing on all side streets.
   - Lacks adequate way-finding signage.
   - Congestion: Based on information from the Planning District Commission, trucks use VA 602 as cut through from the landfill.

3. **Canterbury Rd (VA 634) from Minter Rd (VA 636) to The Trail (VA 14):**
   - Safety Substandard roadway geometric conditions.

4. Lewis B Puller Memorial Hwy (VA 33) at York River Rd (VA 605):

- Safety deficiency – East and westbound left turn lanes are too short.
- Due to speeds on VA 33, right turn treatments are inadequate.
- Vertical curve on eastbound approach limits sight distance to side street.
- Static warning signage already in place.
- High speed roadway and placement of advance warning signs can create safety issues.
- Shoulders are worn from turning traffic.
- Knoll in median creates sight distance issues for side street's view of mainline traffic.

5. Lewis B Puller Memorial Hwy (VA 33) at Buena Vista Rd (VA 14):

- Too many median openings closely spaced.
- West bound left turn lane is too short.
- Based on speeds, eastbound right turn taper may be inadequate.
- Buena Vista Road intersects at less than desirable angle.

6. The Trail (VA 14) at Richmond Tappahannock Hwy (VA 14):

- Pavement markings faded.
- Eastbound and westbound left turn lane is too short.
- Lack of westbound right turn lane increases potential for accidents.
- High number of crashes may be due to red light running.
- Crashes at this location exceed the planning threshold (nine crashes over three-year period).

7. Lewis B Puller Memorial Hwy (VA 33) at The Trail (VA 14):

- Safety deficiency – Westbound right turn taper is inadequate to accommodate truck traffic going to landfill on The Trail (VA 14).
- The approach also has slight vertical/horizontal curve overlap.
- Trash truck queue on southbound approach spills-back to block entrances to United State Post Office and Sears Realty.
- Sears Realty entrance is used as a cut-through to avoid queues at VA 33.

Identified Geometric Deficiencies

1. Stratton Major Road (VA 601) from York River Road (VA 605) to Buena Vista Road (VA 14)
2. Dragon Bridge Road (VA 603) from Middlesex County line to The Trail (VA 14)
3. Clancie Road (VA 608) from 1.25 miles North of Centerville Road (VA 678) to New Hope Road (VA 609)
4. Liberty Hall Road (VA 610) from Devils Three Jump Road (VA 614)
5. Devils Three Jump Road (VA 614) from Mt. Olive Road (VA 602) to Dragonville Road (VA 610)
6. Devils Three Jump Road (VA 614) from Iris Road (VA 609) to Mt. Olive Road (VA 602)
7. Devils Three Jump Road (VA 614) from Dabney Road (VA 613) to Iris Road (VA 609)
8. Devils Three Jump Road (VA 614) from The Trail (VA 14) to Dabney Road (Va 613)
9. Owens Mill Road (VA 619) from Sorghum Road (VA 660) to the Essex County line
10. Owens Mill Road (VA 619) from Sorghum Road (VA 660) to Newtown Road (VA 721)
11. Poor House Lane (VA 631) from Deshazo Road (VA 630) to Powcan Road (VA 620)
12. Poor House Lane (VA 631) from The Trail (VA 14) to Deshazo Road (VA 630)
13. Minor Road (VA 622) from Richmond Tappahannock Hwy (US 360) to Essex County line
14. Indian Neck Road (VA 623) from Newtown Road (VA 721) to Bradley Farm Road (VA 635)
15. Byrds Mill Road (VA 625) from Newtown Road (VA 721) to Kays Lane (VA 649)

16. Smithfield Road (VA 631) from Richmond Tappahannock Hwy (US 360) to Smithfield School Road (VA 650)
17. Stevensville Road (VA 631) from Hockley Neck Road (VA 632) to The Trail (VA 14)
18. Hockley Neck Road (VA 632) from Mantua Road (VA 633) to Bunker Hill Road (VA 631)
19. Mantua Road (VA 633) from Mount Elba Road (VA 634) to Hockley Neck Road (VA 632)
20. Mount Elba Road (VA 634) from Stones Road (VA 633) to Walkerton Landing Road (VA 629)

Traffic Counts
Traffic counts for the County show the trends in transportation and areas which will ultimately need future maintenance and improvements. VDOT maintains these traffic counts, and they are used to shape VDOT's Long Range Planning. For more information on traffic counts for the County please see Appendix D, 2010 Virginia Department of Transportation Daily Traffic Volume Estimates for Jurisdiction 49, and Appendix E, 2016 Virginia Department of Transportation Daily Traffic Volume Estimates.

Recommended Transportation Improvements

Regional and Long Range Transportation Plan
The Virginia Department of Transportation (VDOT) manages and plans for the streets and highways systems in King and Queen County, as well as the surrounding region. For more information about VDOT planning, please see information included from VDOT's Six Year Road Program below:

Route	State Project #	Funding Source/Plan	Description	UPC	Ad Date	Estimate
637	0637-049-P91	Secondary Six Year Plan	RTE 637 - PAVE UNPAVED CHATHAM HILL ROAD	111929	7/25/2018	$ 54,625.00
612	0612-049-P92	Secondary Six Year Plan	RTE 612 - PAVE UNPAVED LILY POND ROAD	111928	8/7/2018	$ 33,775.00
658	0658-049-P93	Secondary Six Year Plan	RTE 658 - PAVE UNPAVED TRAVELLERS ROAD	111930	8/22/2018	$ 160,000.00
673	0673-049-P94	Secondary Six Year Plan	RTE 673 - PAVED UNPAVED MARTIN TOWN ROAD	111931	10/25/2018	$ 96,307.00
607	0607-049-P95	Secondary Six Year Plan	RTE 607 - PAVE UNPAVED CROUCHES ROAD	111932	7/24/2019	$ 120,174.00
645	0645-049-P96	Secondary Six Year Plan	RTE 645 - PAVE UNPAVED PAGE LANE	111933	9/25/2019	$ 65,500.00
33	0033-049-584	Smartscale	#HB2.FY17 - KING & QUEEN COUNTY BUSINESS/TELEWORK CENTER	109581	1/3/2020	$ 299,350.00
662	0662-049-P97	Secondary Six Year Plan	RTE 662 - PAVE UNPAVED GREENBRIAR ROAD	111934	7/28/2020	$ 50,255.00
14	0014-049-589	State of Good Repair	#SGR BRIDGE REHABILITATION RTE 14 POROPOTANK CREEK ID 10588	110097	8/11/2020	$ 2,250,000.00
642	0642-049-598	Secondary Six Year Plan	RTE. 642 - PAVE UNPAVED GREEN CHAMBERS ROAD	111954	8/12/2020	$ 32,775.00
651	0651-049-P99	Secondary Six Year Plan	RTE 651 - PAVE UNPAVED DEWSVILLE ROAD	111935	8/31/2020	$ 107,528.00
617	0617-049-590	State of Good Repair	#SGR BRIDGE REPLACEMENT-RTE 617 EXOL SWAMP ID 10610	110901	1/12/2021	$ 2,500,000.00

Long-range planning for King and Queen County is done as part of the Rural Transportation Planning Program conducted by the Middle Peninsula Planning District Commission and VDOT (available in Appendix B).

King & Queen County, Virginia

Recommended Transportation Improvements | **Map 5**

Route	State Project#	Funding Source/Plan	Description	UPC	Ad Date	Estimate
637	0637-049-P91	Secondary Six Year Plan	RTE637 - PAVE UNPAVED CHATHAM HILL ROAD	111929	7/25/2018	$ 54,625.00
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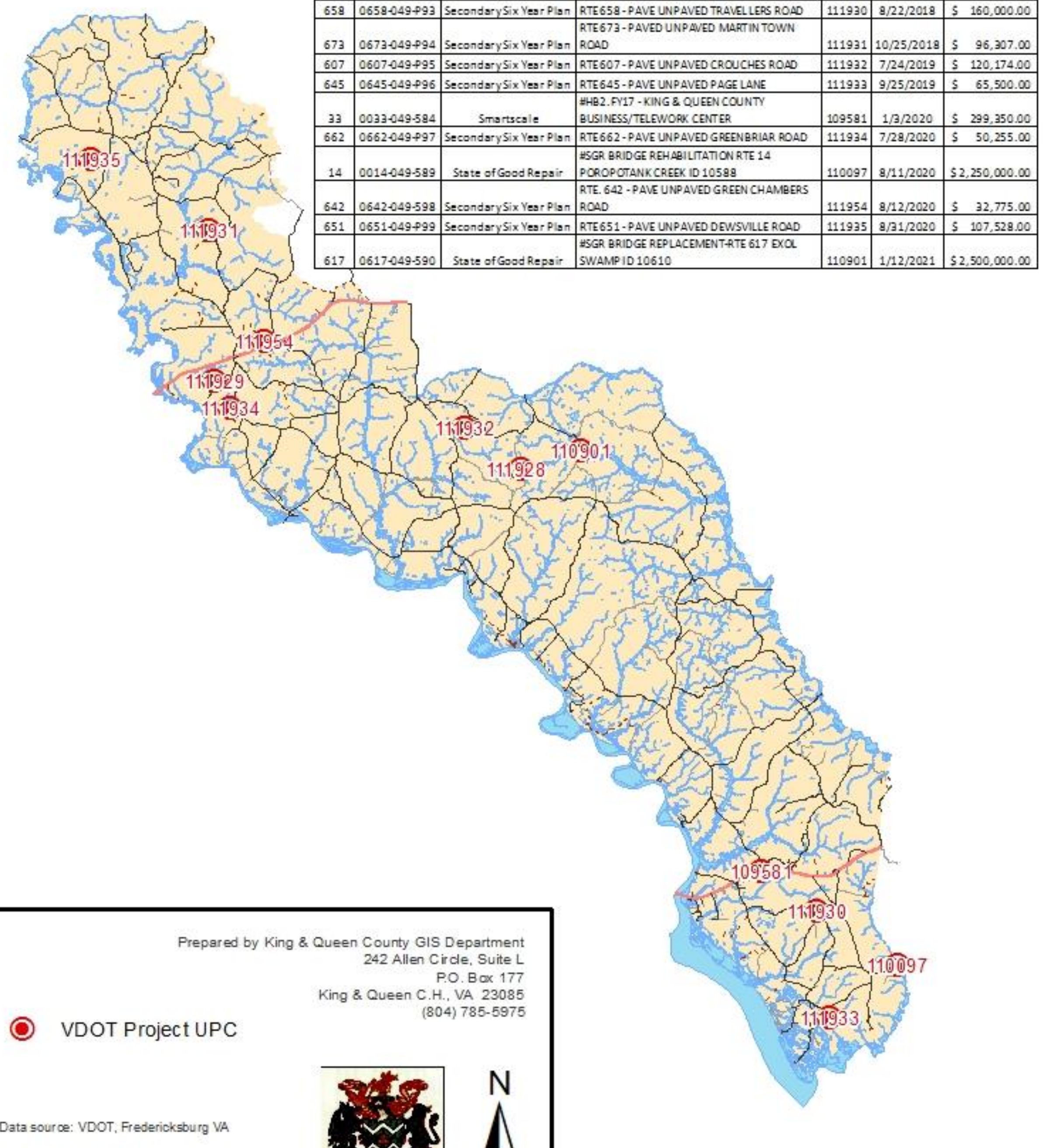

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VDOT Project UPC

*Data source: VDOT, Fredericksburg VA

0 1 2 4 6 8 Miles

N

Chapter 4: Land Use

The Land Use Plan and Map incorporates an approach to economic development planning which emphasizes the critical importance of both *(1) protecting the County's small community atmosphere and (2) providing well-situated development areas to absorb the projected growth demands well into the new century*. From the outset of the update of this plan, the County Board of Supervisors, Planning Commission, and County Staff, have maintained that these two goals should not be mutually exclusive. The Future Land Use Plan and Map are presented with the belief that the County can achieve both its goals for maintain the small community atmosphere while promoting economic development and well managed growth.

In preparation of the Future Land Use Plan and Future Land Use Map, the study process was organized into three principal stages: *(1) research, (2) analysis, and (3) future land use recommendations*. A review of the natural and man-made environment was used to determine the optimal path to organize future growth and to accommodate land use demands in the County. The resulting product is a set of integrated land use recommendations.

The individual land use decisions leading to the Future Land Use Plan were resolved through a comparative analysis process. The result of this process is a recommended Future Land Use Plan which achieves the following objectives:

1. Best expresses the "Vision for King and Queen County" by successfully integrating the community's commonly-held goals for the future;

2. Can be successfully implemented within the context of satisfying both (a) the marketplace demands and (b) the ability of the local government to responsibility supply services and infrastructure; and

3. Provide positive community-wide benefits with the least negative impact on the measured values making up the existing physical, social, political, and economic environment.

Future Land Use Categories

The Future Land Use Plan assigns land use classifications based on recommendations for the preferred type, arrangement, and density of future land uses. The Future Land Use Map is the graphic representation of the geographical locations to which the type, arrangement, and density of land uses have been assigned throughout the County. Along with the strategies and initiatives incorporated into the Comprehensive Plan document, the Future Land Use Plan and Map articulate the long range view of the County, which incorporates the "Vision for King and Queen County". From an implementation standpoint, the Plan geographically assigns the adopted mix of land use classifications upon which subsequent zoning and subdivision decisions will be based. Used together, the Comprehensive Plan and the Future Land Use Map serve as the *fundamental planning tools* which will guide future development in King and Queen County.

The planning process has recognized some of the more contemporary and evolving trends in today's development environment. In doing so, it was necessary to make some major adjustments to the way King and Queen County's plans have been developed in the past. The County's previous Future Land Use Maps incorporated relatively few planning classifications describing residential, commercial uses and industrial uses. Also, it contained a category in which rural, agricultural, and other undeveloped lands within the County were assigned. These categories were broad and vague in terms of the range of uses allowed and how they should be applied throughout the County. Further, the old categories failed to recognize the uniqueness between different land use categories with regard to design guideline requirements and impacts on adjacent uses and the environment. As such, the past Future Land Use Maps did not adequately provide the County with sufficient detail to guide future development in the County in the context of the rapidly changing market conditions and anticipated development pressures.

A new approach incorporating additional comprehensive land use categories was needed. The new Future Land Use Plan takes solid aim at the King and Queen County of the twenty-first century in that it seeks to incorporate the next generation of comprehensive planning techniques, including "smart growth", and "sustainability" approaches to land use. Most importantly, a wider range of land use classifications have been introduced in order to more thoroughly define the characteristics of each land use which has been recommended for the individual Planning Areas in King and Queen County. Chapter 3, Article 3 and Article 4 of the Zoning Ordinance provides planning districts along with the various uses in each.

Land Use

King and Queen County is made up of approximately 198,470 assessed acres. For the purposes of land use, that acreage has been divided into several categories to convey the County's land use.

Agricultural

The Agricultural District comprises the bulk of King and Queen County at approximately 193,196 acres. This District is a mix of mainly agricultural lands, forested lands, and larger residential tracts of land. Logging and farming industries are also a large use of the land in this district. A variety of crops are grown in the County including wheat, barley, soybeans, corn, hay, and cotton. In the agricultural district there are at least 30,000 acres of conservation easements. The majority of property in conservation easements is located within the Stevensville magisterial district.

Residential

Residential single-family, residential-general, and rural-residential districts make up approximately 2,348 acres of the County. The majority of residential single-family, residential-general, and rural-residential districts are found within minor or major subdivisions. Such subdivisions are generally waterfront communities or pre-existing smaller-lot subdivisions.

Commercial

Currently, the commercial districts consist of approximately 498 acres of King and Queen County. Commercial areas range from isolated businesses to commercial areas near development corridors and hubs, but are more encouraged in development corridors. Focusing commercial development in these areas primarily helps to preserve the rural nature of the County. King and Queen County, along with the partnership of the Economic Development Authority, is actively striving to build a business-friendly community.

Industrial

The Industrial District consists of approximately 2,422 acres in King and Queen County. The majority of the Industrial district is focused on the manufacturing aspect of mining, the timber/mulching industry, landfill, and the Middle Peninsula Regional Airport area. The majority of the industrial district of King and Queen County is located within or along the edges of the economic development corridors.

Future Land Use

As King and Queen County strives to preserve the rural aspect of its community, growth within rural areas is discouraged, and established economic development districts, corridors and hubs are the focus of growth for the County.

Economic Development and Transportation Overlay District

This special overlay district was created through zoning regulations of King and Queen County. The intent of the district is to provide for concentrated commercial development in economic development hubs at St. Stephens Church, Shacklefords, Shacklefords Fork, Mattaponi/Airport Road and York River Road. Outside of the established district, commercial development is discouraged in order to preserve the rural residential and agricultural character of the County outside of the areas detailed below.

> *Route 360 Corridor* - Along U.S. Highway 360 for its entire distance through the County and running back on both sides a depth of 1,000 feet from the center of the right-of-way of Route 360
>
> *Route 33 Corridor -* Along Virginia Route 33 for its entire distance through the County and running back on both sides a depth of 1,000 feet from the center right-of-way of Route 33
>
> *Shacklefords -* From the intersection of Route 14 North and Route 33, the boundaries of the Shacklefords Economic Development Hub extends: one mile north of Route 14; one mile east of

Route 33; and one mile west of Route 33. Along each of these lines, the boundaries of the hub runs back a depth of 1,000 feet on both sides of the center right-of-way of these roads

Shacklefords Fork - From the intersection of Route 14 South and Route 33, the boundaries of the Shacklefords Fork Economic Development Hub extends: one mile south of Route 14; one mile east of Route 33; and one mile west on Route 33. Along each of these lines, the boundaries of the hub runs back a depth of 1,000 feet on both sides of the center of the right-of-way of these roads

St. Stephens Church - From the intersection of Route 14 and Route 360, the boundaries of the St. Stephens Church Economic Development Hub extends: one mile south on Route 14; one mile east on Route 360; one mile west on Route 360; and one mile north on Route 721. Along each of these lines, the boundaries of the hub runs back a depth of 1,000 feet on [the] side of the center right-of-way of these roads

Mattaponi/Airport Road - From the intersection of Route 643 and Route 33, the boundaries of Mattaponi/Airport Economic Development Hub extends: one mile south on Route 643; one mile east on Route 33; [and] one mile west on Route 33. Along each of these lines, the boundaries of the hub run back a depth of 1,000 feet on both sides of the center of the right-of-way of these roads

York River Road - From the intersection of Route 605 South and Route 33, the boundaries of York River Road Economic Development Hub extends: one mile and 3/100 south to Route 658; one mile east on Route 33; and one mile west on Route 33. Along each of these lines, the boundaries of the hub run back a depth of 1,000 feet on both sides of the center of the right-of-way of these roads

The Case for "Smart Growth" in King and Queen

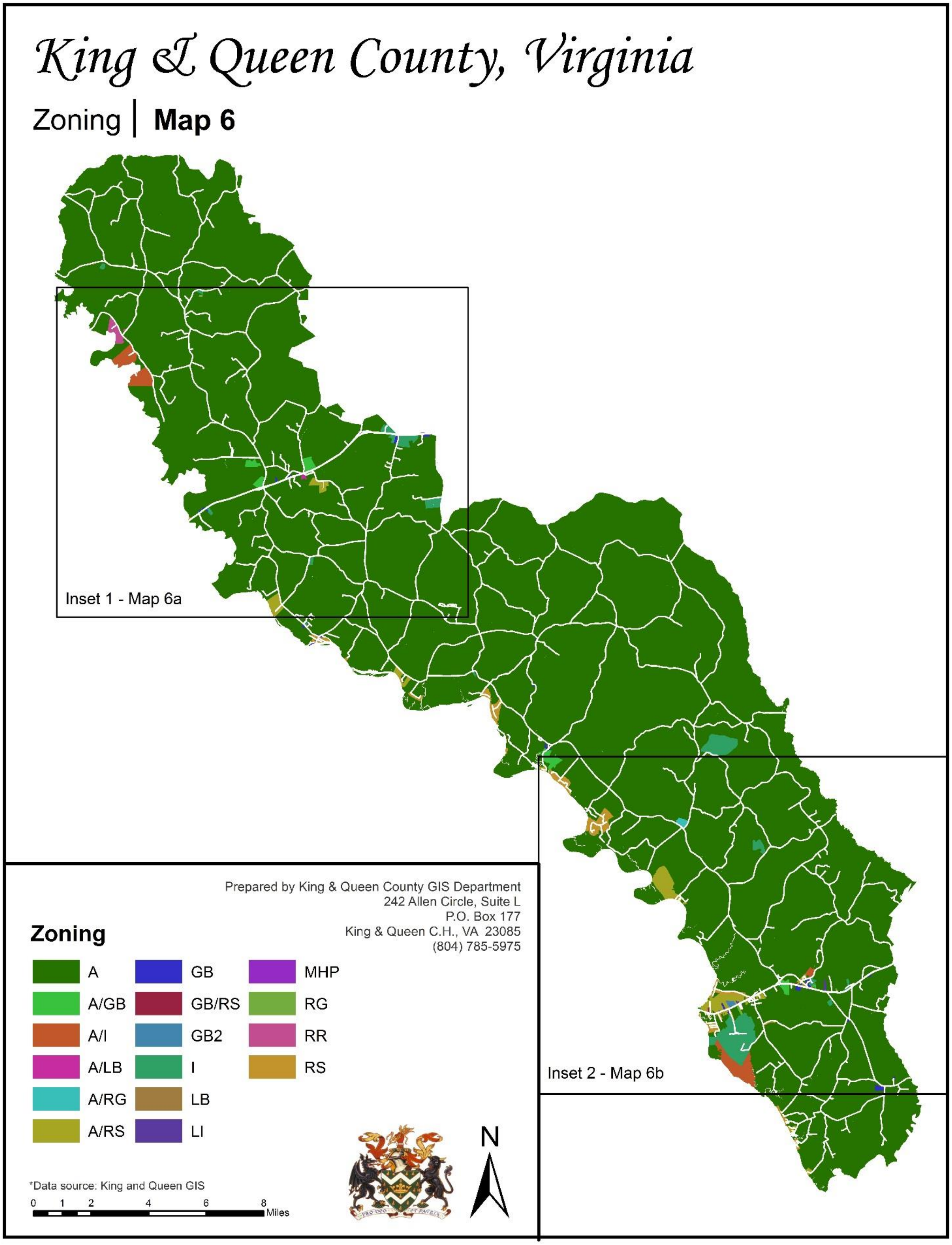
The notion of "smart growth" was the rallying call of the Planning Commission during the preparation of the Comprehensive Plan. Simply defined, "smart growth" is nothing more than making the best of every opportunity to promote quality development. As evidenced in many other successful counties, the rewards from "smart growth" are enhanced property values, improved allocation of land uses and density, and a higher quality of life for the community's citizens. Thus, the adopted goals for "smart growth" and "environmental sustainability" call for contemporary land use guidelines and environmental performance standards to be employed in determining appropriate land holding capacities and densities for new development. These techniques, which have been used throughout Virginia over the past several decades, allow for property owners and public officials alike to evaluate more thoroughly the native development potentials of real estate. Further, they are consistent with the State's enabling statutes for zoning and subdivision controls.

In the adoption of this "smart growth" policy for the Comprehensive Plan, the County has carefully considered these environmental objectives and design criteria and have incorporated them into the update of the zoning ordinance to be used in evaluating individual land development proposals. The following key aspects of a property's development potential should emerge from the application of these environmental criteria by qualified professionals:

1. The overall suitability of a site for development;
2. The prime areas for the siting of appropriate uses for an area;
3. The land use carrying capacities;
4. Environmentally sensitive areas where uses should be restricted; and
5. Specific areas of a property that should be reserved for facilities and infrastructure.

In summary, the ability of land to efficiently "hold" or "absorb" development is directly correlated to its capacity to be put to good use, i.e. good land "holds more" than bad land. From a global view, King and Queen County is a subdivision of thousands of individual parcels of privately owned land. Each parcel is formed with certain physical and environmental attributes which are unique to any other piece of property in the County. The State's zoning statutes enable a locality to incorporate these distinguishing attributes in assessing the physical development potentials (*yield, density, lot coverage*) of a given property. This provides a means by which the County's zoning and erosion and sediment control ordinances can ascribe the process by which "*land holding capacity*" is determined.

"The Comprehensive Plan must afford County Staff the flexibility necessary to support sound development projects while protecting County residents and their property values."


King & Queen County, Virginia
Zoning | Map 6
Inset 1 - Map 6a
Inset 2 - Map 6b
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Zoning
A
A/GB
A/I
A/LB
A/RG
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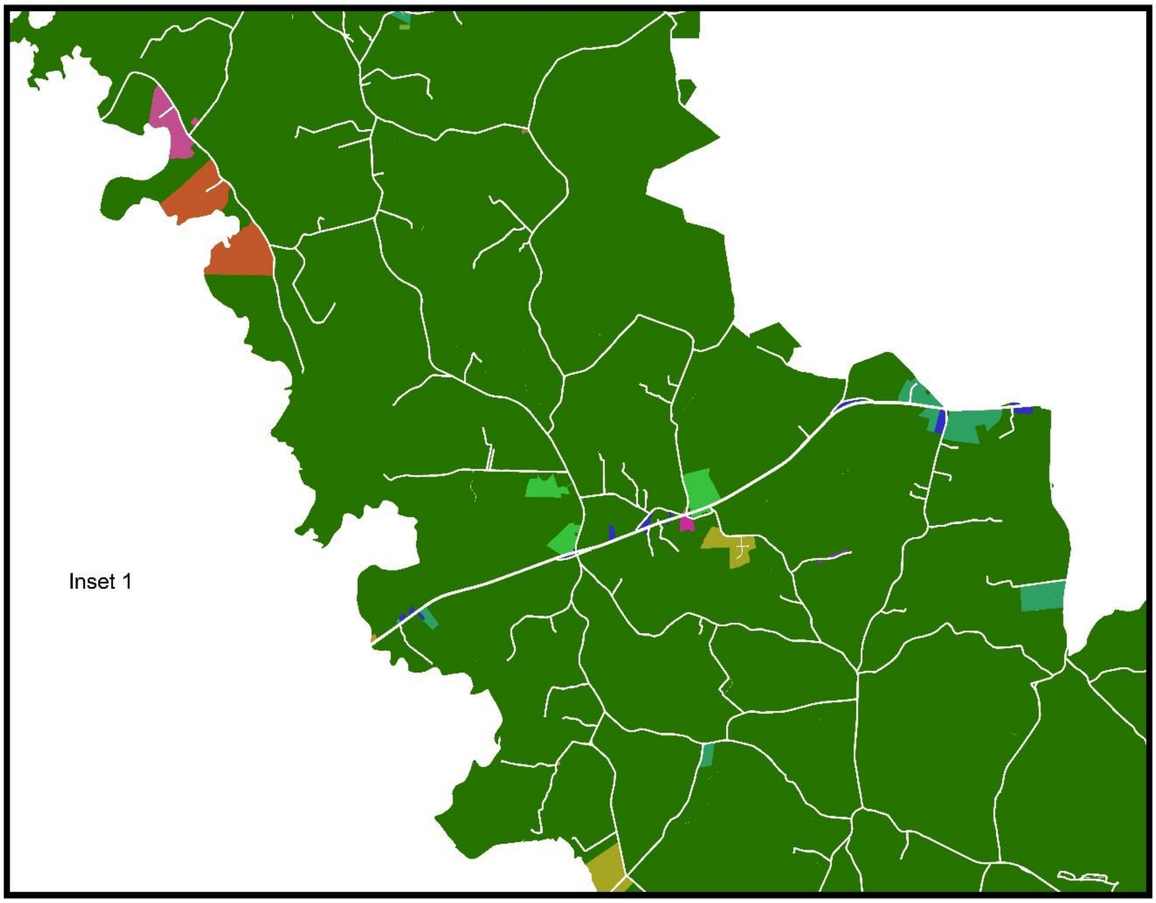
King & Queen County, Virginia

Zoning | **Map 6a**



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Zoning

A, GB, MHP
A/GB, GB/RS, RG
A/I, GB2, RR
A/LB, I, RS
A/RG, LB
A/RS, LI

*Data Source: King and Queen GIS

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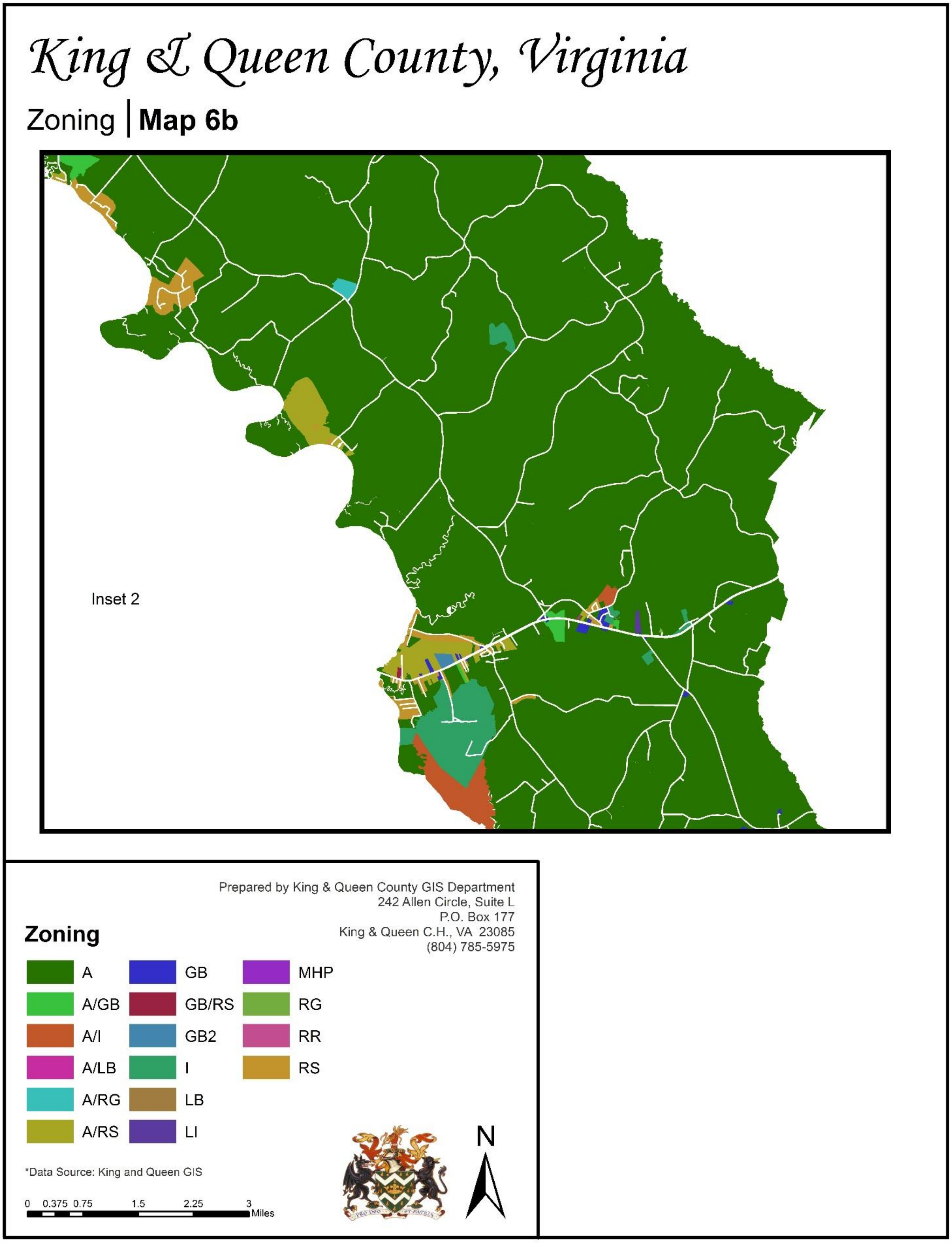
King & Queen County, Virginia
Zoning | Map 6b
Inset 2
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P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
Zoning
A
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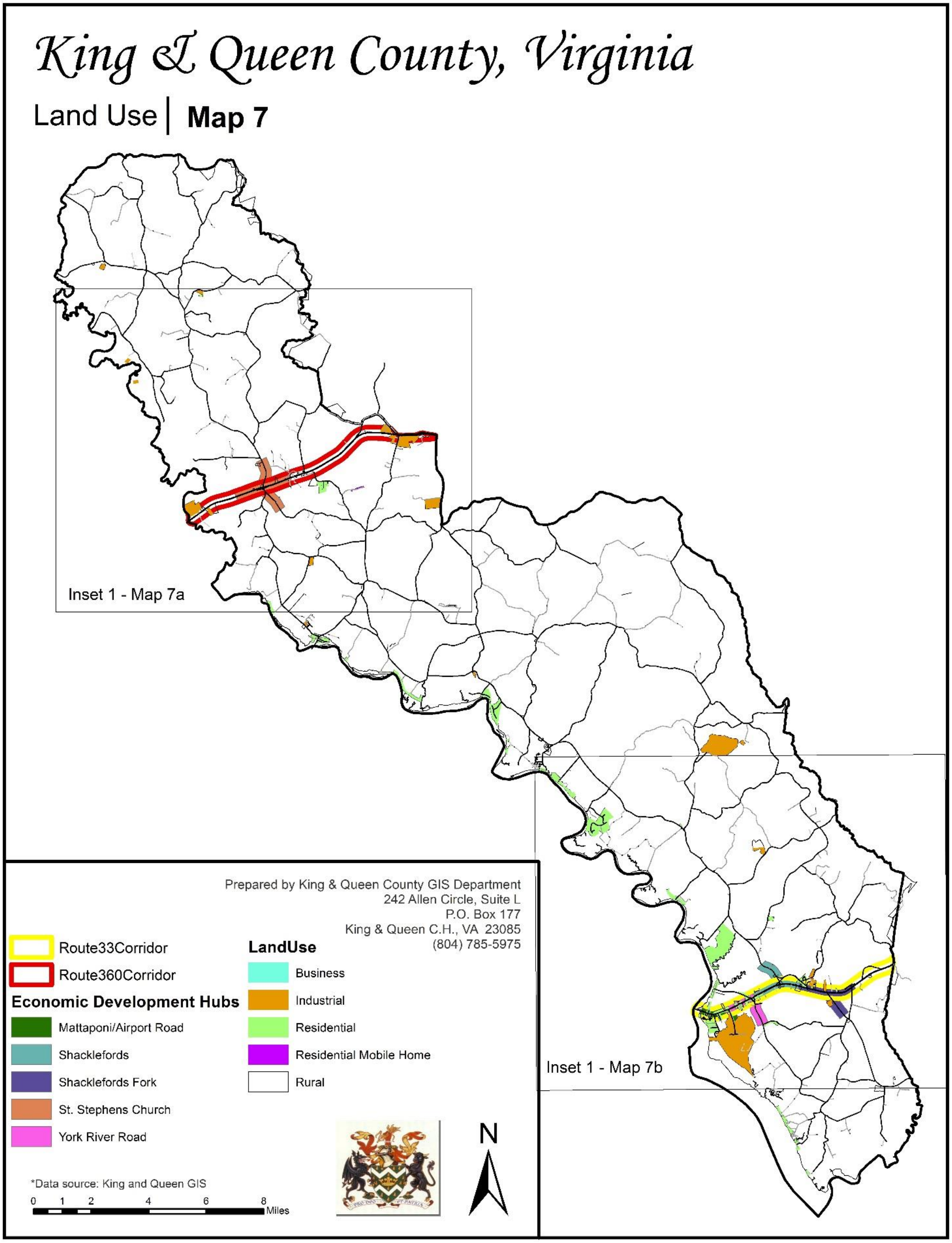
King & Queen County, Virginia
Land Use | Map 7
Inset 1 - Map 7a
Inset 1 - Map 7b
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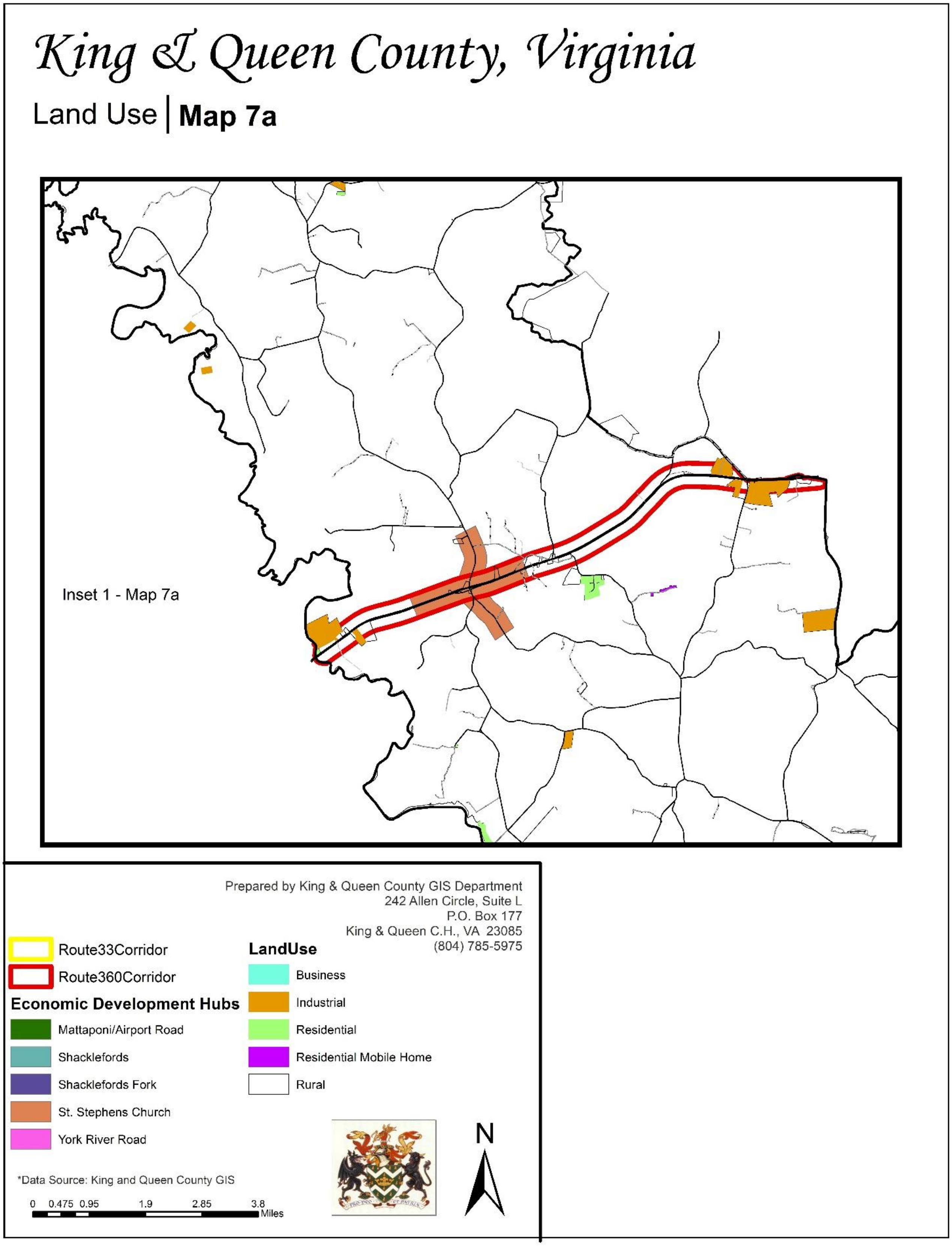
Route33Corridor
Route360Corridor
Economic Development Hubs
Mattaponi/Airport Road
Shacklefords
Shacklefords Fork
St. Stephens Church
York River Road
LandUse
Business
Industrial
Residential
Residential Mobile Home
Rural
*Data source: King and Queen GIS
0 1 2 4 6 8 Miles
N


King & Queen County, Virginia
Land Use | Map 7a
Inset 1 - Map 7a
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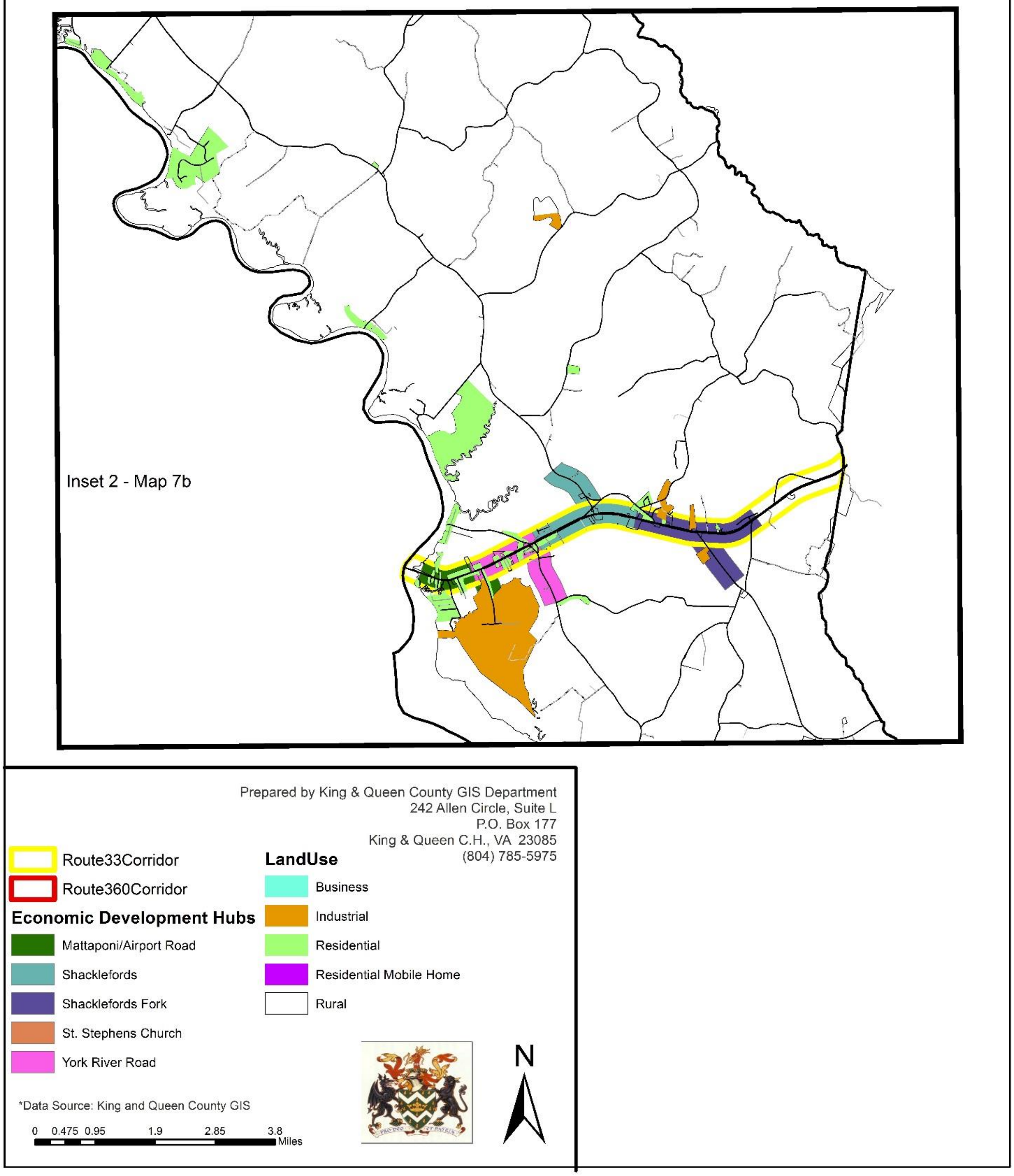
Route33Corridor
Route360Corridor
Economic Development Hubs
Mattaponi/Airport Road
Shacklefords
Shacklefords Fork
St. Stephens Church
York River Road
LandUse
Business
Industrial
Residential
Residential Mobile Home
Rural
N
*Data Source: King and Queen County GIS
0 0.475 0.95 1.9 2.85 3.8 Miles

King & Queen County, Virginia

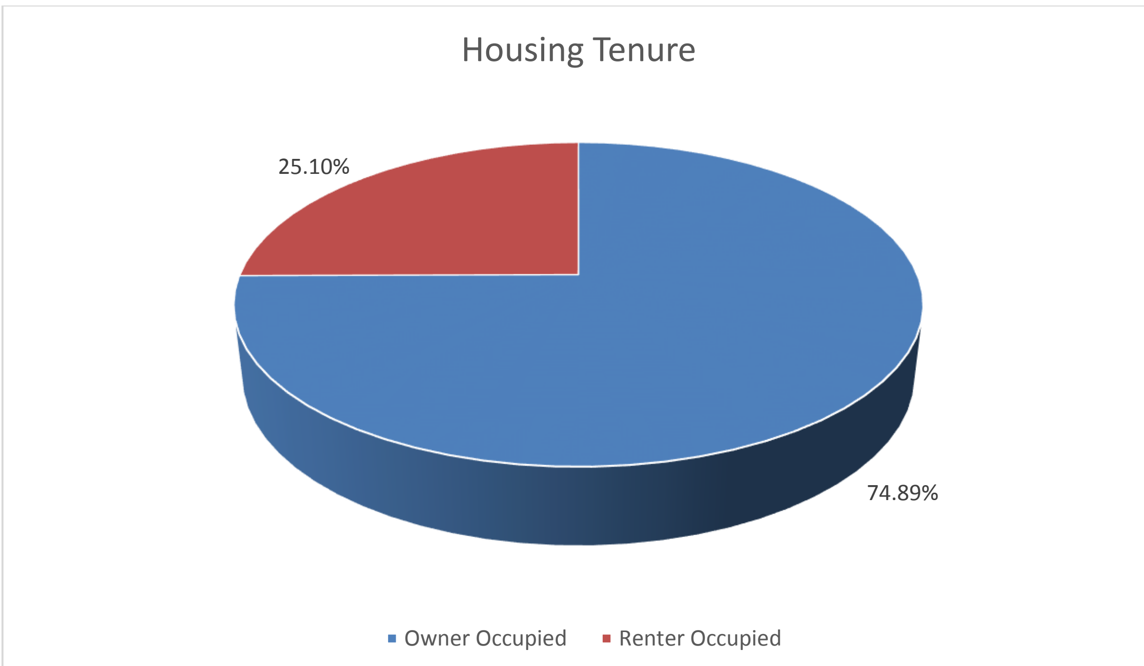
Land Use | **Map 7b**



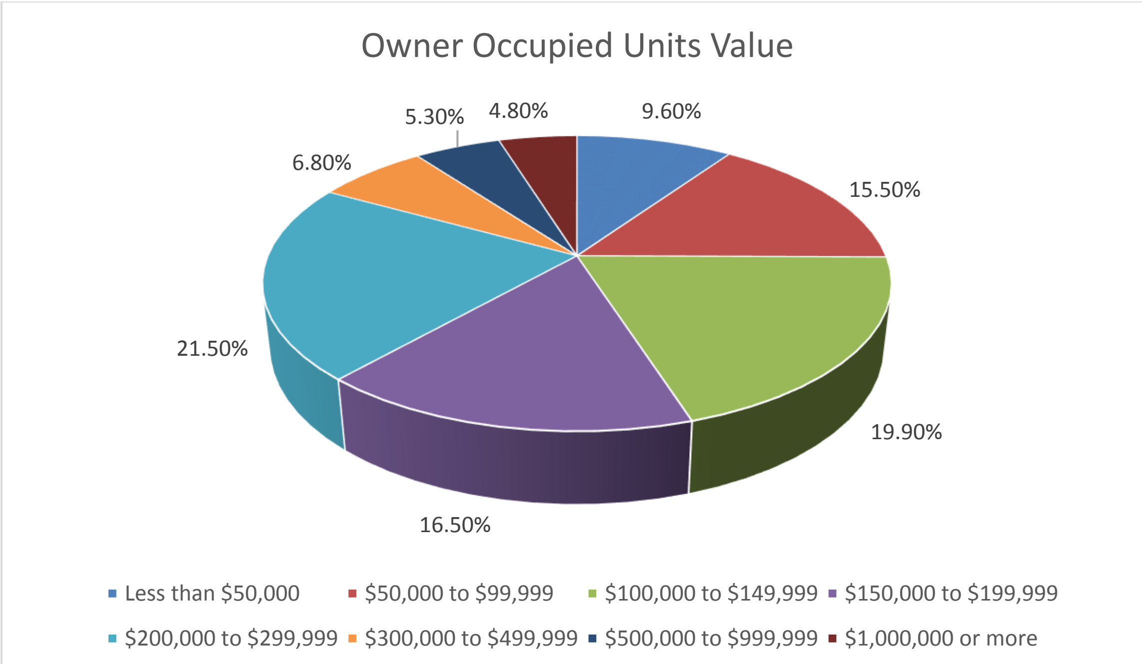
Chapter 5: Housing and Neighborhoods

King and Queen County's housing inventory, trends and projections are discussed below. The number and type of housing units in the area can be an indicator of the economic and social structure of that area. Population fluctuations, land consumption, availability, and the provision of public utilities can affect the development of an area as housing unit growth or decline occurs.

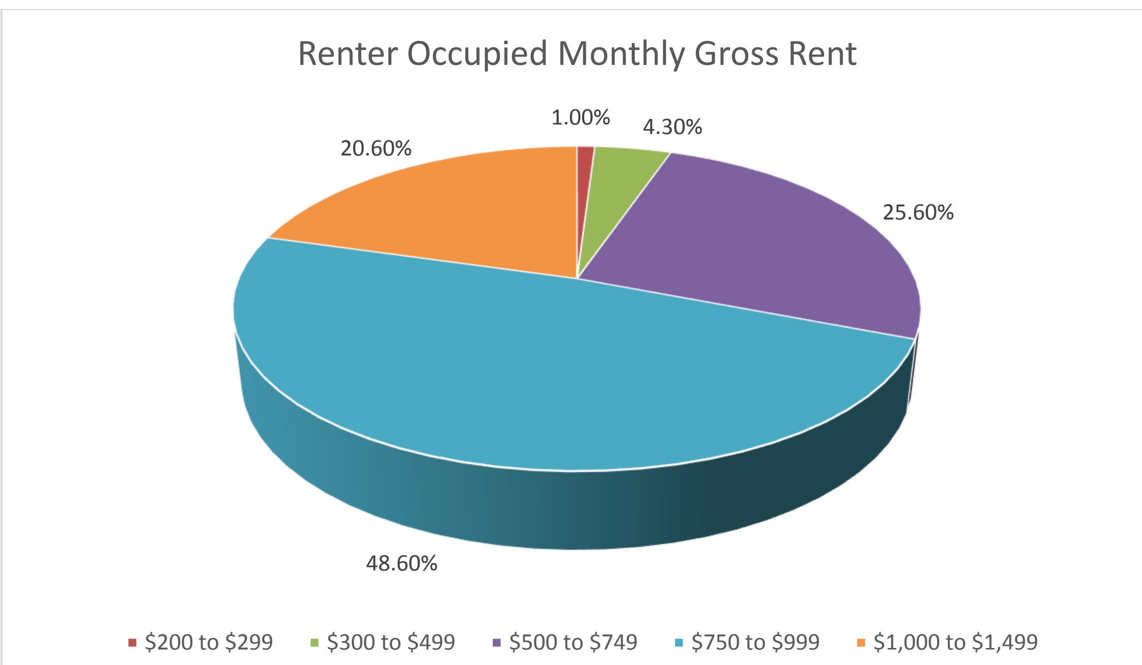
The 2010-2014 American Community Survey reported 3,440 housing units in King & Queen County. Of the 3,440 housing units in King and Queen County, 2,832 are currently occupied. The dominant housing type continues to be the single-family residence, which comprises of approximately 2,869 units. There are approximately 33 multi-family units and 461 mobile homes located in King & Queen County. The report included 608 residences which were vacant in the County. Of the occupied housing units, 2,121 (74.89%) are owner occupied, while 711 (25.10%) are renter occupied.



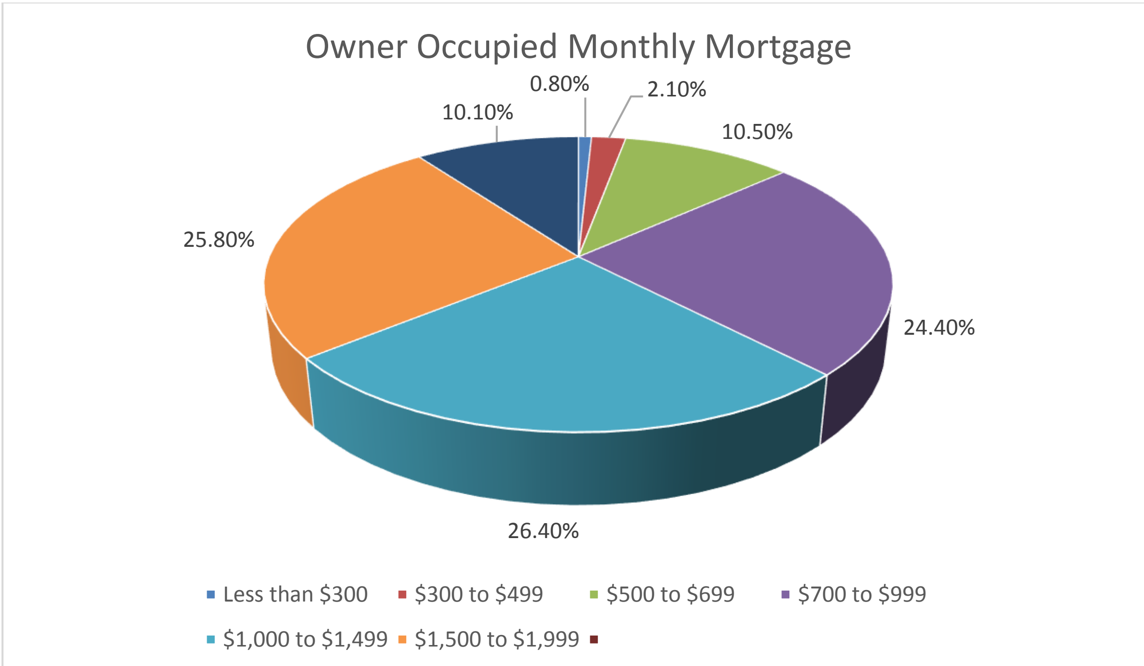
According to the 2010-2014 American Community Survey, the highest percent of the population has an owner occupied home value of $200,000 to $299,999.



Of the 711 (25.10%) renter occupied housing units, 302 pay rent of $750 to $999 per month. According to the report, 89 occupied rental units do not pay rent for housing.



Of the 2,121 (74.89%) owner occupied units, there are 1,299 housing units with a mortgage. The largest percentage of owners with a mortgage in King and Queen County pays $1,000 to $1,499 per month.



Chapter 6: Natural Resources

The Comprehensive Plan, by definition, is the County's best effort to do what is right, or most suitable, for its land. This is the essence of what is meant by "smart growth." In turn, the Plan is translated into reality via its linkages to the zoning and subdivision ordinances. These ordinances recognize that good development only arises from the intelligent application of these "tools" in sizing and shaping the land.

In contemporary zoning ordinances in the Commonwealth, environmental performance standards are commonly employed as measureable criteria to establish the inherent suitability of land for development. The recommended process to be incorporated into the update of the County's zoning ordinance allows for the actual physical characteristics of the land to determine the inherent "*net developable area*" of any given parcel.

Virginia's enabling statutes for planning and zoning support environmental performance standards as a foundation for reinforcing the development suitability process. This process presents a more logical approach to define and allocate land holding capacities and development densities to individual properties.

"*Land holding capacity*" is a measure of how much development density a given property "can hold" and is normally expressed in terms of land use density (i.e. residential dwelling unit count) or *building intensity* (i.e. square footage of retail or industrial space).

In the past, traditional zoning practices in Virginia have allocated land uses densities to the land with little regard for the slope, soil type, vegetation, topographic configuration, flood plain and wetland coverage, geology, and existing development. The recommended development suitability process for King and Queen County allows land use decisions related to density and intensity of development coverage to be determined by the character of the land and its underlying physical, environmental, and geological influences. The concept of "land holding capacity" is not intended to limit one's use of property, but, rather, to serve as a guide in assessing the most appropriate application of density to the land. Today, there are several instances in King and Queen County where there is either too much or too little development on a given property. This process recognizes that in King and Queen County, each property should be carefully evaluated for both its optimal density and impact on its surroundings.

From a physical planning perspective, "smart growth" land use decisions can best be made by employing this analysis technique. However, land use decisions must also incorporate King and Queen County's broader goals and objectives for its citizens. Simply because a property has excellent development potential does not mean that it should be designated for uncomplimentary land uses or high density utilizations. In the big picture, the Future Land Use Plan and Map must assess all land (regardless of development capacity) in the context of the County's objectives for open space, public recreation, ability to provide adequate public facilities, transportation access characteristics and environmental conservation. For instance, gently sloping or perfectly flat land is normally judged as being more "suitable" (i.e. having high "*land holding capacities*") for commercial and high-density residential development than steeply sloped land. However, the Comprehensive Plan may view the same piece of flat land as being more appropriately allocated to an institutional or recreation activity because of the location, access, cultural relationships and environmental attractiveness of the particular property.

Thus, a property's environmental-based "*land holding capacity*", does not, by itself, specifically point to the optimal land use for a given property, but rather it defines the net developable area and land use density which is considered most appropriate for the permitted uses of the particular zoning district for which the property is mapped.

General Criteria for Environmental Performance Standards

Environmental performance standards for “smart growth” will be implemented through the County’s zoning ordinance. Environmental performance standards serve to identify the most relevant and significant physical and ecological characteristics of the land which should be evaluated in the calculation of “land holding capacities”. Through their application, the “net developable area” of any property can be determined. With respect to any private sector land development activity, this process would be initiated by the developer or sub-divider during the preparation of zoning applications or submission of plats and plans for development activities.

Historic Places in King and Queen County

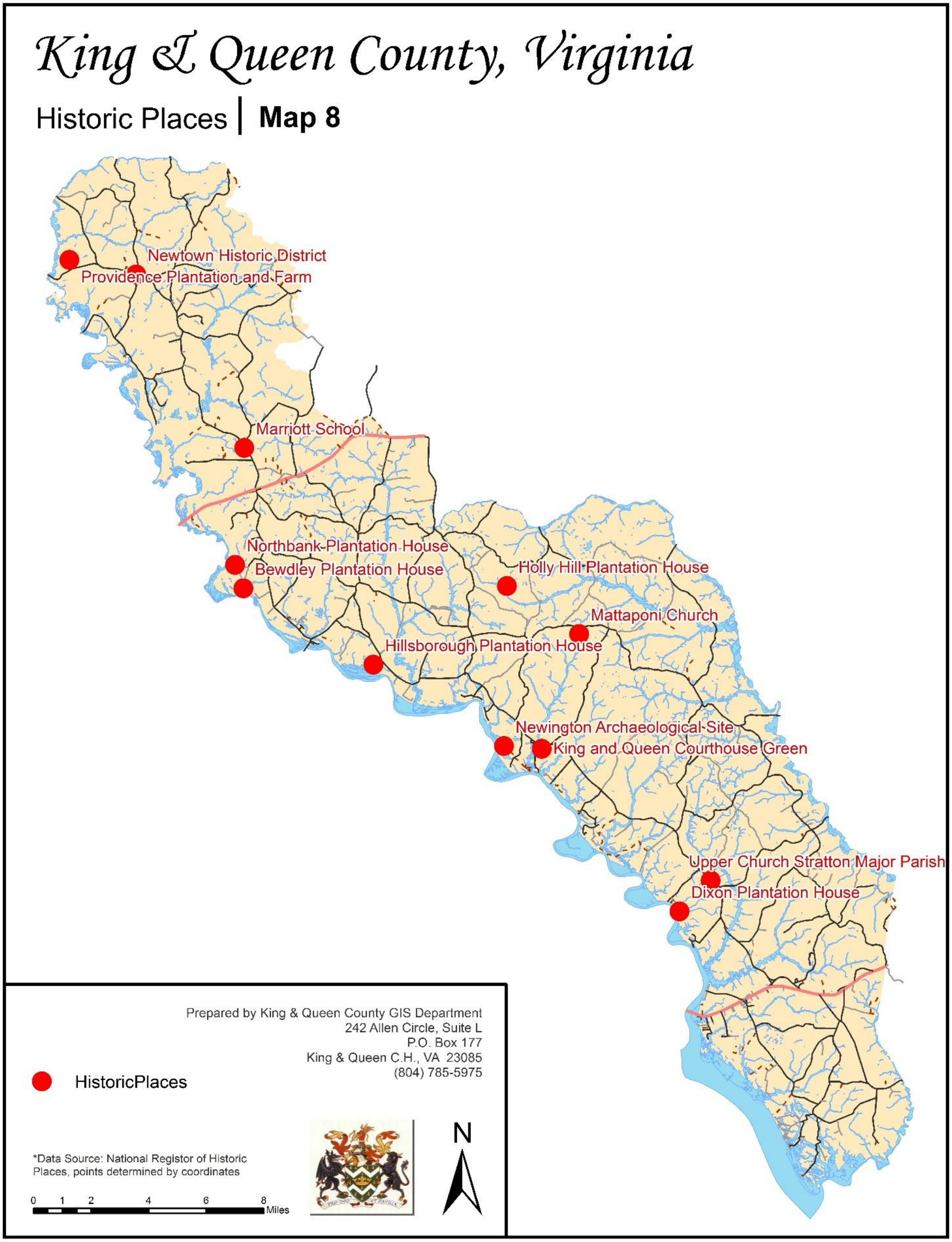
Formed in 1691, King and Queen County is named after King William III and Queen Mary of England. The history of King and Queen County is largely shaped by its physical location and natural features. Lying northeast of the Town of West Point and cradled by two rivers, the rich upland hunting grounds that followed the York River ridge running the full length of the county became a natural passage for the indigenous tribes of the Powhatan confederacy. The "Chisciack Trail" paralleled Route 14-which, along with Route 721, serves as the primary road traversing this long and narrow county. Often called the "shoestring county", King and Queen is about 70 miles long and less than 10 miles wide.

During the post-colonial period, local history was framed by the natural resource base. People owed their livelihoods to the land and the creeks that course through it. Timber harvesting, farming, hunting, and trapping were the trades of early King and Queen County. Many were drawn to the promise of a successful living here, including famous statesmen and wealthy planters. The numerous existing historic homes and properties located in the County pay tribute to their accomplishments.

Based on the information provided by the King and Queen County Historical Society and information obtained from National Register of Historic Places, there are 14 significant historical sites identified throughout the County. Fourteen of those properties and districts are listed on the National Register of Historic Places in King and Queen County (see Map 8). The County acknowledges the important role historical landmarks play in benefiting the area's culture, economy, and tourism industry and encourages local preservation.

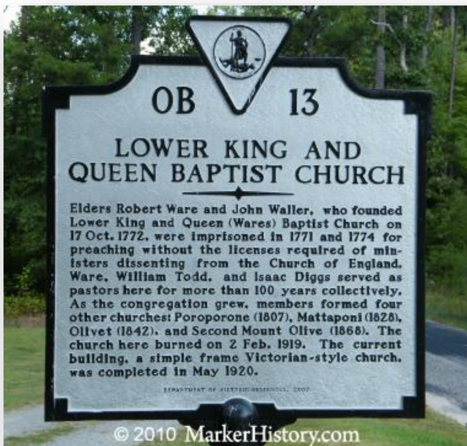
Name	Landmark Type	Date Listed	Geographic Location
Bewdley	Plantation House	11/16/1978	St. Stephens Church
Dixon	Plantation House	1/20/2005	Shacklefords
Farmington	Plantation House	3/17/1995	St. Stephens Church
Fort Mattapony	Archaeological Site	8/19/1994	Walkerton
Hillsborough	Plantation House	9/22/1971	Walkerton
Holly Hill	Plantation House	7/24/1973	Aylett
King and Queen Courthouse Green	Historic District	9/24/1998	King and Queen Courthouse
Marriott School	School	2/13/2007	St. Stephens Church
Mattaponi Church	Place of Worship	3/20/1973	Cumnor
Newington Archaeological Site	Archaeological Site	3/31/2010	King and Queen Courthouse
Newtown Historic District	Historic District	10/29/1982	Newtown
Northbank	Plantation House	3/7/2006	Walkerton
Providence Plantation and Farm	Plantation House	9/3/2009	Newtown
Upper Church, Stratton Major Parish	Place of Worship	4/2/1973	Shanghai

Historical Landmarks in King and Queen


King & Queen County, Virginia
Historic Places | Map 8
Newtown Historic District
Providence Plantation and Farm
Marriott School
Northbank Plantation House
Bewdley Plantation House
Holly Hill Plantation House
Mattaponi Church
Hillsborough Plantation House
Newington Archaeological Site
King and Queen Courthouse Green
Upper Church Stratton Major Parish
Dixon Plantation House
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
HistoricPlaces
*Data Source: National Registor of Historic Places, points determined by coordinates
0 1 2 4 6 8 Miles
N

King and Queen County Historical Markers

There are eighteen historical markers placed throughout King and Queen County. The responsibility of these markers' placement and maintenance has changed between State departments since being established, but currently resides with the Virginia Department of Transportation.



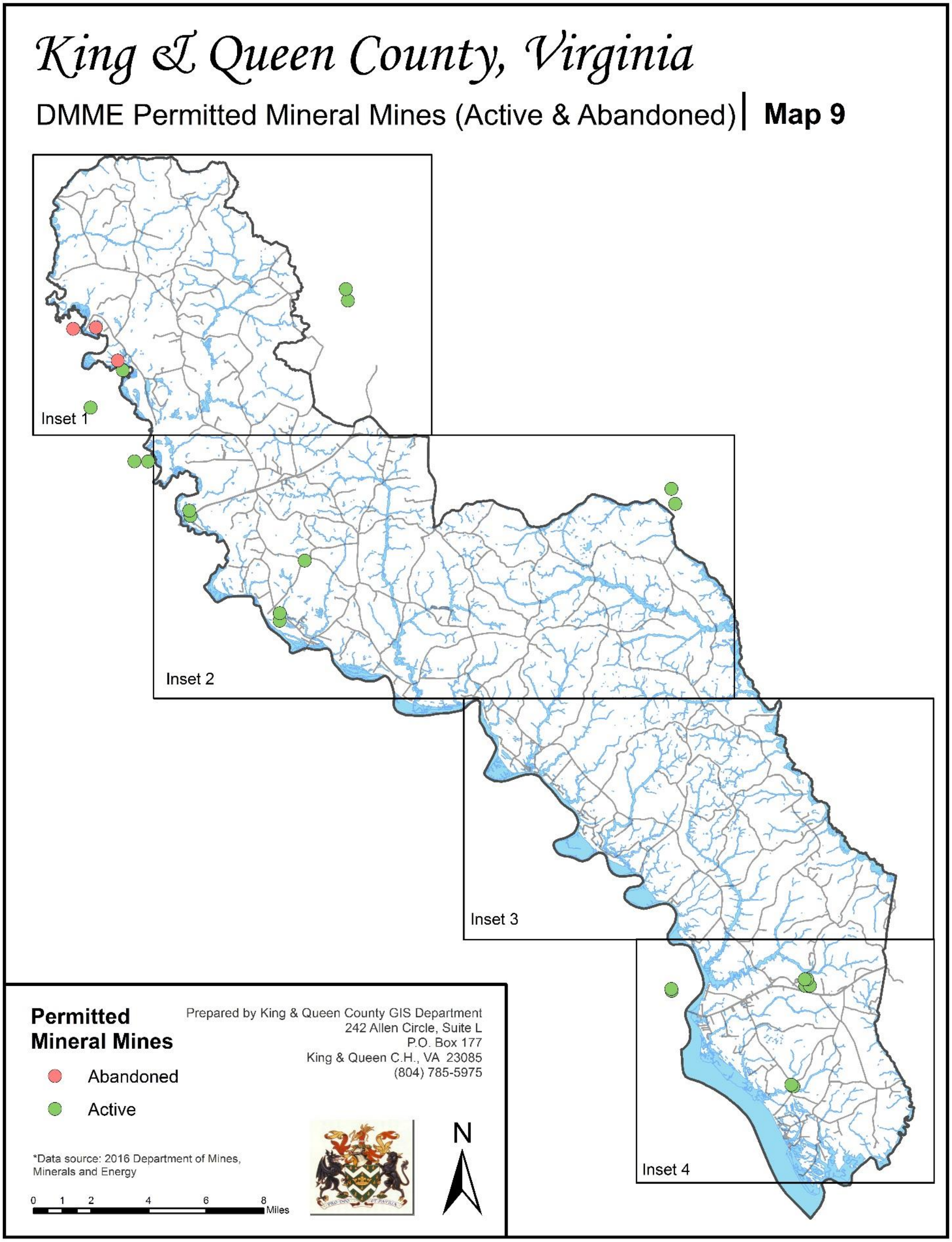
Name	Date
The Indentured Servants' Plot	September 13, 1663
Poropotank Creek	January 1, 1676
King and Queen County	April 16, 1691
Apple Tree Church	January 1, 1710
Hillsborough	January 1, 1722
Park Church	January 1, 1723
Newington	September 10, 1736
Clark Home	January 1, 1750
Laneville	January 1, 1760
Colonial Church	January 1, 1767
Corbin's Church	January 1, 1768
Newtown	January 1, 1770
Lower King & Queen Baptist Church	October 17, 1722
Bruington Church	January 1, 1790
Mount Pleasant	January 1, 1800
Mattapony Church	January 1, 1824
Where Dahlgren Died	March 2, 1864
State Fish Hatchery	January 1, 1937

Historical Markers in King and Queen

Mining in King and Queen County

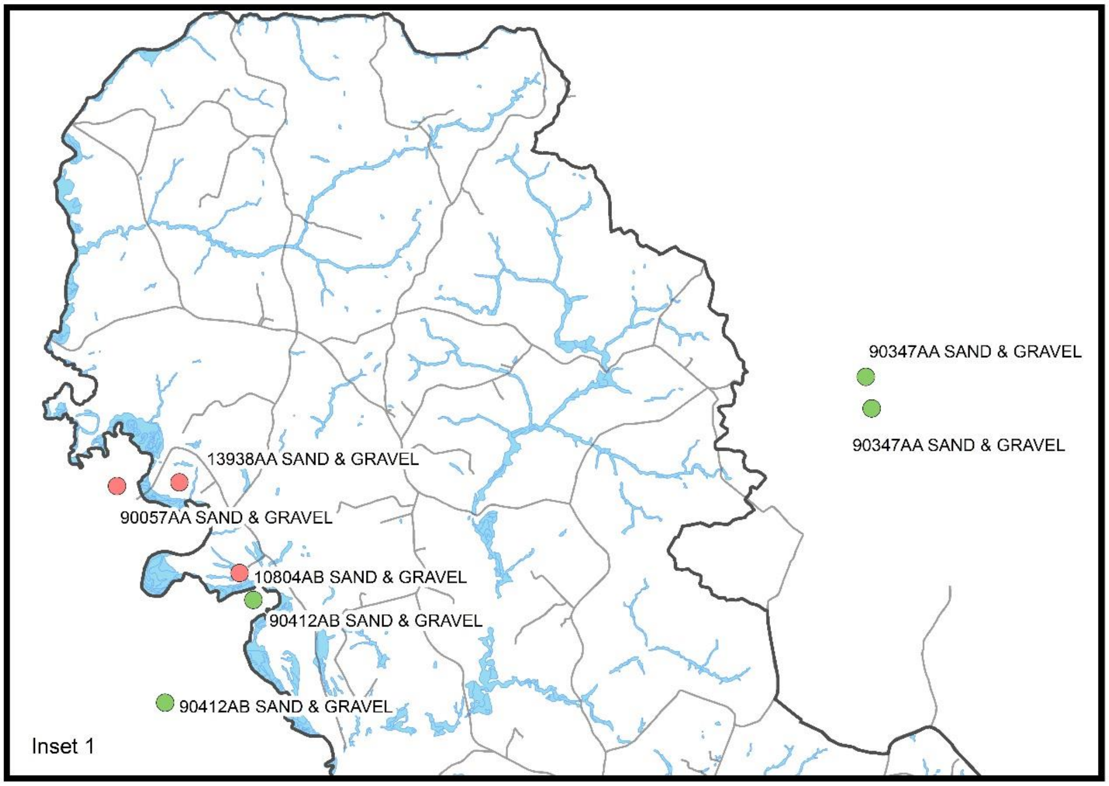
In 1996, the General Assembly of the Commonwealth of Virginia amended state statutes governing localities' comprehensive planning to include mineral resources among the key considerations in planning for future growth (Code of Virginia §15.2-2224). State and local governments have been challenged to ensure that the benefits accrued from mining operations are maximized in a sustainable way, while any negative impacts are mitigated. Through comprehensive planning, local governments work with citizens to ensure an appropriate balance between protecting community values and developing important natural resources.

As part of "smart growth" in King and Queen County, the County seeks to minimize potential land use conflicts and to ensure that uses of an industrial nature related to resource extraction are sited where transportation and utility infrastructure are sufficient and available to support such uses and where adjacent land uses are compatible. View Appendix F, Map 9 for a map of King and Queen County's active and abandoned mining sites as provided by DMME.


King & Queen County, Virginia
DMME Permitted Mineral Mines (Active & Abandoned) | Map 9
Inset 1
Inset 2
Inset 3
Inset 4
Permitted Mineral Mines
Abandoned
Active
*Data source: 2016 Department of Mines, Minerals and Energy
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
0 1 2 4 6 8 Miles
N

King & Queen County, Virginia

DMME Permitted Mineral Mines (Active & Abandoned) | **Map 9a**



Permitted Mineral Mines

Abandoned

Active

*Data source: 2016 Department of Mines, Minerals and Energy

0 0.475 0.95 1.9 2.85 3.8 Miles

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

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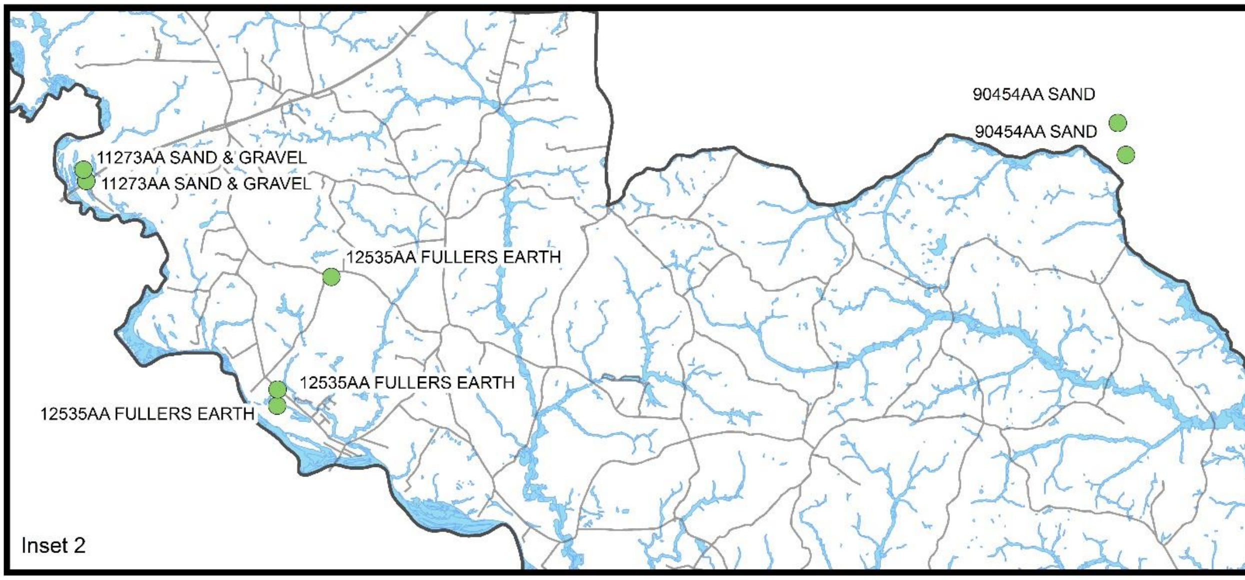
King & Queen County, Virginia

DMME Permitted Mineral Mines (Active & Abandoned) | **Map 9b**



Permitted Mineral Mines

Abandoned

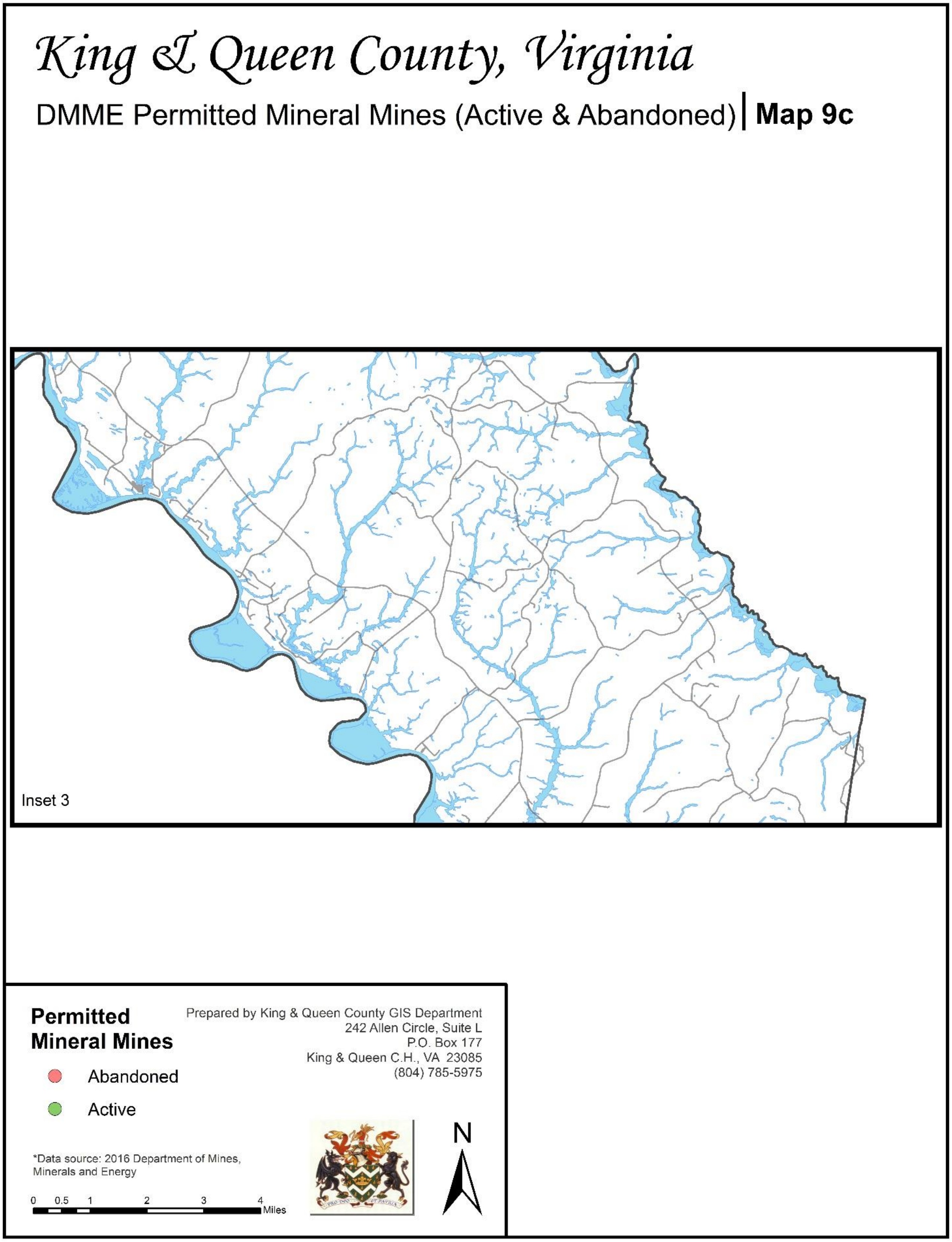
Active

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

*Data source: 2016 Department of Mines, Minerals and Energy

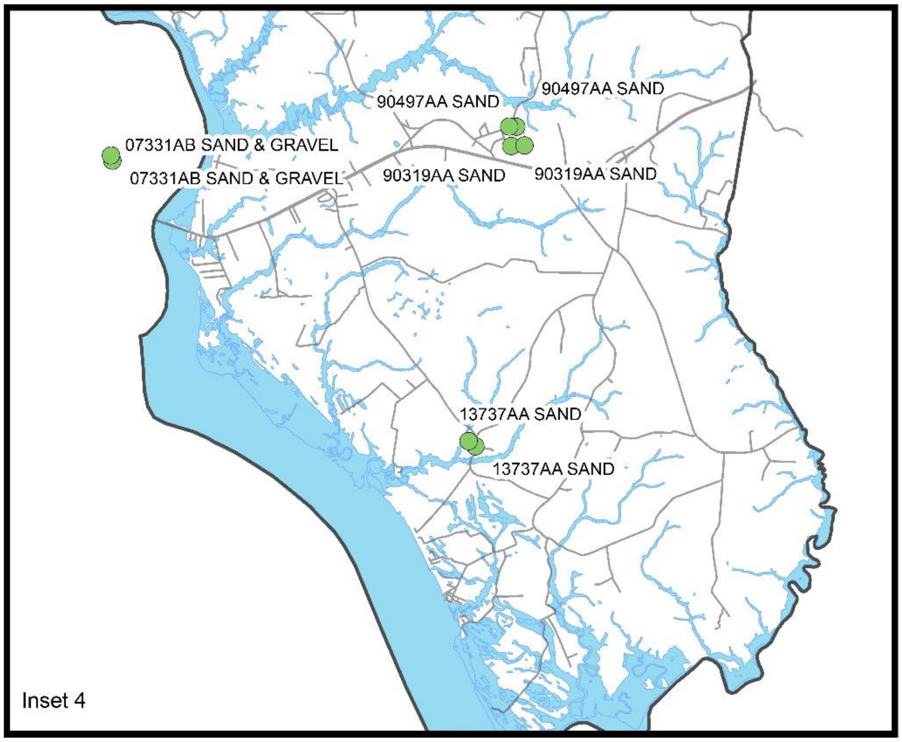
0 0.5 1 2 3 4 Miles

N


King & Queen County, Virginia
DMME Permitted Mineral Mines (Active & Abandoned) | Map 9c
Inset 3
Permitted Mineral Mines
Abandoned
Active
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data source: 2016 Department of Mines, Minerals and Energy
0 0.5 1 2 3 4 Miles
N

King & Queen County, Virginia

DMME Permitted Mineral Mines (Active & Abandoned) | **Map 9d**



Permitted Mineral Mines

- Abandoned
- Active

*Data source: 2016 Department of Mines, Minerals and Energy

0 0.45 0.9 1.8 2.7 3.6 Miles

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
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King & Queen C.H., VA 23085
(804) 785-5975

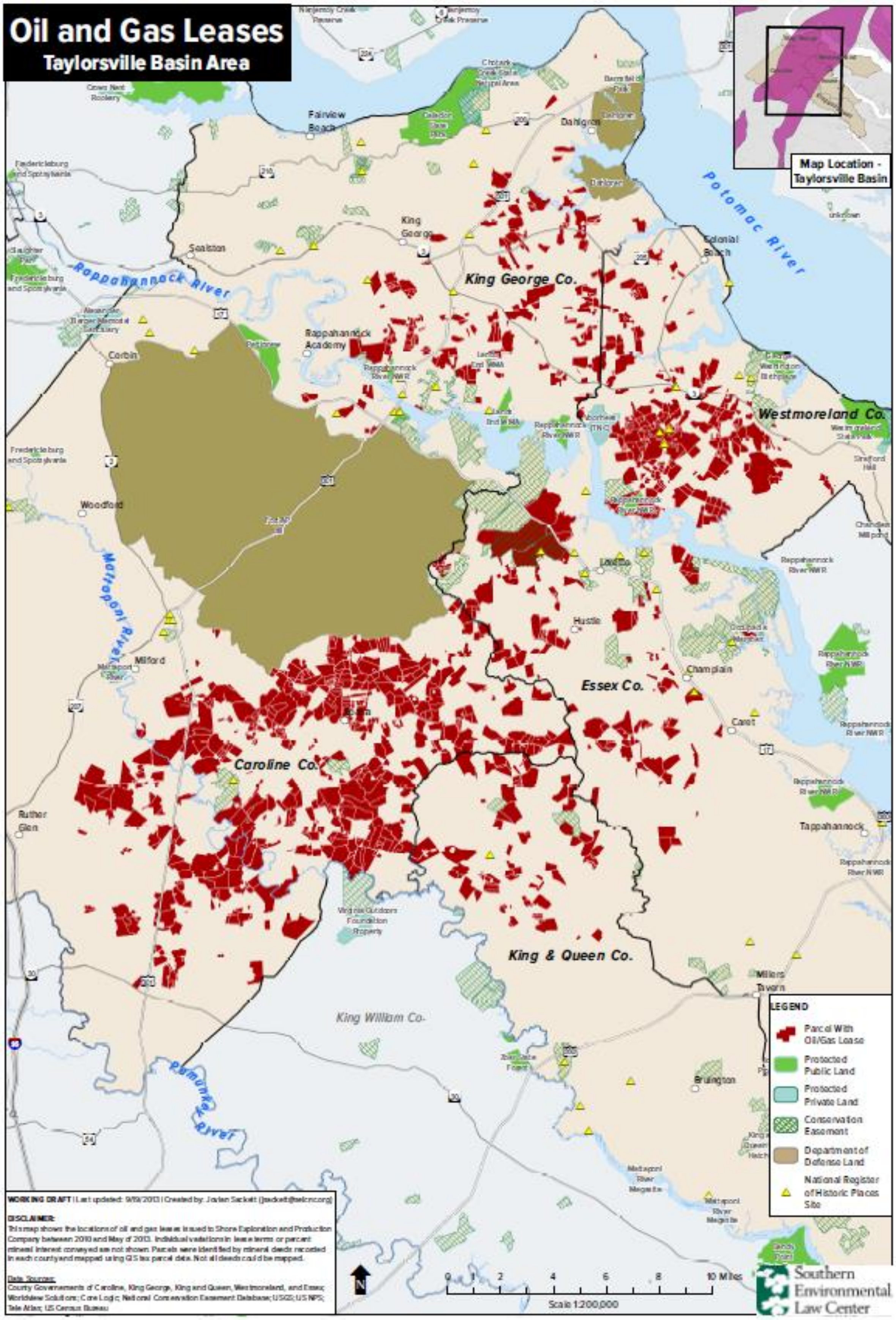
N

Gas and Oil Exploration (Taylorsville Basin) in King and Queen County

Since 2010, Texas-based Shore Exploration and Productions Corporation has leased mineral rights on the Middle Peninsula, including 6,050 acres of land located on the eastern end of King and Queen County, north of Route 360. The leases are located within the Taylorsville Basin, a shale deposit that stretches from central Virginia to southern Maryland. Although no drilling has occurred to date in the County, advances in non-conventional oil and gas drilling, known as hydrofracturing, have heightened interest in energy production from hydrocarbon formations in Virginia, including the Taylorsville Basin. While energy development can bring jobs and economic development to King and Queen County, the industrial nature of oil and gas hydrofracturing can also bring unintended consequences that create conflicts with other important County goals and plans. For more information on fracking, please see the Opinion from Office of the Commonwealth's Attorney General in Appendix H.

King and Queen County recognizes that landowners with property in the Taylorsville Shale Basin (See Appendix I for a Map of Leases) or similar hydrocarbon resource areas identified in the future may choose to enter into leasing agreements to allow oil and gas exploration and drilling and related activities where hydrocarbon formations are productive and may become commercially viable. It is the County's objective to protect public health, safety, and welfare, the character of its communities, and the environment from adverse effects of activities related to energy production from oil and gas exploration and drilling and to minimize potential long and short term land use conflicts between those activities and current or planned land uses. These include: compatibility with traditional rural economic sectors, such as agriculture, forestry, recreation and tourism; increased costs in providing community services to address impacts to roads, emergency services, criminal justice, public health and affordable housing that could potentially result from oil and gas extraction; protection of air quality and water quality and supply; and conservation of natural resources and the Chesapeake Bay.

The County further intends to ensure that activities related to the conversion of hydrocarbon resources to energy will not jeopardize long term commitments to agriculture, silviculture and maintaining the County's rural atmosphere, or introduce industrial activities into agricultural and residential areas. Gas and oil exploration drilling and hydrofracturing are not compatible with the character of King and Queen County and the County does not have transportation infrastructure and utilities sufficient to support such highly intensive land uses. Therefore, gas and oil exploration, including hydrofracturing shall not be permitted within the boundaries of King & Queen County, as the adverse effects heavily outweigh the positive impacts, if any.


Oil and Gas Leases
Taylorsville Basin Area
Map Location - Taylorsville Basin
Potomac River
Rappahannock River
Mattaponi River
Pamunkey River
King George Co.
Westmoreland Co.
Essex Co.
Caroline Co.
King & Queen Co.
King William Co.
LEGEND
Parcel With Oil/Gas Lease
Protected Public Land
Protected Private Land
Conservation Easement
Department of Defense Land
National Register of Historic Places Site
WORKING DRAFT
DISCLAIMER:
Data Sources:
Scale 1:200,000
10 Miles
Southern Environmental Law Center

Coastal Resource Management Guidance

Coastal ecosystems reside at the interface between the land and water, and are naturally very complex. They perform a vast array of functions by way of shoreline stabilization, improved water quality, and habitat for fishes; from which humans derive direct and indirect benefits.

The science behind coastal ecosystem resource management has revealed that traditional resource management practices limit the ability of the coastal ecosystem to perform many of these essential functions. The loss of these services has already been noted throughout coastal communities in Virginia as a result of development in coastal zone areas coupled with common erosion control practices. Beaches and dunes are diminishing due to a reduction in a natural sediment supply. Wetlands are drowning in place as sea level rises and barriers to inland migration have been created by construction of bulkheads and revetments. There is great concern on the part of the Commonwealth that the continued armoring of shorelines and construction within the coastal area will threaten the long-term sustainability of coastal ecosystems under current and projected sea level rise.

In the 1980s, interest arose in the use of planted wetlands to provide natural shoreline erosion control. Today, a full spectrum of living shoreline design options is available to address the various energy settings and erosion problems found. Depending on the site characteristics, they range from marsh plantings to the use of rock sills in combination with beach nourishment.

Research continues to support that these approaches combat shoreline erosion, minimize impacts to the natural coastal ecosystem and reinforce the principle that an integrated approach for managing tidal shorelines enhances the probability that the resources will be sustained. Therefore, adoption of new guidance and shoreline best management practices for coastal communities is now necessary to insure that functions performed by coastal ecosystems will be preserved and the benefits derived by humans from coastal ecosystems will be maintained into the future.

In 2011, the Virginia Assembly passed legislation to amend §28.2-1100 and §28.2-104.1 of the Code of Virginia and added section §15.2-2223.2, to codify a new directive for shoreline management in Tidewater Virginia. In accordance with section §15.2-2223.2, all local governments shall include in the next revision of their comprehensive plan beginning in 2013, guidance prepared by the Virginia Institute of Marine Science (VIMS) regarding coastal resource management and, more specifically, guidance for the appropriate selection of living shoreline management practices. The legislation establishes the policy that living shorelines are the preferred alternative for stabilizing eroding shorelines.

This guidance, found within the Comprehensive Coastal Resource Management Portal, is being prepared by VIMS for localities within the Tidewater region of Virginia. It explicitly outlines where and what new shoreline best management practices should be considered where coastal modifications are necessary to reduce shoreline erosion and protect our fragile coastal ecosystems. This guidance will include a full spectrum of appropriate management options which can be used by local governments for site-specific application and consideration of cumulative shoreline impacts. The guidance applies a decision-tree method using a based resource mapping database that will be updated from time to time, and a digital geographic information system model created by VIMS.

Note: King and Queen County is not listed on the Comprehensive Coastal Resource Management Portal.

See Appendix J for guidance on the rationale behind the policy titled, “Planning Information and Guidance for Living Shoreline Preference” provided by Virginia Institute of Marine Science (VIMS).

Physical Restraints to Development

- ***Soils*** can be highly erodible or have permeability issues
- ***Wetlands*** are largely made up of protected areas
- ***Chesapeake Bay Protection Areas*** are protected by the Chesapeake Bay Preservation Act
- ***Shoreline Erosion*** is prevented by County development guidelines
- ***Potential Groundwater Contamination*** is prevented by regulations
- ***Dragon Run Conservation District*** protects and conserves resource areas

The development of properties within a Conservation Easements is usually prohibited. Other factors that could create obstacles for development include the presence wetlands or RPAs, soil types, or steep slopes. King and Queen evaluates potential site development and weighs these factors during their site plan review process prior to construction approval. Map 24 depicting these areas is included further below in this Chapter as well as in Appendix F of this document.

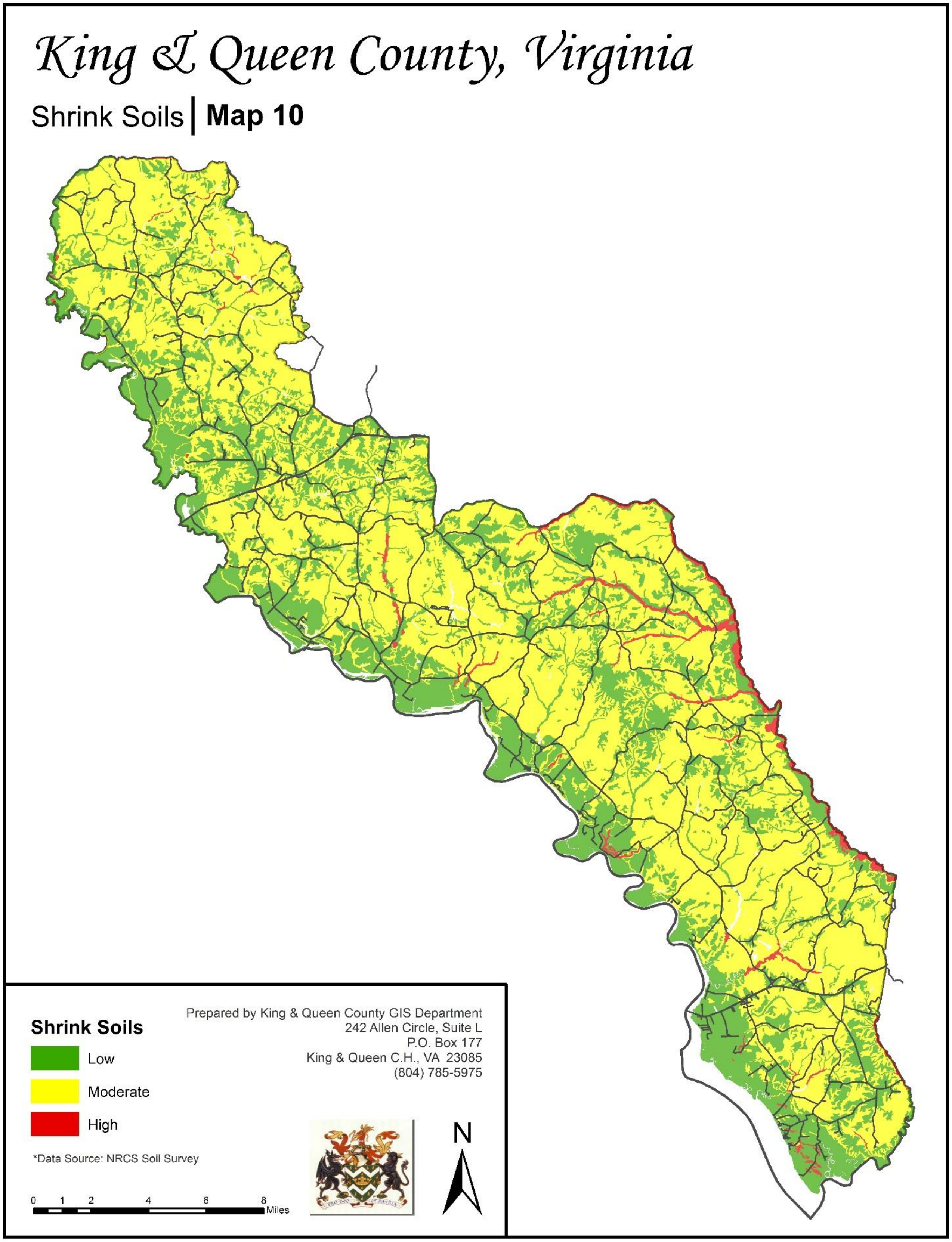
Soils

Soils in the County are predominantly sandy and loamy in the bottomlands and a mix of alluvial deposits and finer clays in the higher elevations. The soils are made up of many ancient, nearly level, marine and alluvial terraces. More detailed soil survey information obtained from the Natural Resources Conservation Services is included in Appendix K.

State agencies have guidelines for determining the qualities of soil that are suitable for septic tanks. They use a quality called permeability which is the measurement of the percolation qualities of the soil. Soils with permeability of less than 0.5 inches per hour are regarded as too slow for septic tanks while soils with ratings of 2.0 or more are regarded as too fast.

Areas of the County where soil types have permeability below 0.5 are mostly located in low areas along streams and overlap with many of the other conditions that are unfavorable to development. Most other land is in the range of 2.0 or less. Although one may expect that most land is of a classification suitable for septic tank fields, every site must be examined for specific soil values prior to planning for the use of on-site sewage disposal.

Soils that are characterized as highly erodible have a potential for erosion and sedimentation problems. Since erosion adversely affects water quality highly, erodible soils are identified and mapped in order to comply with the requirements of the Chesapeake Bay Preservation Act. These soils cover a large portion of King and Queen County, and development on erodible soils increase storm runoff.


King & Queen County, Virginia
Shrink Soils | Map 10
Shrink Soils
Low
Moderate
High
*Data Source: NRCS Soil Survey
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
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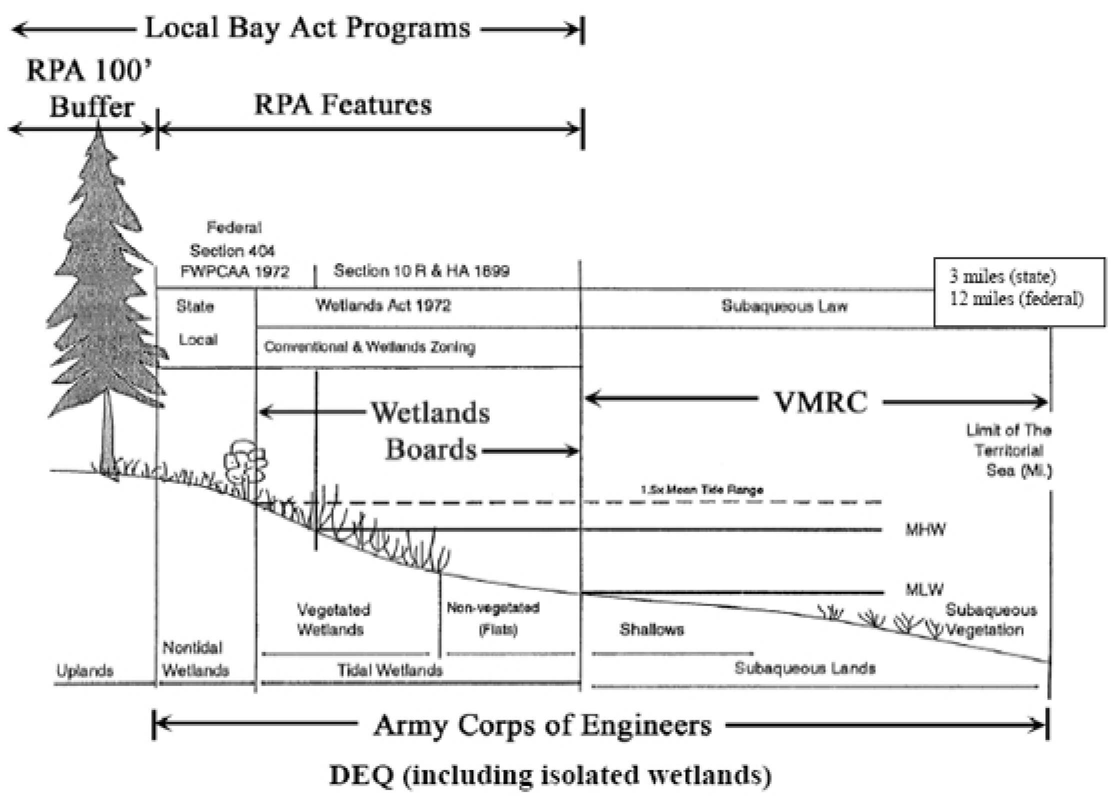
0 1 2 4 6 8
Miles

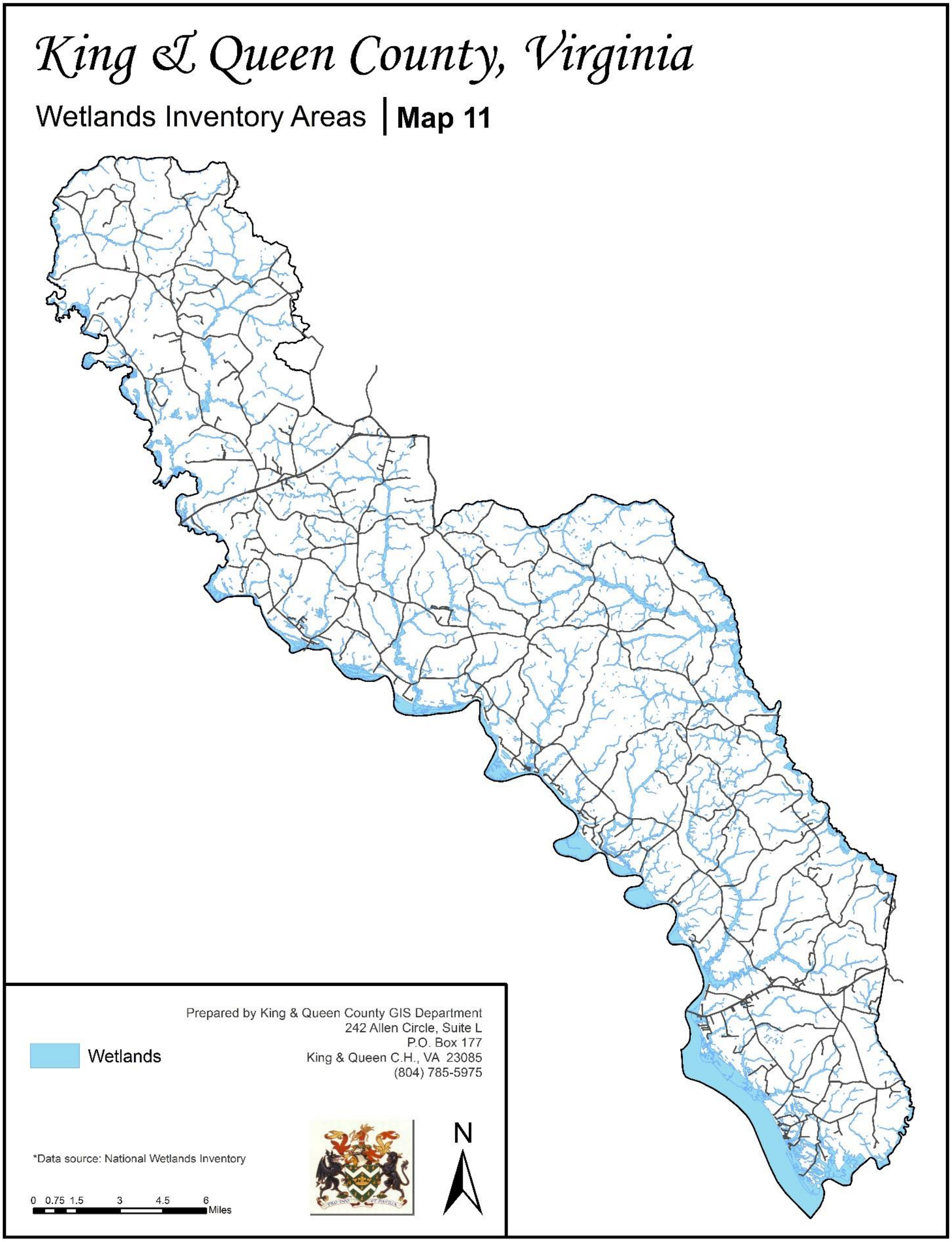
Wetlands

The Virginia Department of Environmental Quality describes a great diversity of wetlands found across Virginia including swamps, tidal marshes, wet meadows, bogs, pocosins, sinkhole wetlands and more. Tidal wetlands serve as spawning and nursery grounds for a variety of marine life. In addition to their habitat value, these areas also assist in flood control, improve water quality, reduce erosion, and serve as an important food source for marine and inland wildlife. Activities altering, using, filling or impacting tidal wetlands, such as riprap, bulkheads, boat ramps, and road crossing may require review by and approval by the King and Queen County Wetlands Board, US Army Corps of Engineers, and the Virginia Resource Commission and other potential agencies.

JURISDICTIONAL BOUNDARIES



King and Queen County has a five member Wetlands Board, appointed by the Board of Supervisors. This Board is responsible for the review of requests for permits for the alteration, development or use of wetlands. The Board enforces regulations, investigates unauthorized activities affecting wetlands, and rectifies violations.


King & Queen County, Virginia
Wetlands Inventory Areas | Map 11
Wetlands
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data source: National Wetlands Inventory
0 0.75 1.5 3 4.5 6
Miles
N

Chesapeake Bay Protection Areas

The Chesapeake Bay Preservation Act requires local governments within its watershed to prepare Preservation Plans and adopt zoning regulations establishing Resource Protection Areas. The Resource Protection Areas, or RPAs, include streams, adjoining wetlands, related environmentally sensitive areas and 100-foot buffer areas inland from these sensitive areas. King and Queen has a Zoning Ordinance pertaining to Resource Management Areas (RMAs) and RPAs – the ordinance provides guidelines, or performance criteria, for the use of property within these preservation areas:

- No more land shall be disturbed than is necessary to provide for the desired use or development and indigenous vegetation shall be preserved to the maximum extent possible consistent with the use and development allowed. This criterion is aimed at reducing soil erosion by preserving indigenous vegetation, which acts to filter runoff and allows storm water to return to the ground before entering public waters. The goal is to have no more pollution after development than was present before development.

- New development shall follow Best Management Practices (BMPs): defined as practices, or combinations of practices, that are determined by a state or designated area wide planning agency to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

- The County's Zoning Ordinance requires that all development within the RMA exceeding 2,500 square feet of land disturbance shall be accomplished through a plan of development review process.

- Land development shall minimize impervious cover consistent with the use or development allowed. This criteria ensures that through careful site design the development of property is accomplished to limit the amount of impervious cover such as roof areas, driveways, and patios, only to that are essential to support development.

- Any land disturbing activity within a preservation zone that exceeds an area of 2,500 square feet (including septic tank field areas) shall comply with the requirements of the County's erosion and sediment control ordinance. This criteria is for the purpose of preventing, or slowing soil erosion from any land disturbing activity, that is to say any land change which may result in soil erosion, from water or wind and the movement of sediments into state waters.

- On-site sewage treatment systems within a preservation zone that do not require a Virginia Pollution Discharge Elimination permit shall have pump-out accomplished for all such systems at least once every five years, and for new construction a reserve sewage disposal site shall be provided with a capacity at least equal to that of the primary sewage disposal site.

The Chesapeake Bay Preservation Area Overlay District shall apply to all lands identified as Chesapeake Bay Preservation Areas (CBPAs) as designated by the Board of Supervisors of King and Queen County, Virginia, and as shown on the Chesapeake Bay Preservation Area Map for King and Queen County, Virginia. The Chesapeake Bay Preservation Area Map for King and Queen County, Virginia, together with all explanatory matter thereon, is hereby adopted by reference and declared to be a part of this article and the zoning district map for King and Queen County. The CBPAs are hereby divided into the resource protection area (RPA) and the resource management area (RMA).

(1) *The resource protection area includes:*

(a) Tidal wetlands;

(b) Nontidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow;

(c) Tidal shores; and

(d) A 100-foot vegetated buffer area located adjacent to and landward of the components listed in subsections (a) through (c) above, and along both sides of water bodies with perennial flow.

(2) The resource management area is composed of concentrations of the following land categories:

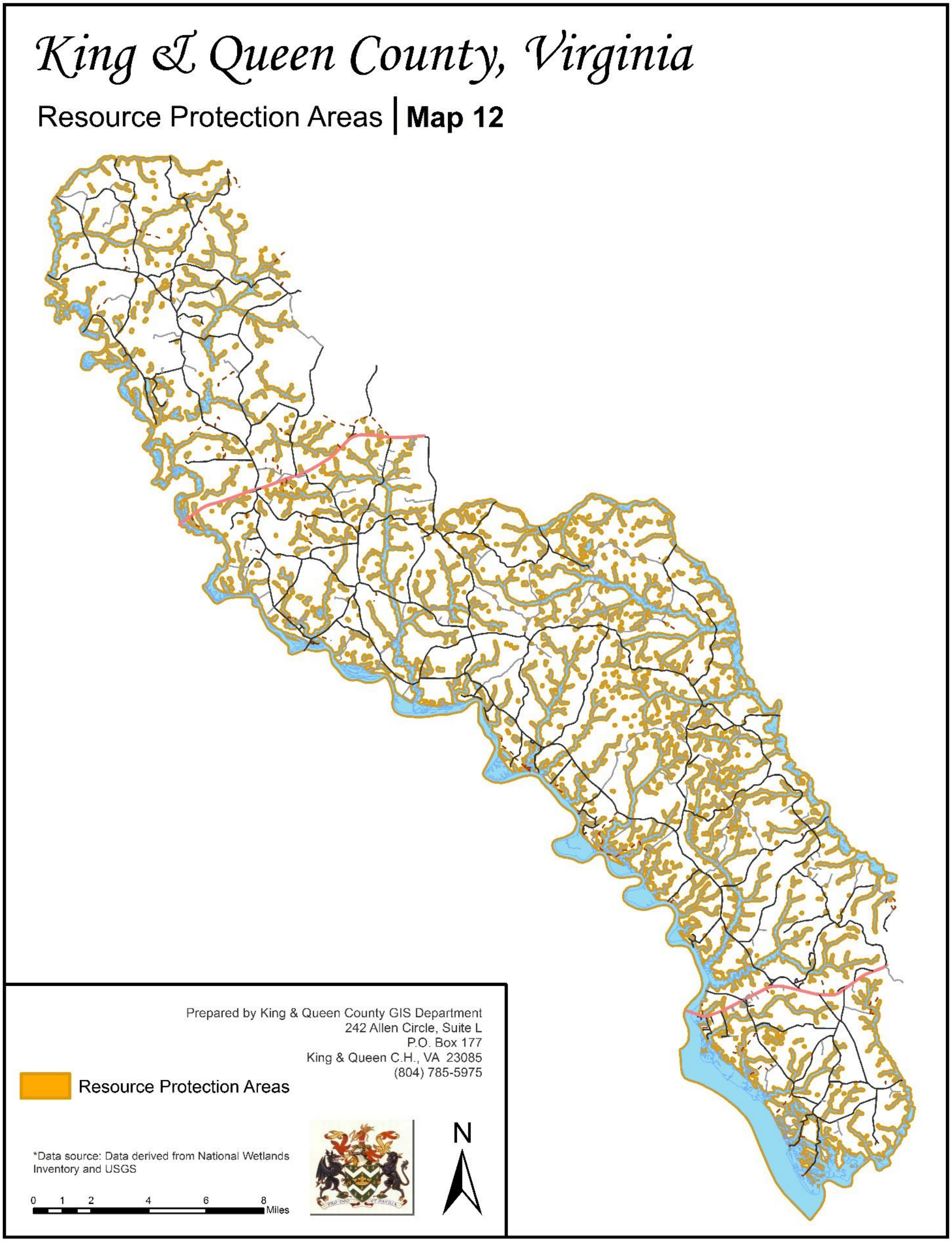
(a) Floodplains;

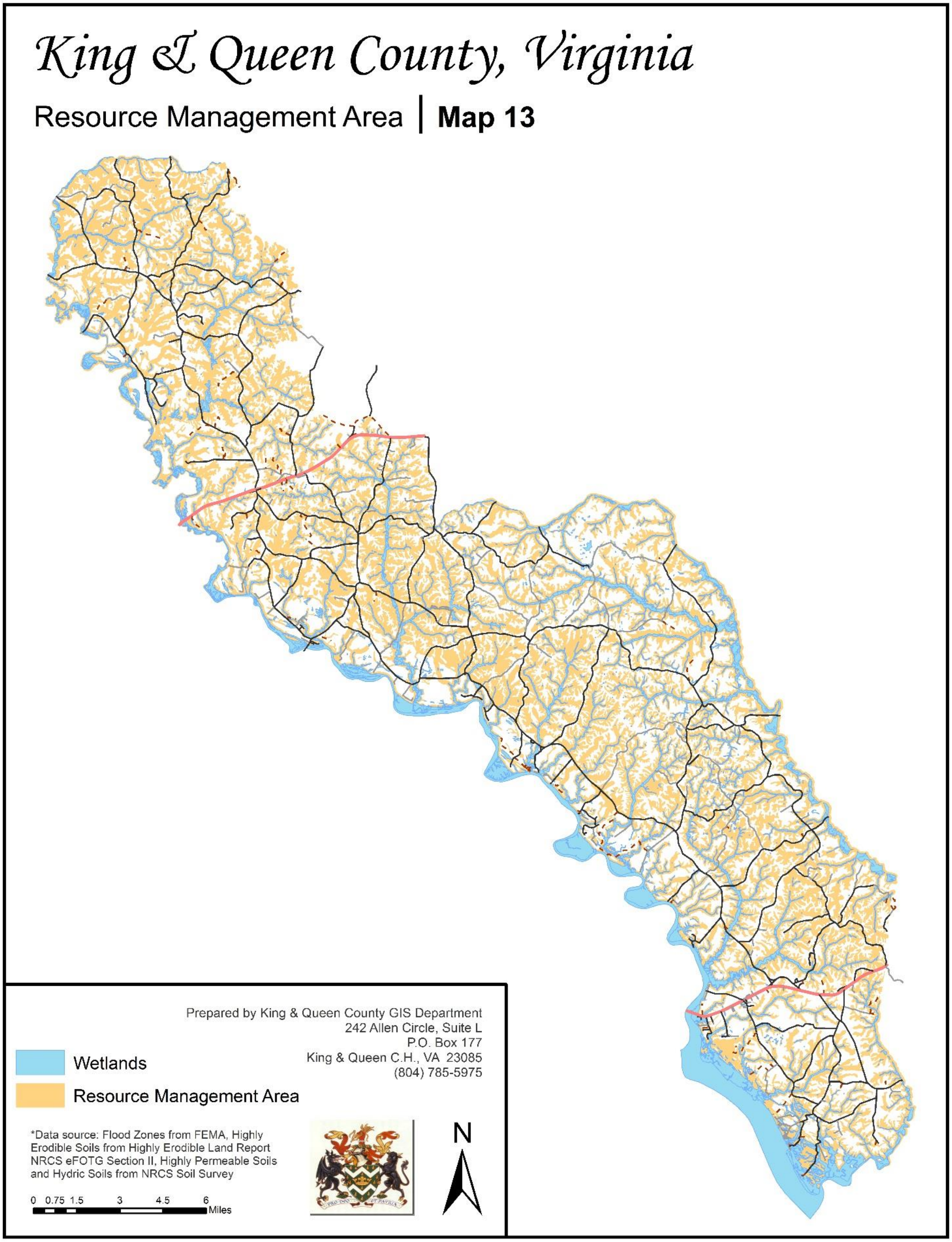
(b) Other sensitive lands with highly permeable, highly erodible and/or hydric soils; and

(c) Slopes greater than 15 percent.

(3) The resource management area shall consist of land areas outside the RPA shown to be of highly permeable, highly erodible soils; provided, however, that the RMA shall consist of not less than a landward distance of 250 feet perpendicular and contiguous to the RPA.

(4) The Chesapeake Bay Preservation Area Map and the Sensitive Land Maps for King and Queen County, Virginia, show the general locations of CBPAs and should be consulted by persons contemplating activities within King and Queen County prior to engaging in a regulated activity.


King & Queen County, Virginia
Resource Protection Areas | Map 12
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
Resource Protection Areas
*Data source: Data derived from National Wetlands Inventory and USGS
0 1 2 4 6 8
Miles
N


King & Queen County, Virginia
Resource Management Area | Map 13
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
Wetlands
Resource Management Area
*Data source: Flood Zones from FEMA, Highly Erodible Soils from Highly Erodible Land Report NRCS eFOTG Section II, Highly Permeable Soils and Hydric Soils from NRCS Soil Survey
0 0.75 1.5 3 4.5 6
Miles
N

Water Quality Protection Plan

This plan broadly defines the policies of King and Queen County regarding protection of state waters in accordance with 9VAC25-839-170. The issues specifically to be addressed are:

1. Physical constraints to development in King and Queen county;
2. Protection of the county's potable water supply and aquatic resources;
3. Shoreline protection and waterfront access; and
4. Potential conflicts between land use plans and water quality protection plan.

Through the following policies, the government of King and Queen County intends to promote and enforce the laws and regulations promulgated by the Commonwealth of Virginia and the Federal government. In particular, land use and development in Chesapeake Bay Preservation Areas must be consistent with the requirements of the Chesapeake Bay Preservation Act and Regulations and King and Queen County's Chesapeake Bay Preservation Area Overlay District.

1. Physical constraints to development in King and Queen County.

The primary physical constraints to development in King and Queen County are proximity to perennial waterbodies, floodplains, slopes greater than 15%, and highly permeable soils. As such, the requirements of the Resource Management Area overlay apply to almost all development outside of the Resource Protection Area.

The county lacks public sewer systems, meaning all new developments depend on private septic systems. Currently, soil suitability for septic systems doesn't represent a significant constraint on development. By enforcing the county zoning ordinances' limit of a single dwelling per parcel, and limits on the subdivision of existing parcels, a low density of development is maintained in the county and the number of new septic systems created is reduced. To date, no proposed development in the county has been unable to find a suitable site for either a conventional septic system or an alternative system approved by the Department of Health and either a licensed engineer or soil scientist.

Shrink-swell soils are not common in King and Queen County, therefor only sites known to include shrink-swell soils are required to submit engineered plans showing that they can support the proposed structure.

2. Protection of the county's potable water supply.

All potable water in the county is sourced from individual, rather than public wells. In order to protect wells from potential pollution sources such as septic systems, damaged fuel tanks, and runoff from farms and intensive livestock facilities, the county's policy is to work with the Department of Health to site wells and septic systems in new developments safely in accordance with Department of Health regulations, and to require larger lot sizes when recording new plats if the health official determines there are factors present which may cause health problems, in accordance with section 4-24 of the county zoning ordinance. The county also communicates with the Three Rivers Soil and Water Conservation district to ensure that agricultural nutrient management plans are observed to prevent excessive sediment and nutrient runoff to neighboring properties.

Protection of water quality as it relates to commercial and recreational fisheries and other aquatic resources is also of great importance to the county. Toward this end, enforcement of the Chesapeake Bay Act, Erosion and Sediment Control regulations, and Stormwater regulations is intended to protect fisheries and aquatic resources from excessive sedimentation and nutrients, as well as other sources of non-point source pollution. The county currently is without public waste water treatment facilities or other industries that contribute significantly to point source pollution.

3. Shoreline preservation and waterfront access

Shoreline preservation, especially in cases of erosion threatening the property of county residents, is a perennial issue for the county. County staff work together with the King and Queen Wetlands Board to ensure that riparian buffers and personal property along the shores of the county are protected in accordance with the Chesapeake

Bay act and the Tidal Wetlands act. The policy of the Wetlands board is to favor shoreline erosion control solutions involving the least hardening and impact to tidal wetlands.

Most waterfront access in the county belongs to individual private property owners, whose impacts are reduced by preserving vegetation and limiting clearing for paths to the least necessary to access the water, in accordance with the Chesapeake Bay Act. Docks and piers are limited to one per parcel as required by the Virginia Marine Resource Commission, but siting is otherwise left to the owner of the property from which they are built. The public pier and public boat launches were also developed within the requirements of the Chesapeake Bay act, and include signage informing visitors of what is required for their use, but the precise impacts of these sites on local water quality is currently unknown.

4. Potential conflicts between land use plan and water protection plan

Conflict between land use plans and water protection plans may arise in areas under intensive use, or which have the potential for dense development in the future. Of main concern are possible future increases of nutrients and sediment in runoff. These issues are addressed by enforcement of county zoning laws, as authorized by the Chesapeake Bay act, Erosion and Sediment Control regulations, and Stormwater act, as well as by the regulations enforced by the Health Department, and the requirements of Nutrient Management plans promulgated by Three Rivers Soil and Water Conservation district.

It is the County's policy that in instances of redevelopment that such redevelopment improves the quality of the property being redeveloped. Typical measures may include, but are not limited to:

- Limiting impervious surfaces to the least necessary for the proposed redevelopment
- Protection of existing vegetation
- Re-establishment of riparian buffers in areas where they have been removed or diminished
- Reducing any RPA encroachment that existed prior to redevelopment

Shoreline Erosion

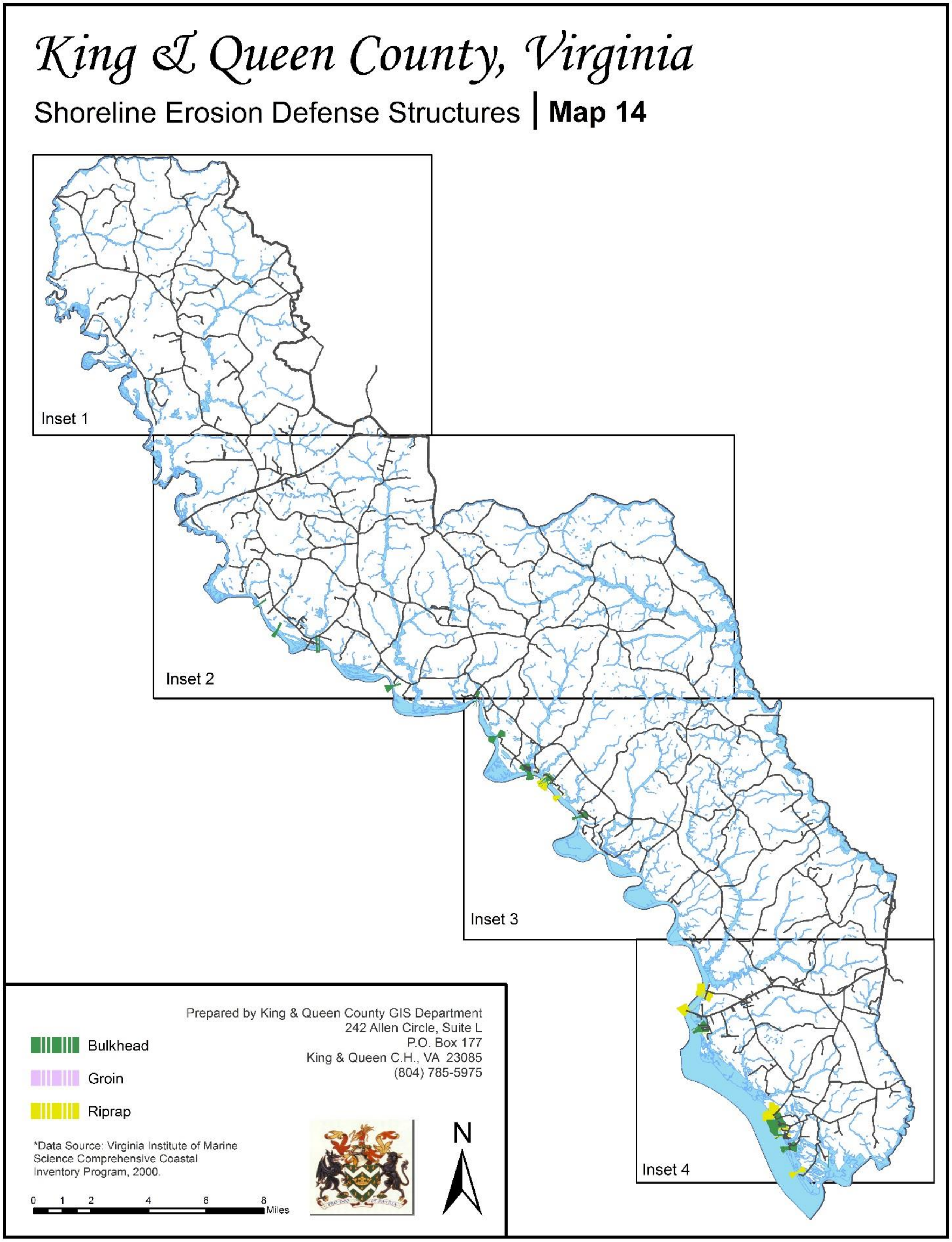
Shoreline erosion is a natural occurrence along the coasts of Virginia as well as near other water features such as streams, rivers and lakes. Many causes of shoreline erosion occur naturally through tides, weather and storms. Other causes that can be linked to development are weighed carefully by the County in order to deterred further erosion. The County has established guidelines for those projects which may further disrupt the shoreline and cause erosion.

Proposed Shoreline Erosion Control Projects must:

- Avoid impacting wetlands
- Preserve existing vegetation to the maximum extent possible
- Minimize land disturbance
- Provide mitigation plantings if vegetation is to be removed
- Have an access path that will provide the minimum disturbance as necessary
- Meet the erosion and sediment control ordinance requirements

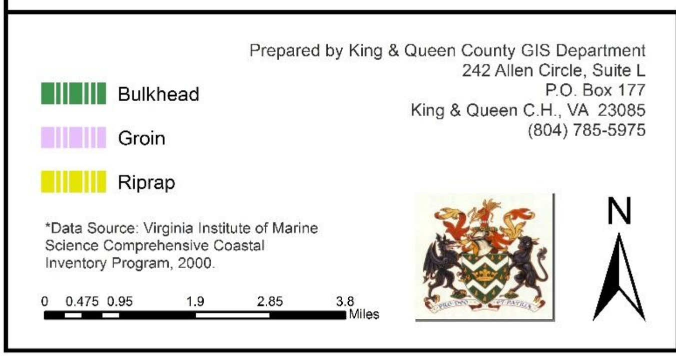
Project Field Requirements:

- Limits of RPA 100' buffers must be clearly marked
- Trees to be removed must be clearly flagged or marked on site
- Limits of land clearing / grading must be clearly flagged or marked on site
- The seaward toe and landward top of proposed structure must be clearly staked in the field with staking that will stay in place


King & Queen County, Virginia
Shoreline Erosion Defense Structures | Map 14
Inset 1
Inset 2
Inset 3
Inset 4
Bulkhead
Groin
Riprap
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.
0 1 2 4 6 8 Miles
N

King & Queen County, Virginia

Shoreline Erosion Defense Structures | **Map 14a**



King & Queen County, Virginia

Shoreline Erosion Defense Structures | **Map 14b**

Bulkhead

Groin

Riprap

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.5 1 2 3 4 Miles

Prepared by King & Queen County GIS Department
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King & Queen C.H., VA 23085
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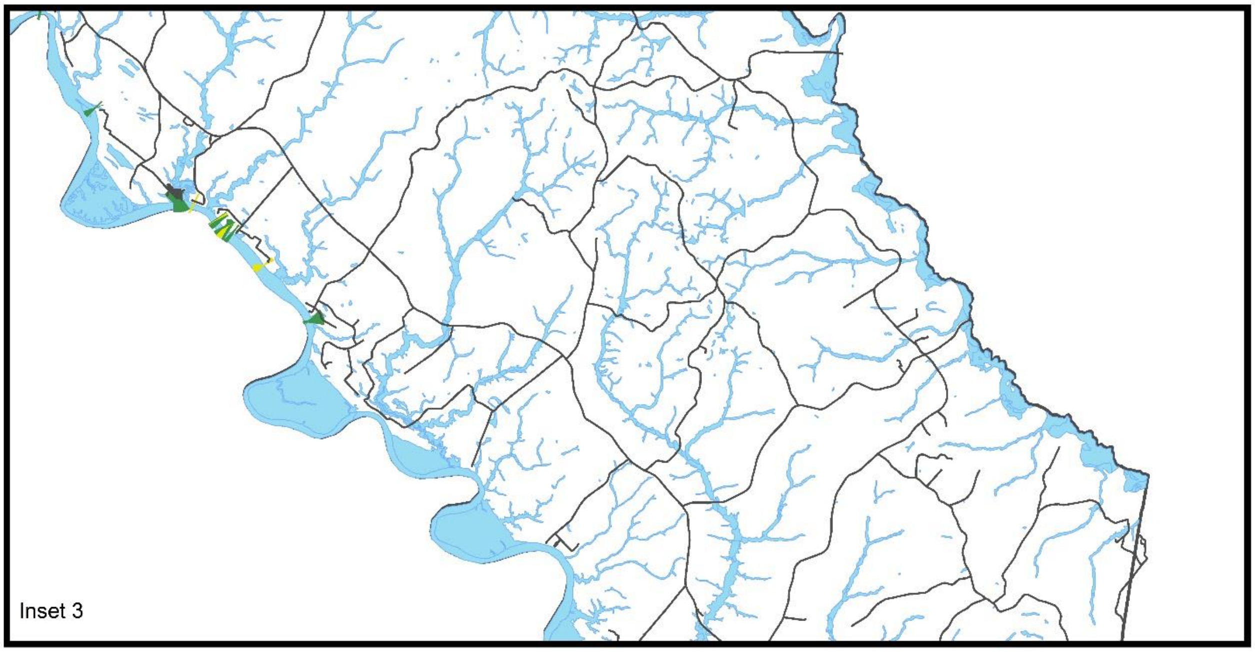
N

King & Queen County, Virginia

Shoreline Erosion Defense Structures | Map 14c



Bulkhead
Groin
Riprap

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.5 1 2 3 4 Miles

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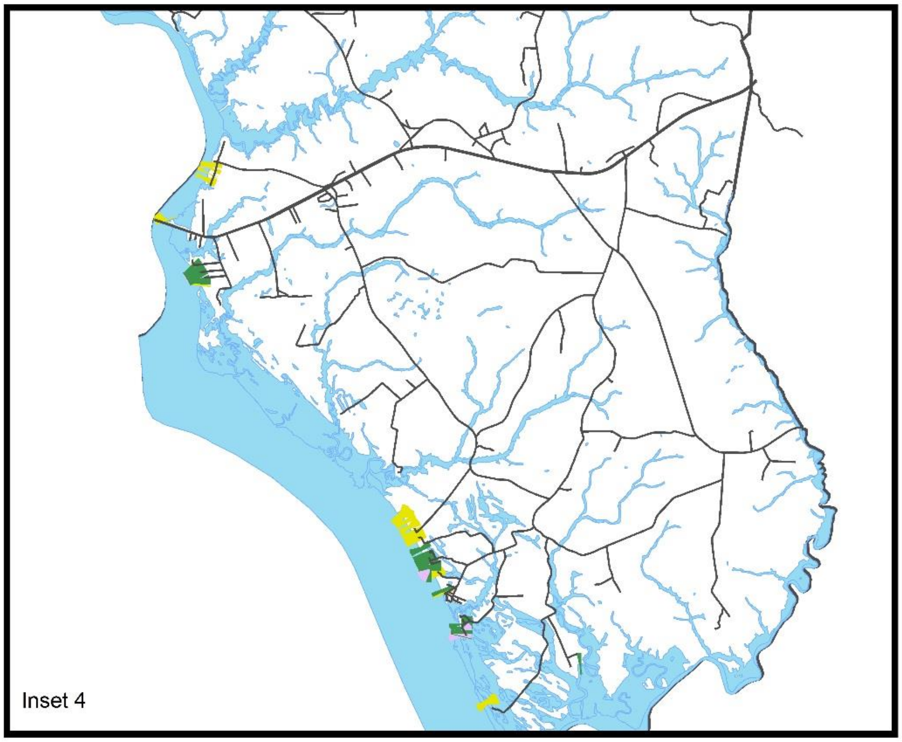
King & Queen C.H., VA 23085
(804) 785-5975

N

King & Queen County, Virginia

Shoreline Erosion Defense Structures | Map 14d



Bulkhead
Groin
Riprap

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.45 0.9 1.8 2.7 3.6 Miles

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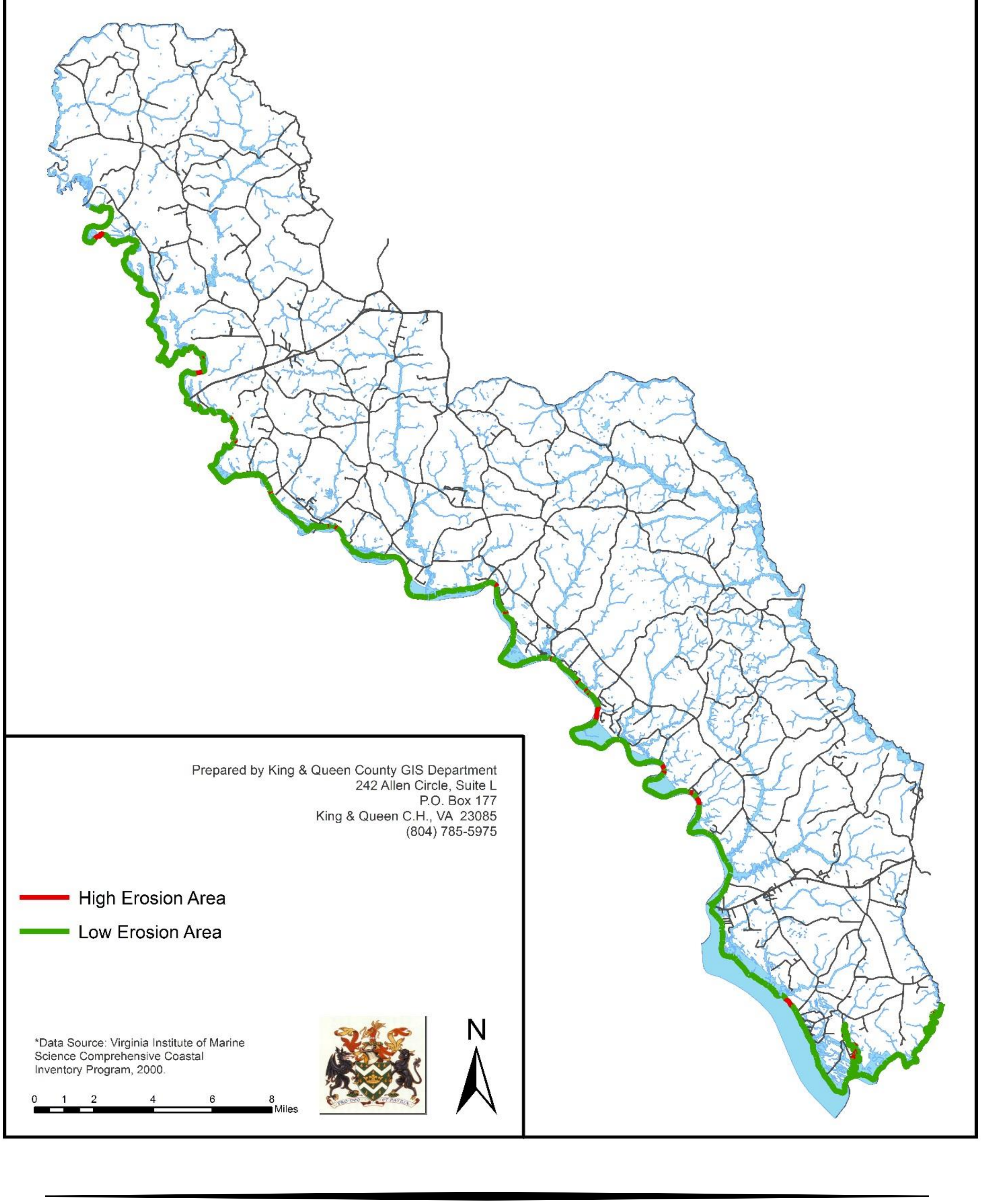
N

King & Queen County, Virginia

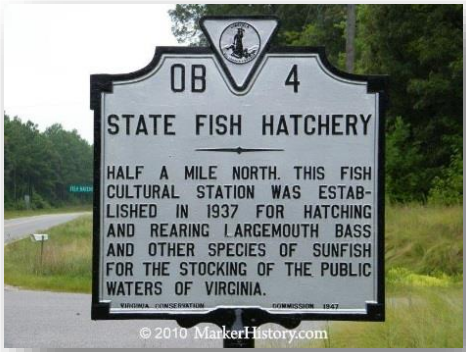
Shoreline Erosion Impact Areas | Map 15



Aquatic Resources

Fisheries

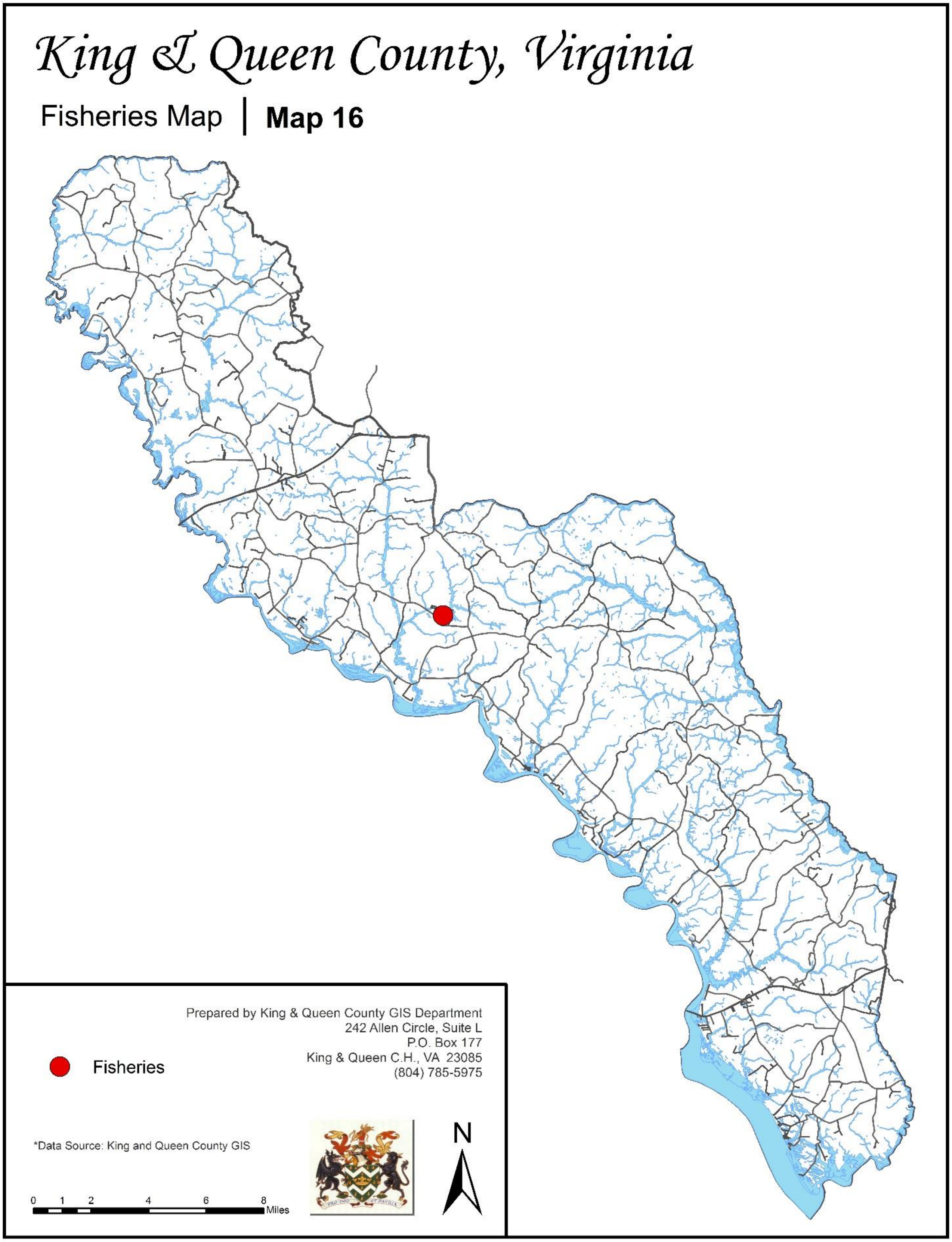
King and Queen County is home to one of nine fish cultural stations in the state. The King and Queen Hatchery hatches and rears walleye, saugeye, fathead minnows, channel catfish, largemouth bass, crappie, redear, and bluegill. The hatchery has participated in restoration of many fish populations, and collaborates with academic institutions to promote natural resource management. The Hatchery is a point of interest in the County, and offers scheduled group tours in the late spring and early summer months.



Private, Fee Based Water Access

There are three privately owned water access areas, but each are available to the public for a fee or donation. These sites include:

Name	Location
Walkerton Landing	County Route 629
Rainbow Acres Campground	County Route 631
Tucker's Recreation Park & Marina	County Route 666


King & Queen County, Virginia
Fisheries Map | Map 16
Fisheries
Prepared by King & Queen County GIS Department
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P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: King and Queen County GIS
0 1 2 4 6 8 Miles
N

Public Boating Access

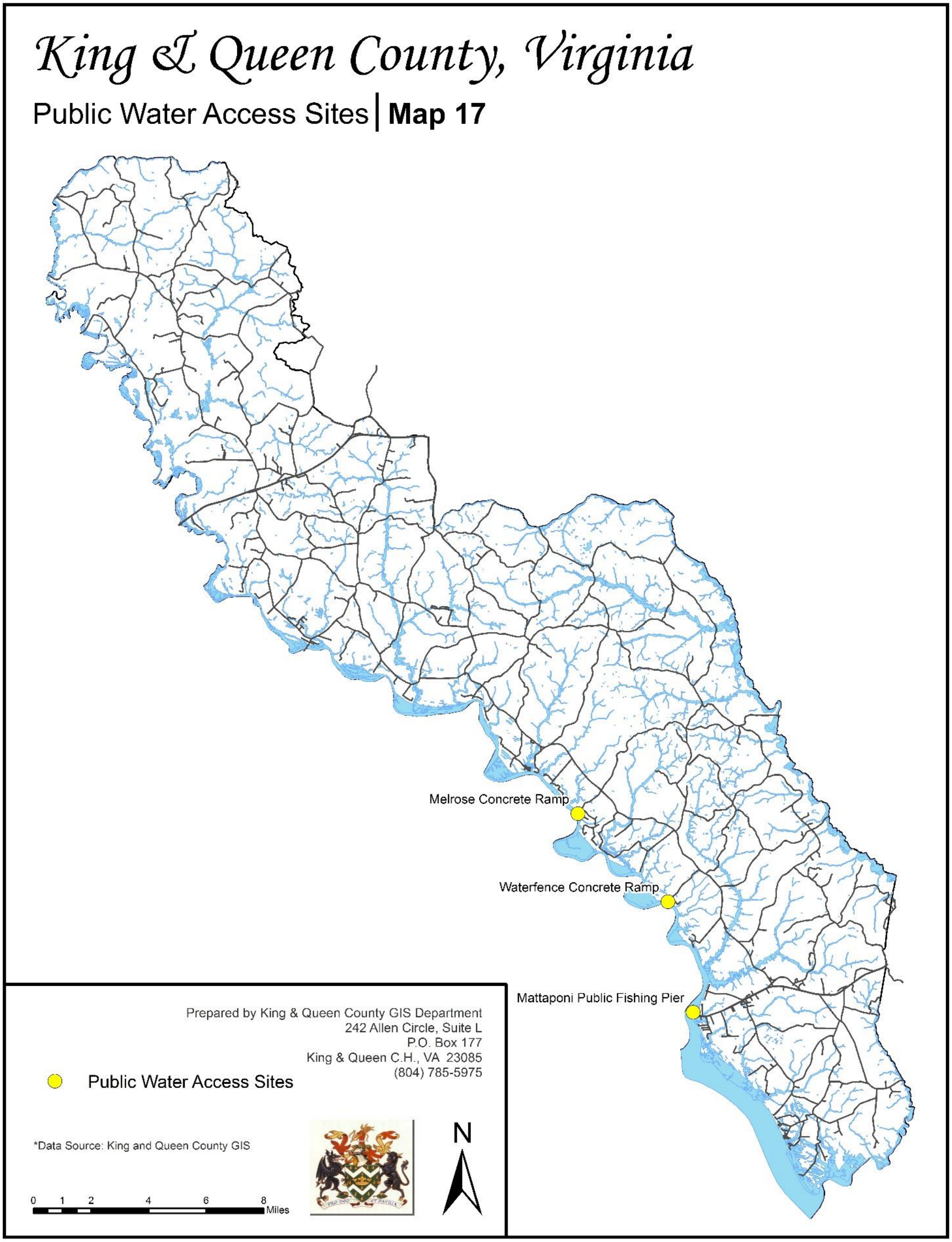
King and Queen has two locations that provide public boating access to the public. These are both located on the Mattaponi River. These access areas are owned and maintained by the Virginia Department of Game and Inland Fisheries.

Waterbody	Access Area	Type
Mattaponi River	Melrose	Concrete Ramp
Mattaponi River	Waterfence	Concrete Ramp

An additional Boat Ramp, owned by a private landowner, is available for public use at the discretion of the landowner. This ramp is located at the Walkerton Bridge on the Mattaponi River.

Public Access Piers

King and Queen has one public access pier, the Mattaponi Public Fishing Pier. It is located at 7486 Lewis B Puller Memorial Highway.


King & Queen County, Virginia
Public Water Access Sites | Map 17
Melrose Concrete Ramp
Waterfence Concrete Ramp
Mattaponi Public Fishing Pier
Prepared by King & Queen County GIS Department
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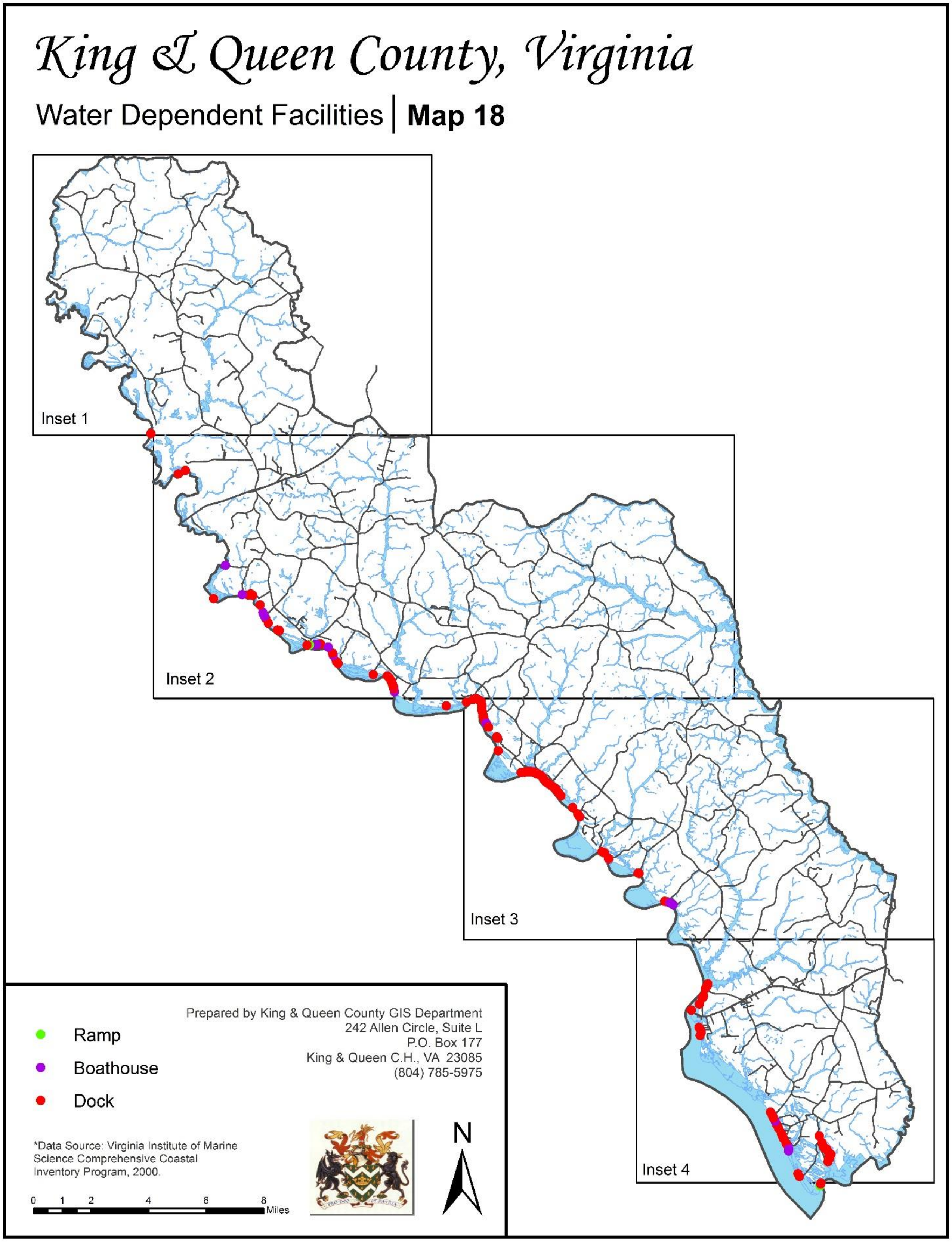
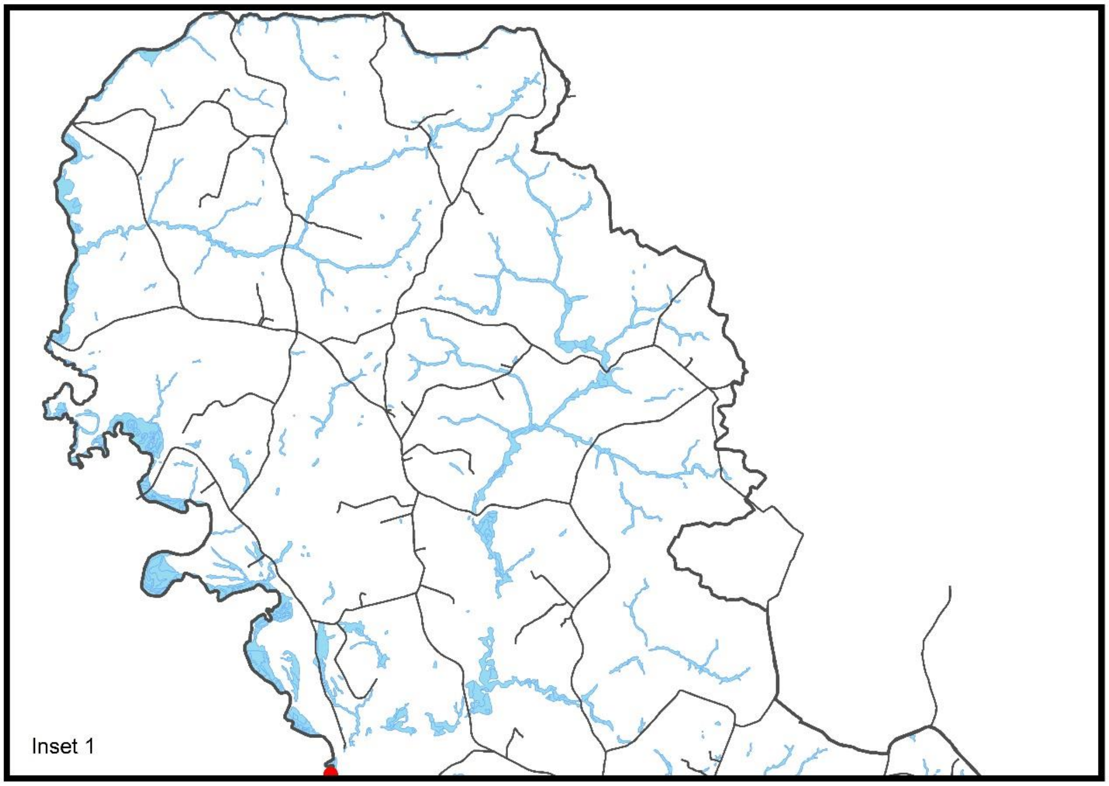
Public Water Access Sites
*Data Source: King and Queen County GIS
0 1 2 4 6 8 Miles
N


King & Queen County, Virginia
Water Dependent Facilities | Map 18
Inset 1
Inset 2
Inset 3
Inset 4
Ramp
Boathouse
Dock
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.
0 1 2 4 6 8 Miles
N

King & Queen County, Virginia

Water Dependent Facilities | Map 18a



- Ramp
- Boathouse
- Dock

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P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

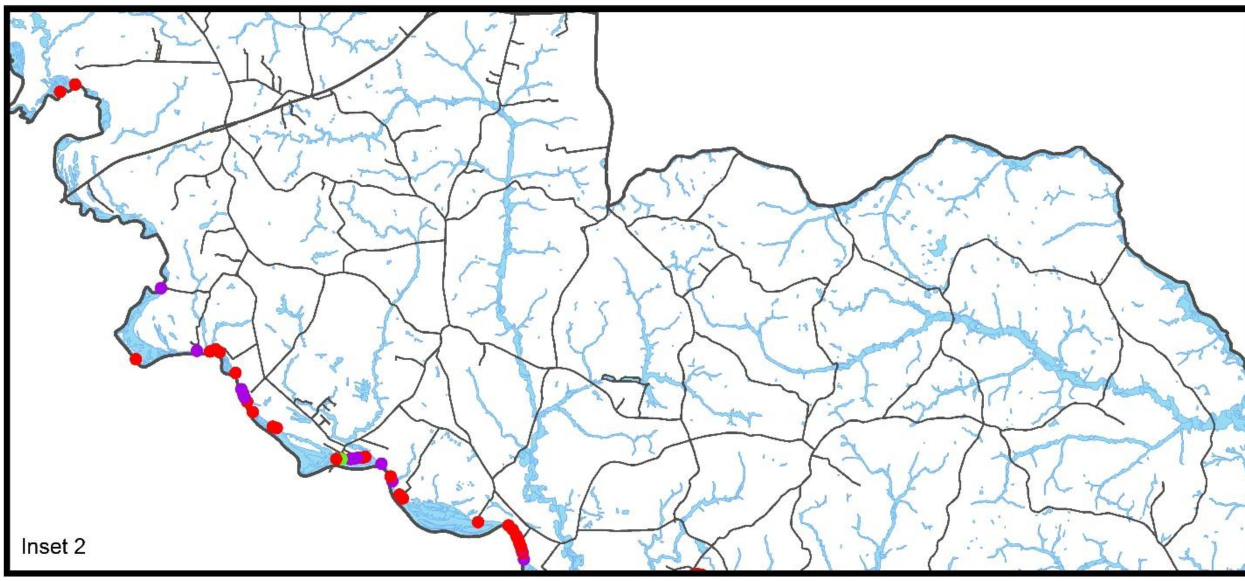
*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.475 0.95 1.9 2.85 3.8 Miles

N

King & Queen County, Virginia

Water Dependent Facilities | **Map 18b**



- Ramp
- Boathouse
- Dock

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King & Queen C.H., VA 23085
(804) 785-5975

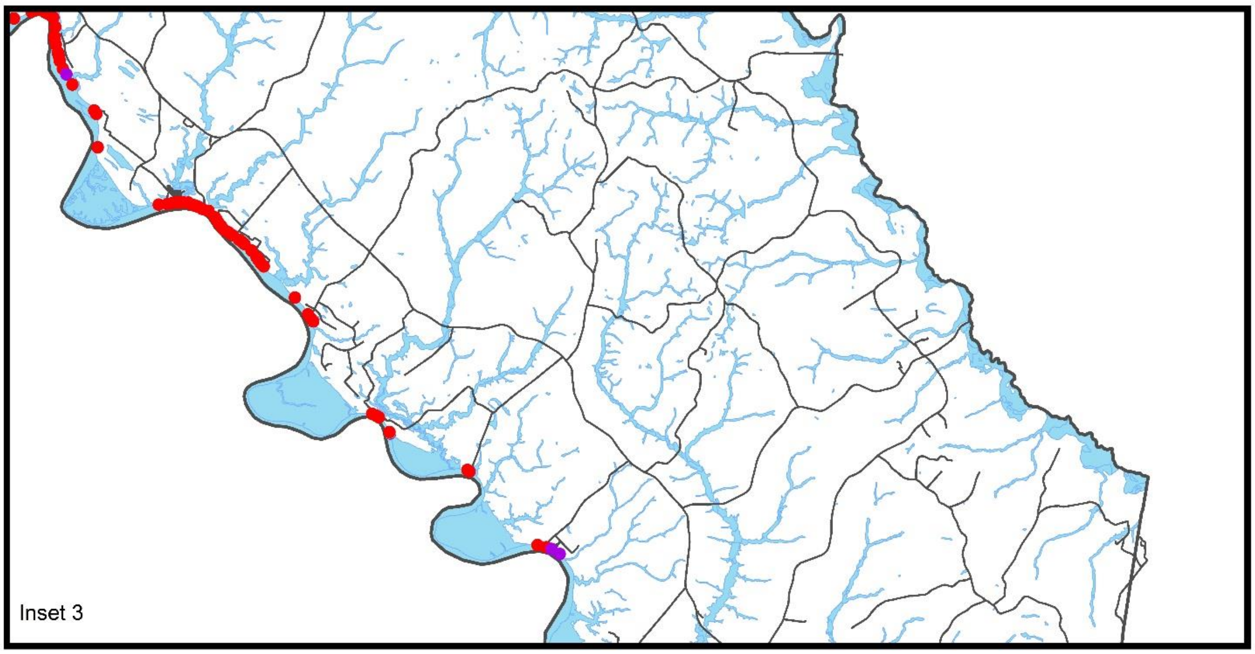
*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

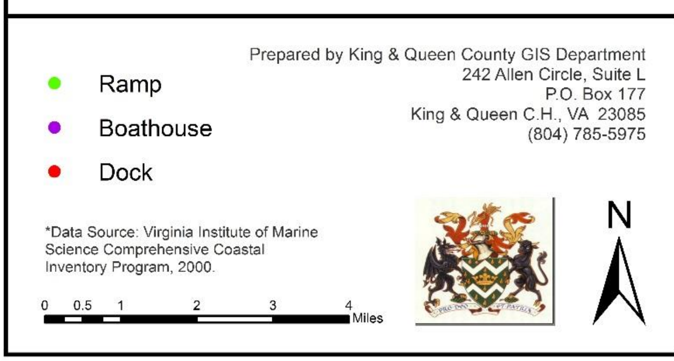
0 0.5 1 2 3 4 Miles

N

King & Queen County, Virginia

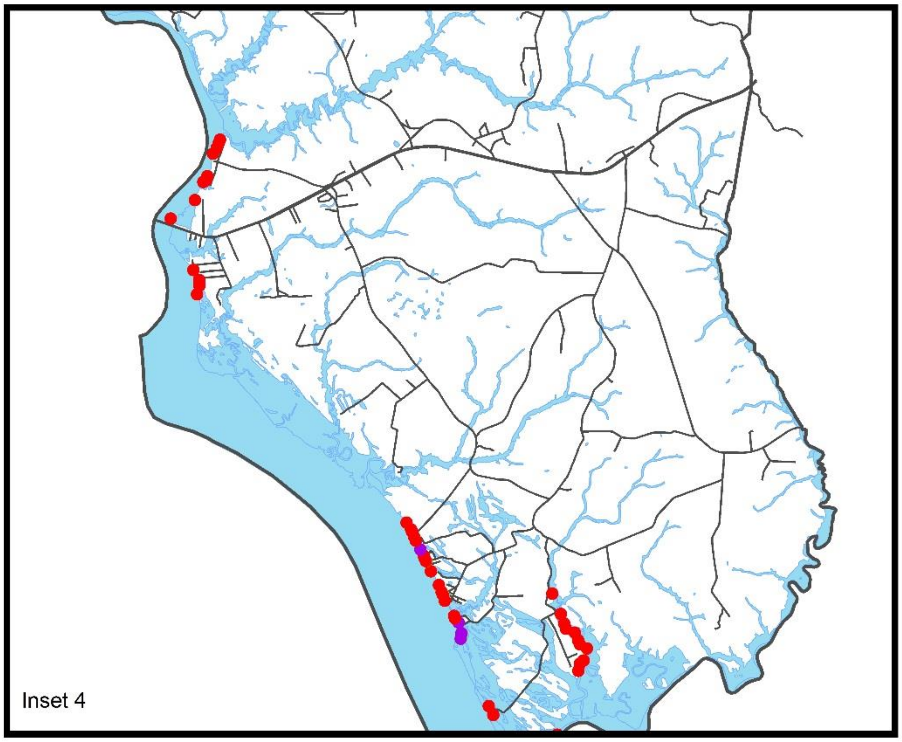
Water Dependent Facilities | **Map 18c**





King & Queen County, Virginia

Water Dependent Facilities | **Map 18d**



Ramp

Boathouse

Dock

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P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.45 0.9 1.8 2.7 3.6 Miles

N

Potential Groundwater Contamination Sources

Underground Storage Tanks

Underground Storage Tanks are contamination risks as leaks are often not detected until the adjacent soils are already contaminated. Because of this risk, Underground Storage Tanks are under the overall supervision of Virginia Department of Environmental Quality under Article 9 of State Water Control Law.

Wells

Though not strictly a groundwater contamination source, King and Queen was put into the Groundwater Management area by DEQ in 2014. Most wells in the County are private wells, which are the predominant water source in King and Queen County. However, there are also some commercial water systems within the County.

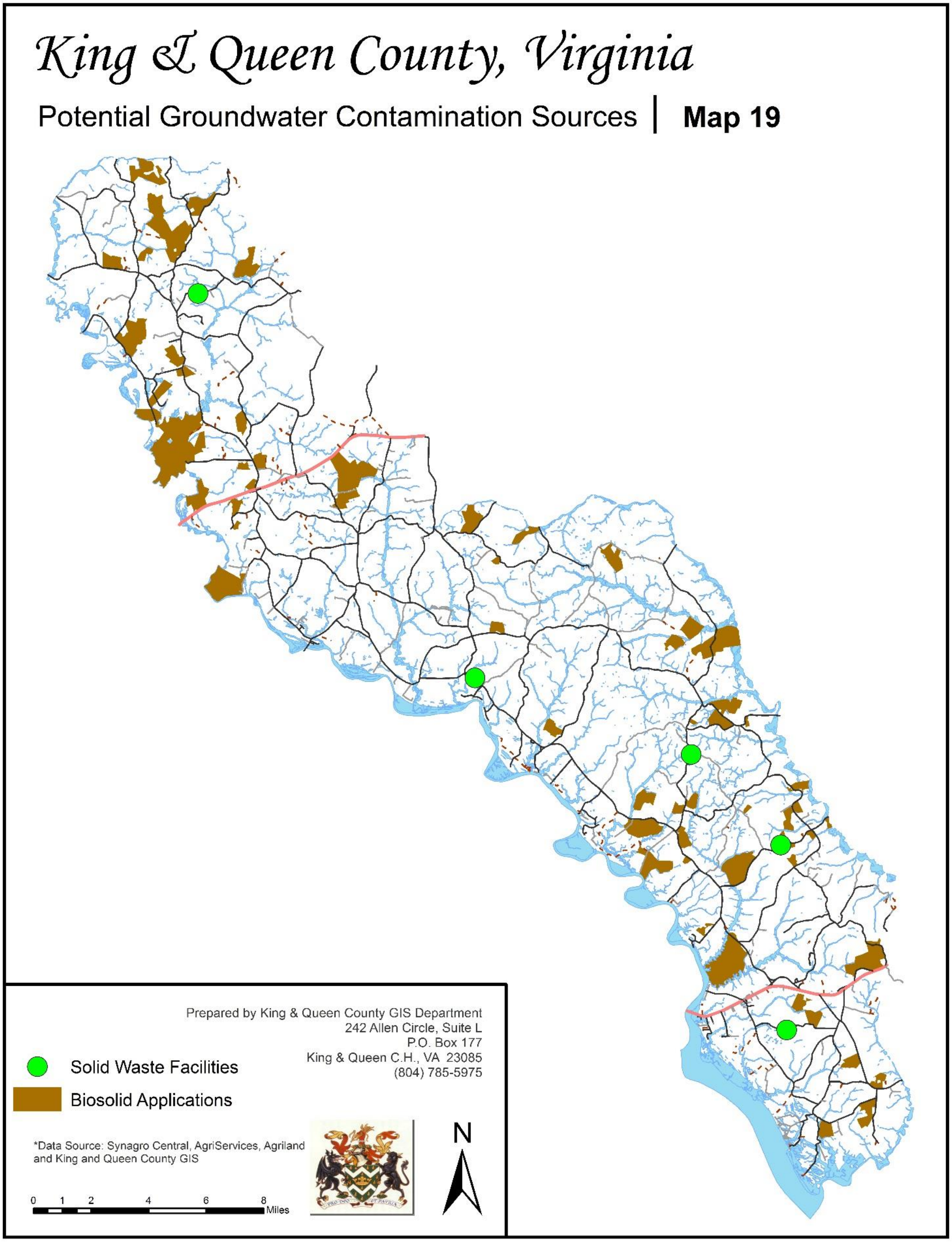
Above Ground Storage Tanks

According to the Virginia Department of Environmental Quality, the Virginia Facility and Aboveground Storage Tank (AST) Regulations (9VAC25-91) apply to tanks having a capacity greater than 660 gallons and storing oil. This regulation is to avoid leaks and spill that may contaminate groundwater and require landowners to comply with safety regulations in order to prevent pollution. All ASTs greater than 660 gallons must be registered with DEQ and be permitted. Inhibit

Septic Systems

Another threat to the underground water system comes from failed septic tanks. Two generalizations may be stated concerning on-site sewage disposal. First, practically all septic tanks have the capacity to fail eventually and this happens often without the users' knowledge until the system stops working completely. But long before the system fails to function, it is causing damage to the underground water system by passing untreated materials into the soils. Second, if steps can be taken to extend the usable life of a septic tank system, then the failure rate declines and the potential water quality damage is reduced accordingly.

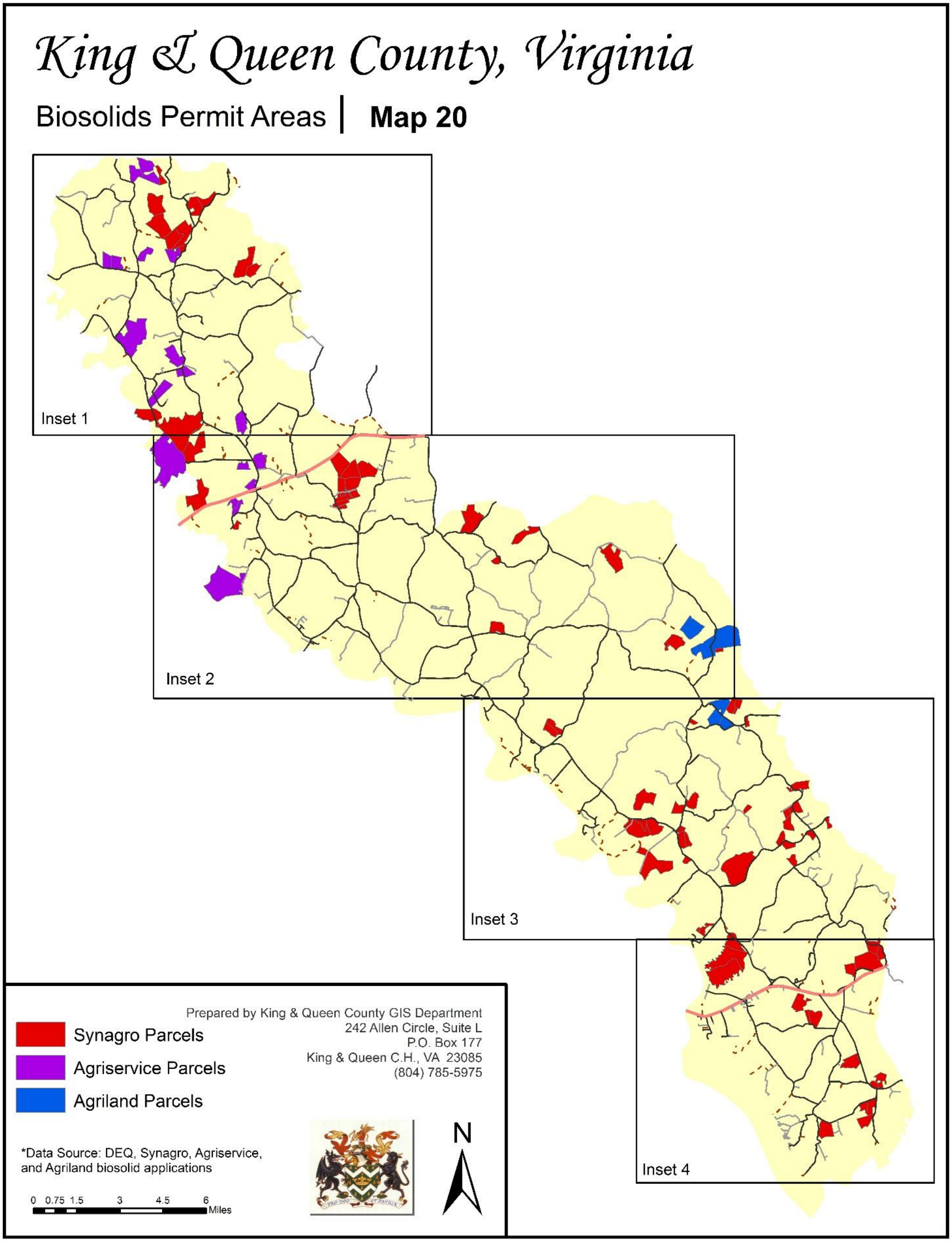
King and Queen has approximately 3,418 septic systems within its boundaries. The County does not have public sewer systems available as an alternative. Code Section 9VAC25-830-130-7, and Article 12 of the Chesapeake Bay Overlay District of the King & Queen County Zoning Ordinance, requires that septic systems be pumped out at least once every five years or inspected. This is a mandatory state program which the county is required to enforce. The County requires notification from Licensed Sewage Handlers to ensure that pump outs are completed according to the above requirements by the landowner in order to lower the risk of potential groundwater contamination.


King & Queen County, Virginia
Potential Groundwater Contamination Sources | Map 19
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
Solid Waste Facilities
Biosolid Applications
*Data Source: Synagro Central, AgriServices, Agriland and King and Queen County GIS
0 1 2 4 6 8 Miles
N

Biosolids

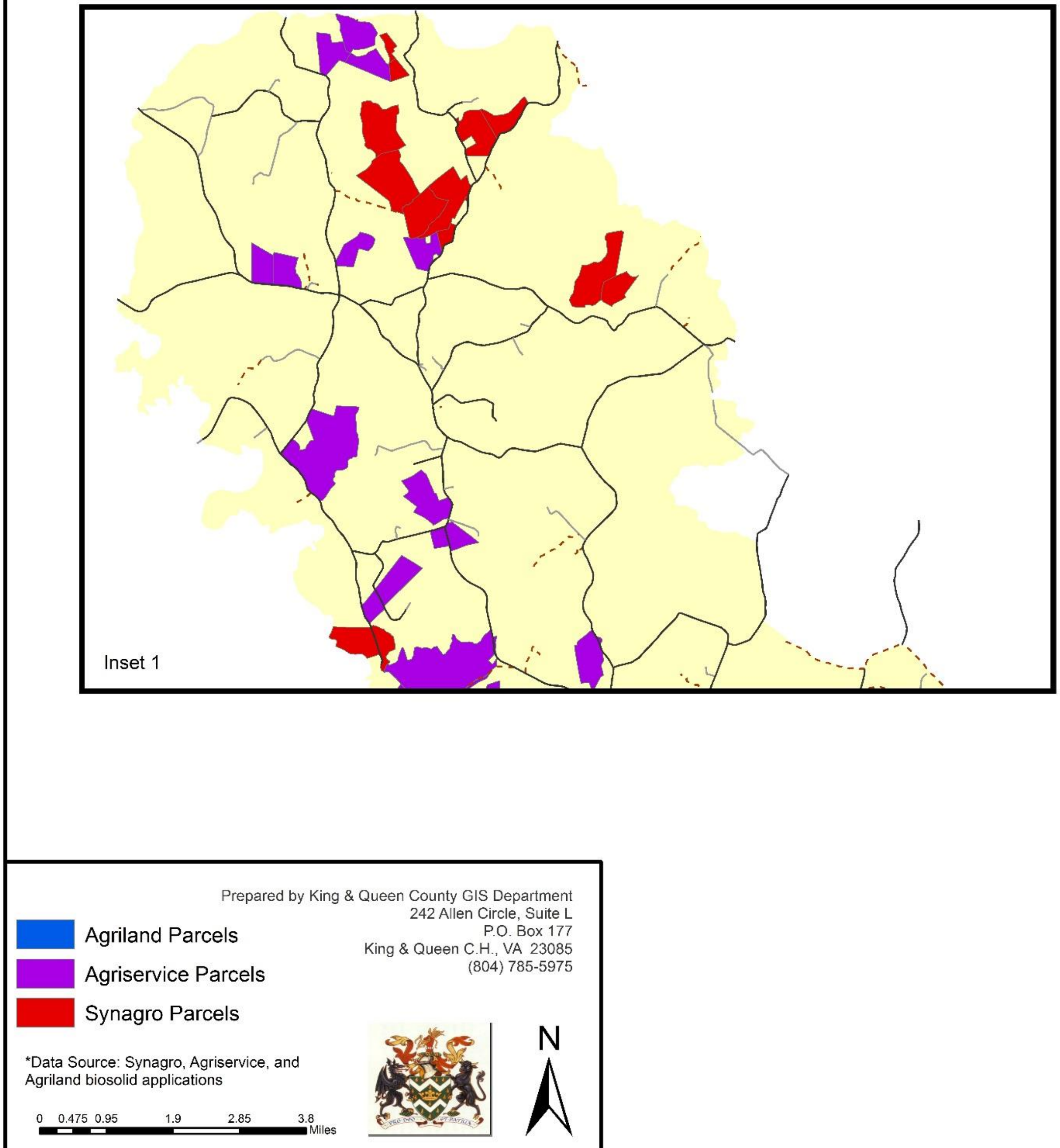
Biosolids are solid, semi-solid, or liquid materials, resulting from treatment of domestic sewage that have been sufficiently processed to permit these materials to be safely land-applied. Biosolids comprise of solids that are removed from the wastewater and further processed into streams and rivers. Concerns about biosolids include stormwater runoff, groundwater contamination, and increased truck traffic.

For additional information on biosolids, please see Appendix N, Biosolids FAQ, provided by the Virginia Department of Environmental Quality.


King & Queen County, Virginia
Biosolids Permit Areas | Map 20
Inset 1
Inset 2
Inset 3
Inset 4
Synagro Parcels
Agriservice Parcels
Agriland Parcels
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: DEQ, Synagro, Agriservice, and Agriland biosolid applications
0 0.75 1.5 3 4.5 6 Miles
N

King & Queen County, Virginia

Biosolids Permit Areas | **Map 20a**



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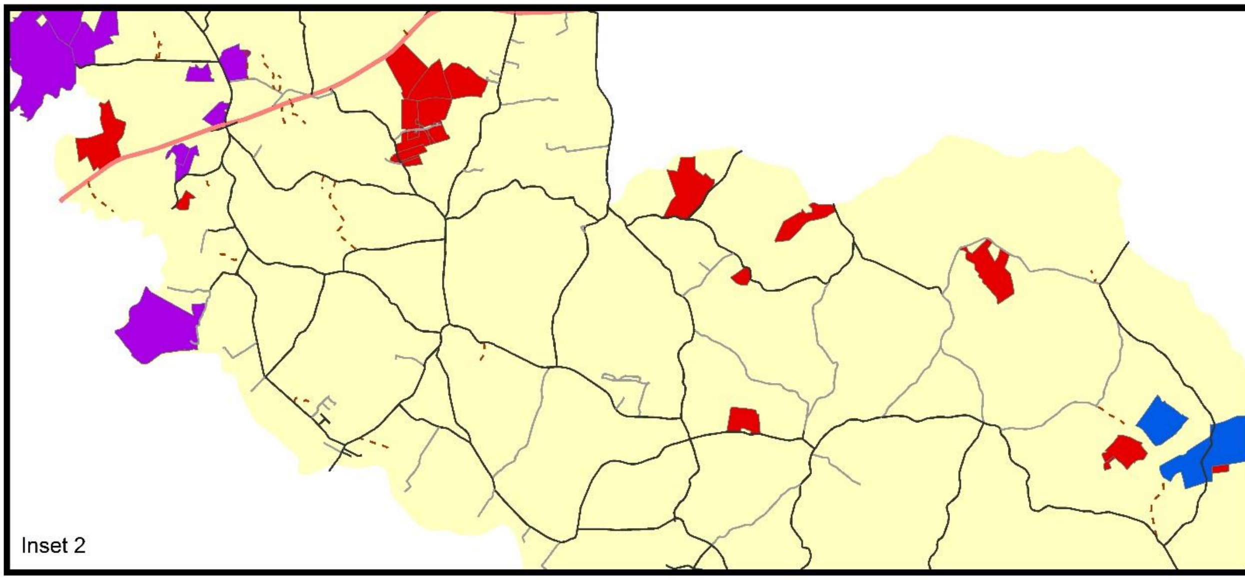
King & Queen County, Virginia

Biosolids Permit Areas | **Map 20b**



Agriland Parcels
Agriservice Parcels
Synagro Parcels

*Data Source: DEQ, Synagro, Agriservice, and Agriland biosolid applications

0 0.5 1 2 3 4 Miles

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King & Queen C.H., VA 23085
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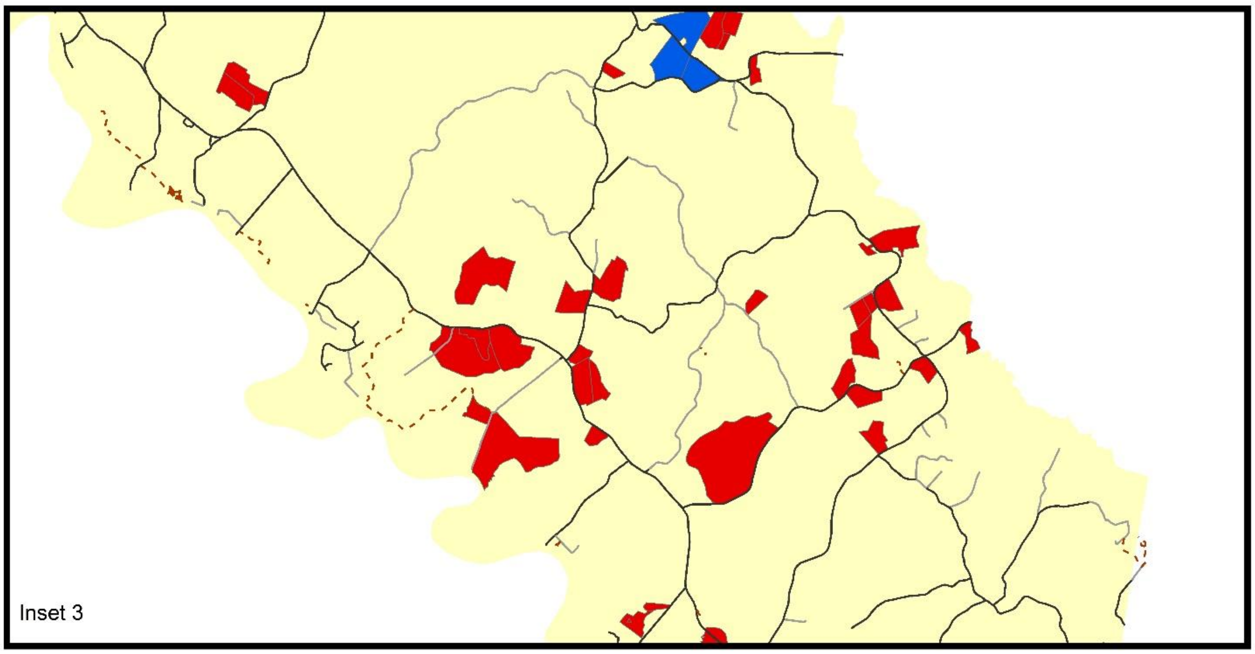
N

King & Queen County, Virginia

Biosolids Permit Areas | **Map 20c**



Agriland Parcels
Agriservice Parcels
Synagro Parcels

*Data Source: DEQ, Synagro, Agriservice, and Agriland biosolid applications

0 0.5 1 2 3 4 Miles

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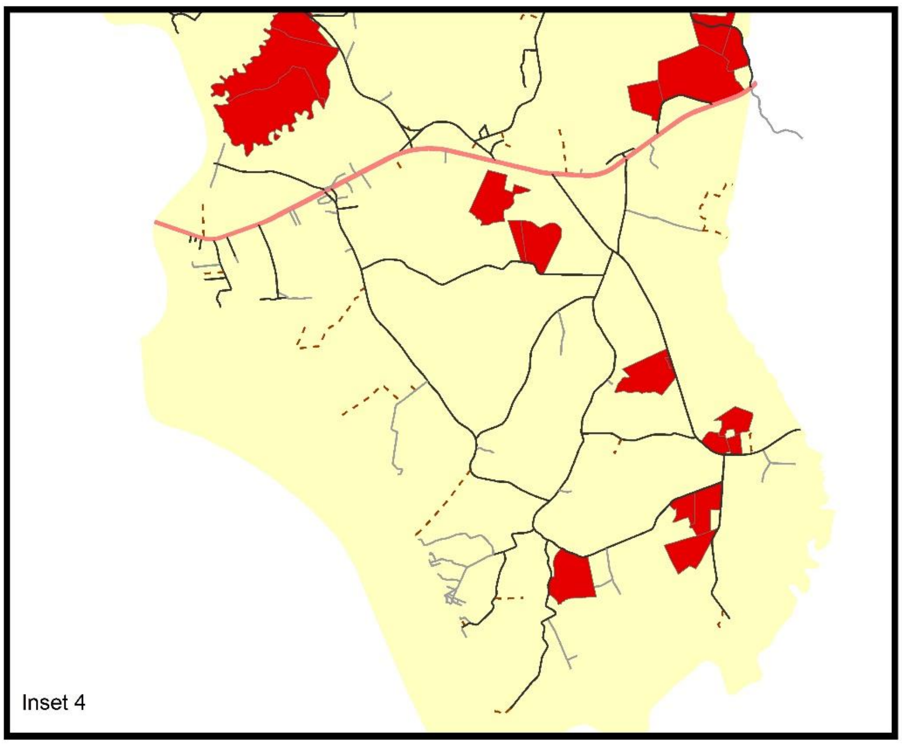
N

King & Queen County, Virginia

Biosolids Permit Areas | **Map 20d**



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- Agriland Parcels
- Agriservice Parcels
- Synagro Parcels

*Data Source: DEQ, Synagro, Agriservice, and Agriland biosolid applications

0 0.45 0.9 1.8 2.7 3.6 Miles

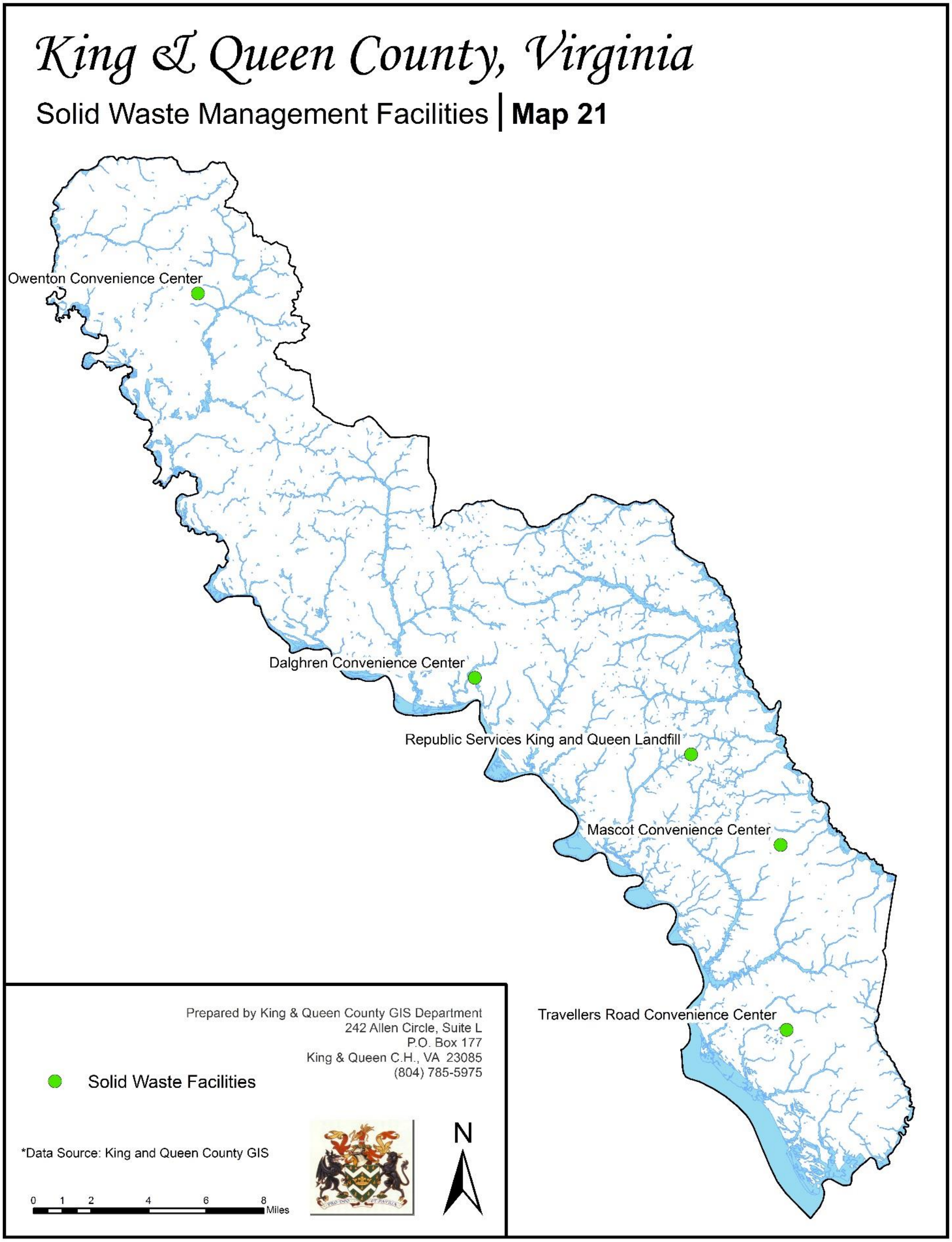
N

Solid Waste Management Facilities

Currently, King and Queen County has four convenience and recycling centers throughout the County, and one landfill. These facilities are listed below and available in Map 21, Appendix F.

Name	Location
Dahlgren Convenience Center	128 Dahlgren Rd, Stevensville
Travellers Rest Convenience Center	2187 Travellers Rd, Shacklefords
Owenton Convenience Center	992 Lyneville Rd, Newtown
Mascot Convenience Center	2131 Lombardy Rd, Mascot
Republic Services Landfill	1000 Iris Rd, Little Plymouth

The current landfill located in King & Queen County, owned by Republic Services, Inc. is located off of Devil's Three Jump Road on Iris Road in the Buena Vista Magisterial District, lying within the Stevensville voting district. The landfill is situated on approximately 420.5 acres, excluding additional acreage for road access (20.25 acres). Since the opening of the landfill, King & Queen County has felt the negative impacts of such use. Landfills are not compatible with the character of King and Queen County as the County does not have the transportation infrastructure and utilities sufficient to support such a highly intensive land use. A landfill use in King & Queen County is disruptive to the quiet enjoyment of surrounding property owners and has both long and short term land use conflicts including compatibility with traditional rural economic sectors such as agriculture, forestry, recreation and tourism. Landfills result in increased costs in providing community services, emergency services, criminal justice and significantly impact road quality and can conflict with protection of air quality, water quality and supply; and conservation of natural resources and the Chesapeake Bay.

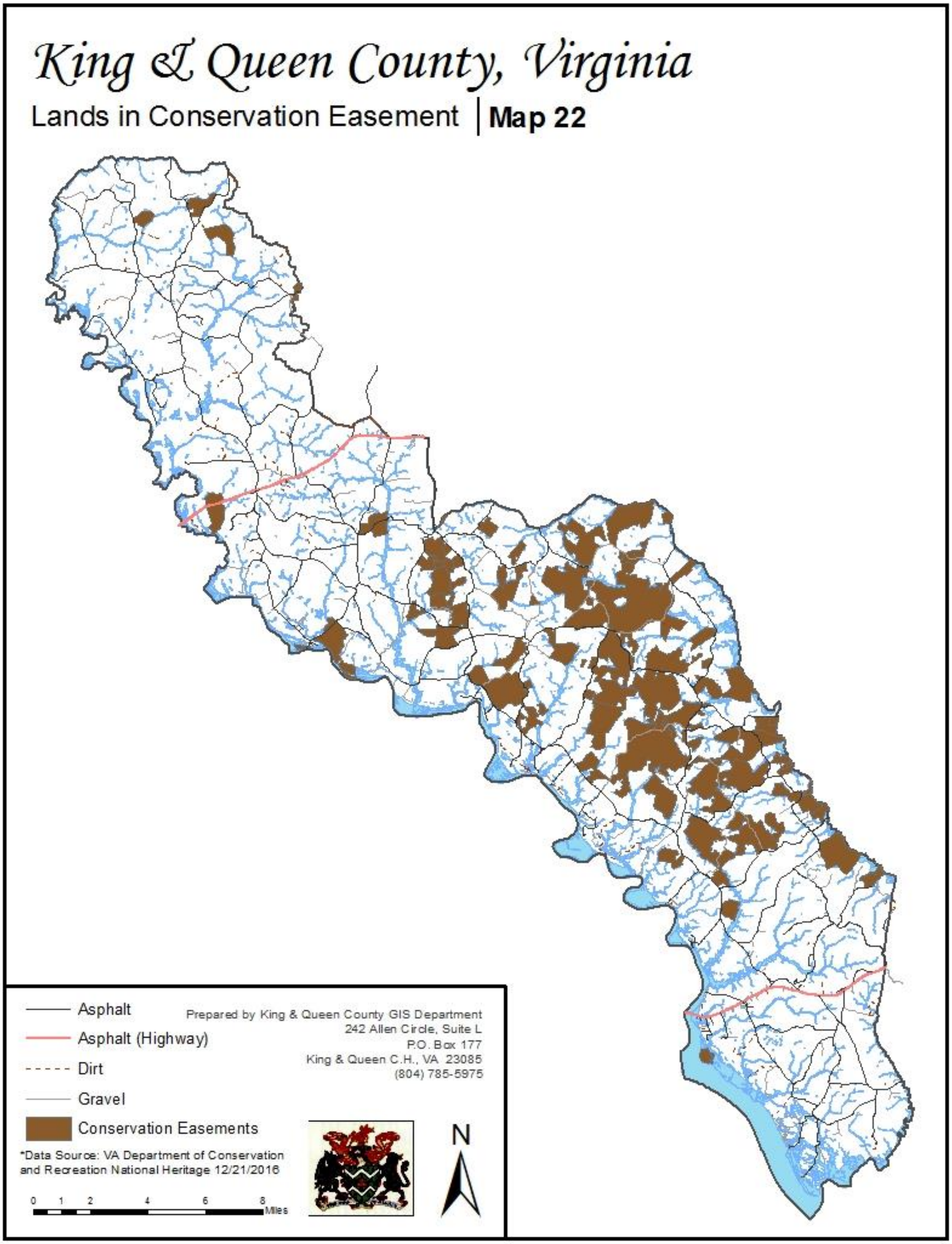

King & Queen County, Virginia
Solid Waste Management Facilities | Map 21
Owenton Convenience Center
Dalghren Convenience Center
Republic Services King and Queen Landfill
Mascot Convenience Center
Travellers Road Convenience Center
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
Solid Waste Facilities
*Data Source: King and Queen County GIS
0 1 2 4 6 8
Miles
N

Conservation Easements

A conservation easement is a voluntary legal agreement between a property owner and a land trust or government agency that permanently limits the future development of the land to protect its conservation values. The terms of an easement are negotiated between the property owner and the organization that will hold the easement. The terms of the easement are perpetual and apply to all future property owners. The organization holding the easement is responsible for ensuring the easement's terms are followed. Conservation easements may limit the division of the property and the right of the property owner to building additional structures on the property. Easements do not require property owners to provide public access.

Most of the conservation easements in King and Queen County are located in the Stevensville Magisterial District, as shown in the maps below, also included in Appendix F, Comprehensive Plan Maps. For more information regarding the impacts of conversation easements on localities, specifically King and Queen County, please view see Appendix G, Conservation Easements: Fiscal Impacts to Localities in the Middle Peninsula.

In order not to impede future economic development opportunities, the County will restrain the placement of conservation easements in its economic development corridors.

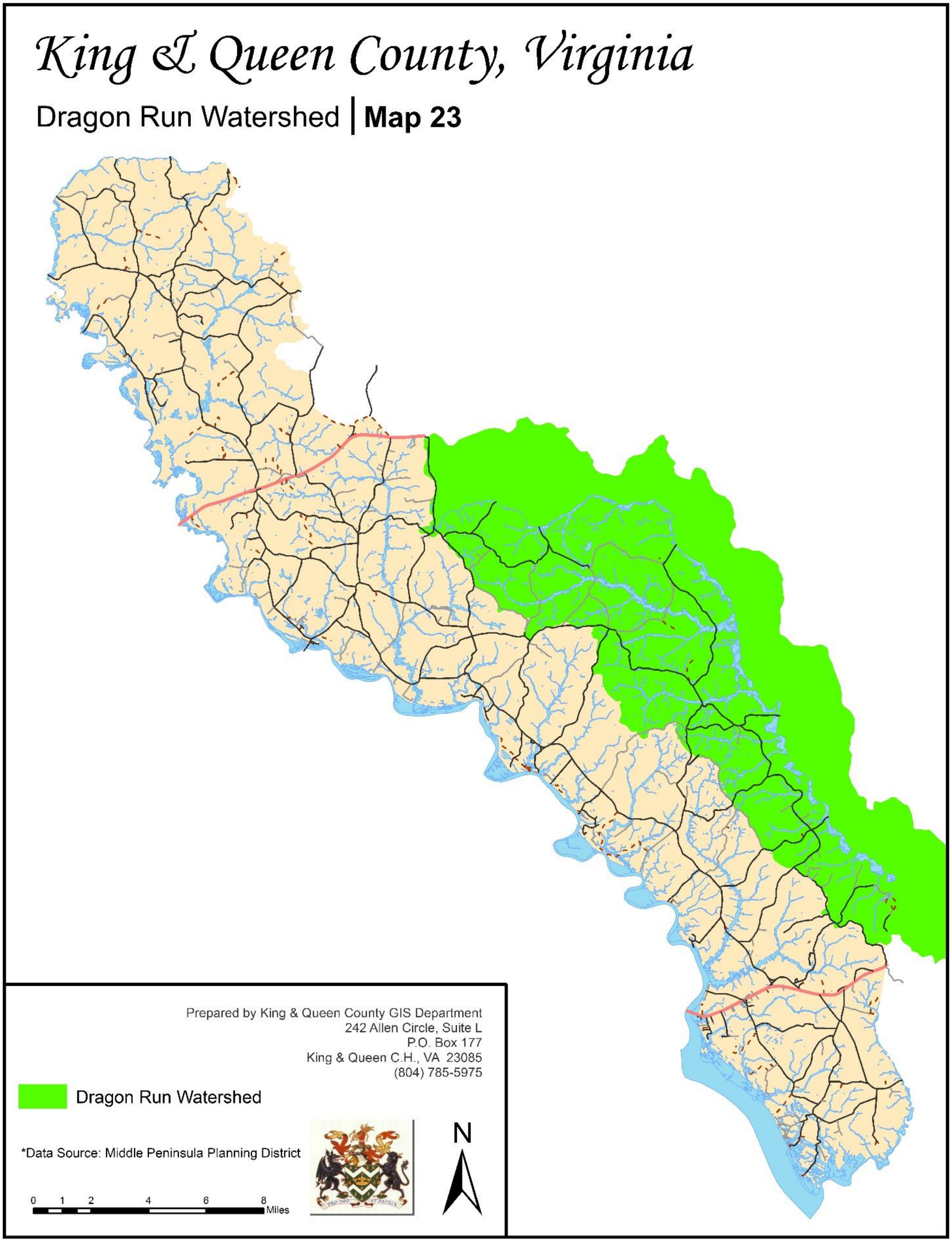

King & Queen County, Virginia
Lands in Conservation Easement | Map 22
Asphalt
Asphalt (Highway)
Dirt
Gravel
Conservation Easements
*Data Source: VA Department of Conservation and Recreation National Heritage 12/21/2016
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
0 1 2 4 6 8 Miles
N

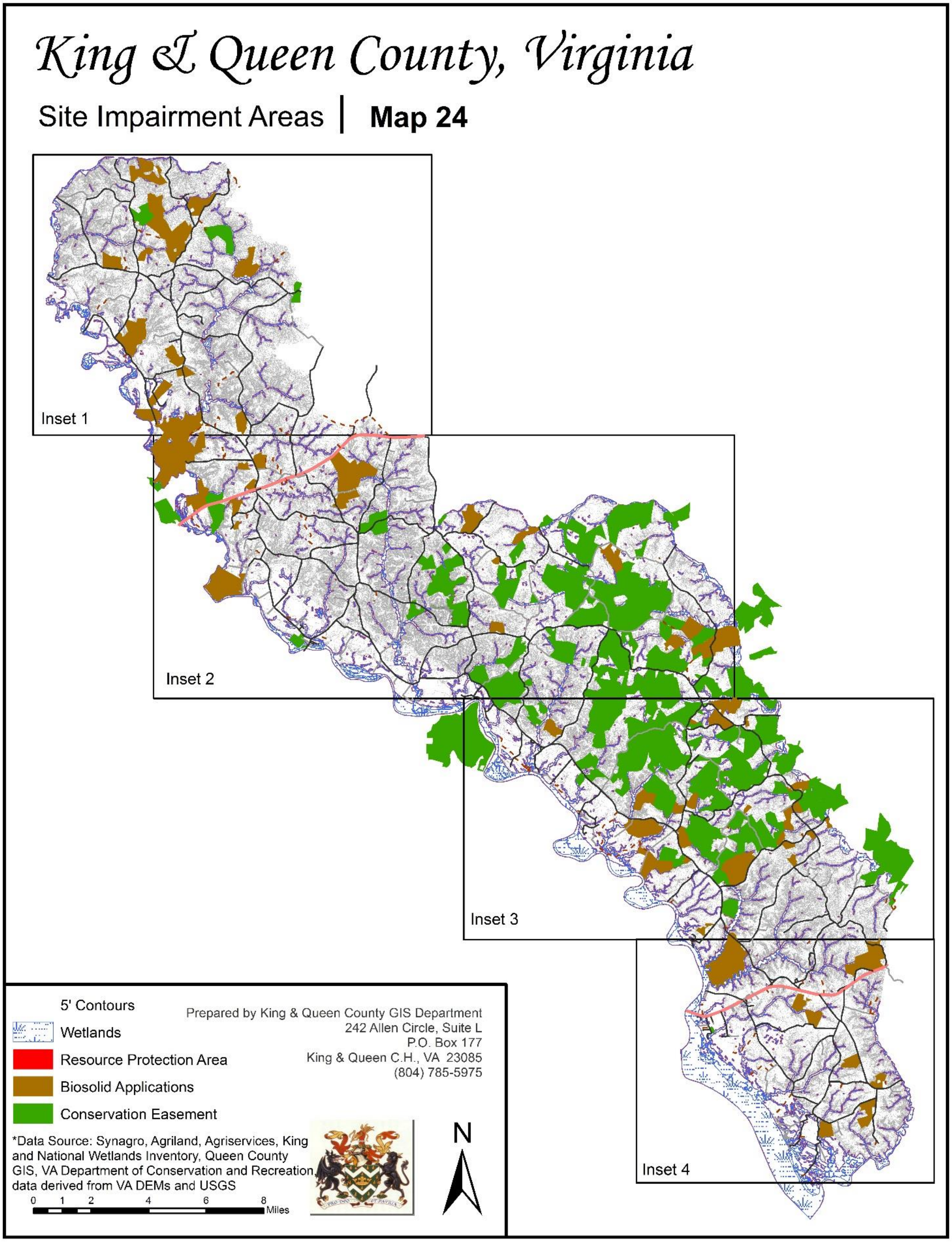
Dragon Run Conservation District

The purpose of the Dragon Run Conservation District (DRCD) is to protect and conserve fragile resource areas which perform valuable functions in their natural state and which are unsuitable for development and intense use. Areas to be designed as the DRCD primarily include wetlands and swamps, but may include other areas deemed to be important for floodplain management, aquifer recharge, water storage, critical wildlife habitat, or similar functions.

Permitted Uses:

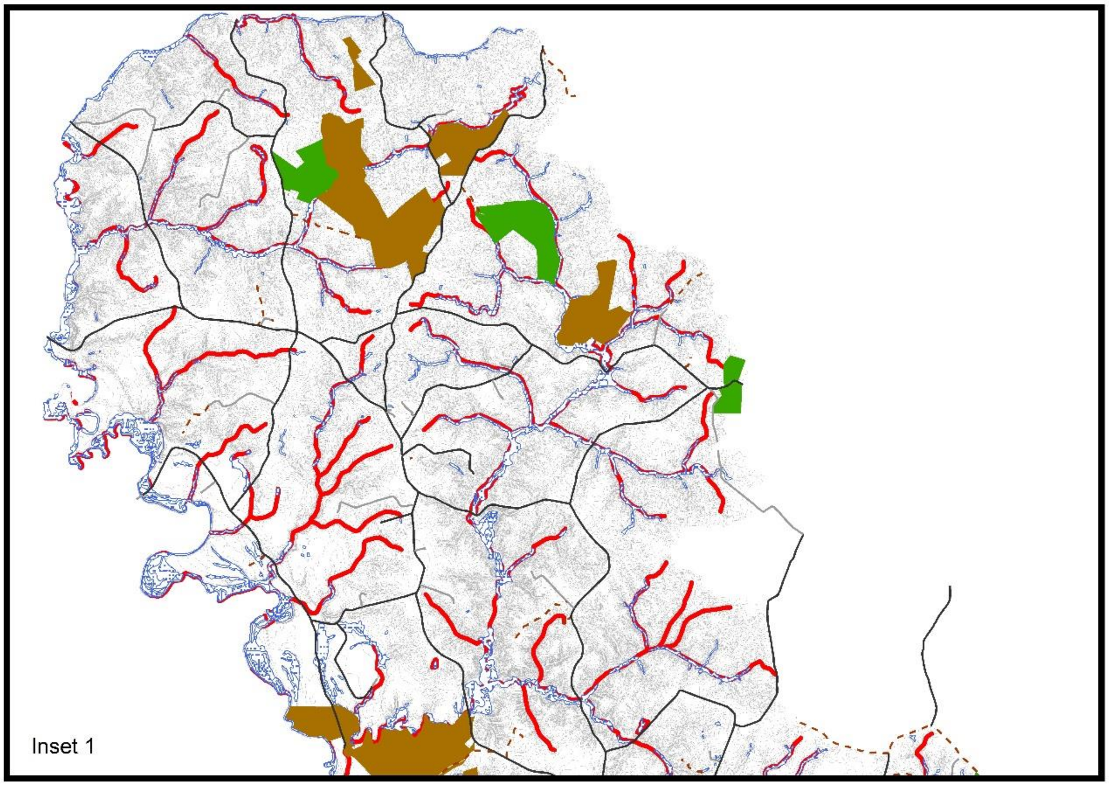
- The construction and maintenance of noncommercial catwalks, piers, fences and duck blinds, provided that structures are constructed on pilings as to permit the reasonably unobstructed flow of the tide in tidal areas, or natural contour of matches, swamps and watercourses
- The cultivation and harvesting of shellfish and worms for bait
- Noncommercial outdoor recreational activities, including hiking, boating, trapping, hunting, fishing, shellfishing, horseback riding, swimming, and skeet and trap shooting
- Conservation, repletion, education and research activities of the Virginia Marine Resources Commission, the Virginia Institute of Marine Science, the commission of game and inland fisheries, and other related conservation agencies
- The normal maintenance, repair, or addition to existing roads, highways, or the facilities of any person, firm, corporation, utility, or government abutting or crossing wetlands or swamps; provided that no waterway is altered and no additional wetlands or swamps are covered or drained
- The normal maintenance of existing manmade drainage ditches; provided that no additional wetlands or swamps are covered or drained
- Agricultural management activities must incorporate the application of best management practices (BMPs) in a plan approved by the local soil and water conservation district
- Forestry management activities must incorporate the application of best management practices in a plan approved by the Virginia Department of Forestry


King & Queen County, Virginia
Dragon Run Watershed | Map 23
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
Dragon Run Watershed
*Data Source: Middle Peninsula Planning District
0 1 2 4 6 8 Miles
N


King & Queen County, Virginia
Site Impairment Areas | Map 24
Inset 1
Inset 2
Inset 3
Inset 4
5' Contours
Wetlands
Resource Protection Area
Biosolid Applications
Conservation Easement
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: Synagro, Agriland, Agriservices, King and National Wetlands Inventory, Queen County GIS, VA Department of Conservation and Recreation, data derived from VA DEMs and USGS
0 1 2 4 6 8 Miles
N

King & Queen County, Virginia

Site Impairment Areas | **Map 24a**



5' Contours
Wetlands
Resource Protection Area
Biosolid Applications
Conservation Easement

*Data Source: Synagro, Agriland, Agriservices, King and Queen County GIS, National Wetlands Inventory, VA Department of Conservation and Recreation, data derived from VA DEMs and USGS

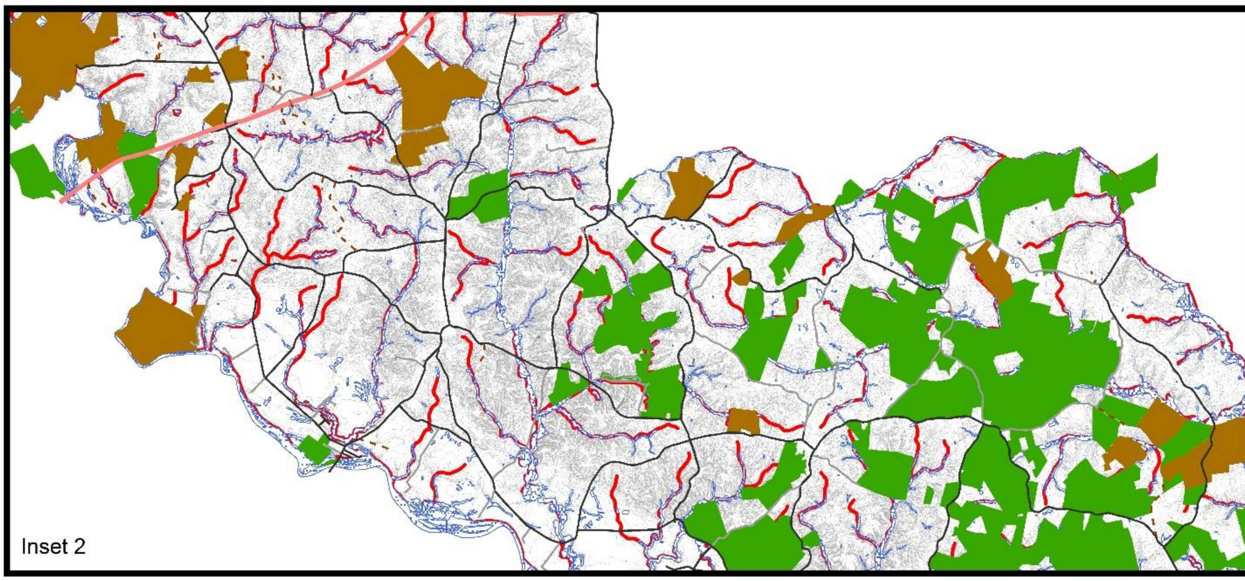
0 0.475 0.95 1.9 2.85 3.8 Miles

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

N

King & Queen County, Virginia

Site Impairment Areas | **Map 24b**



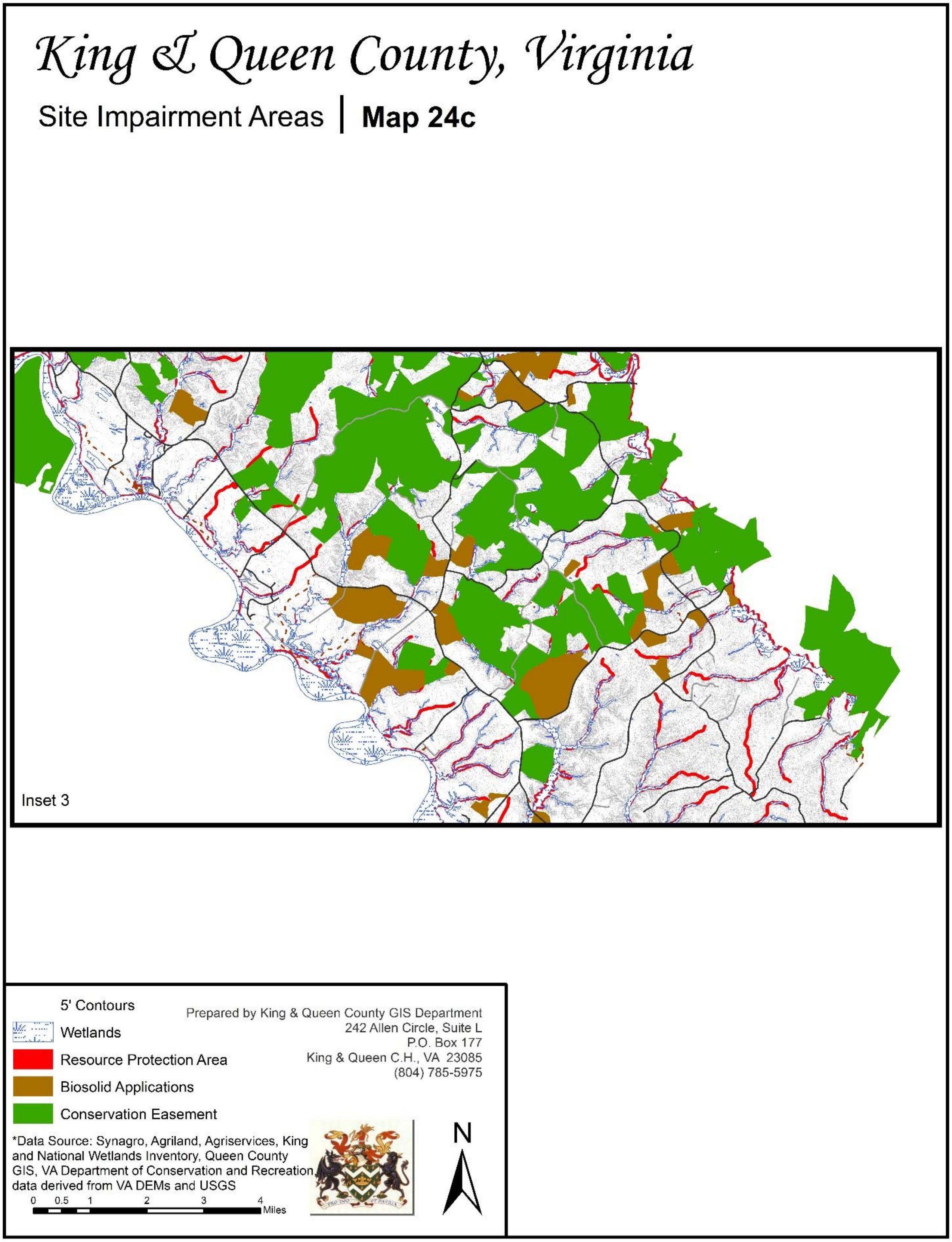
5' Contours
Wetlands
Resource Protection Area
Biosolid Applications
Conservation Easement

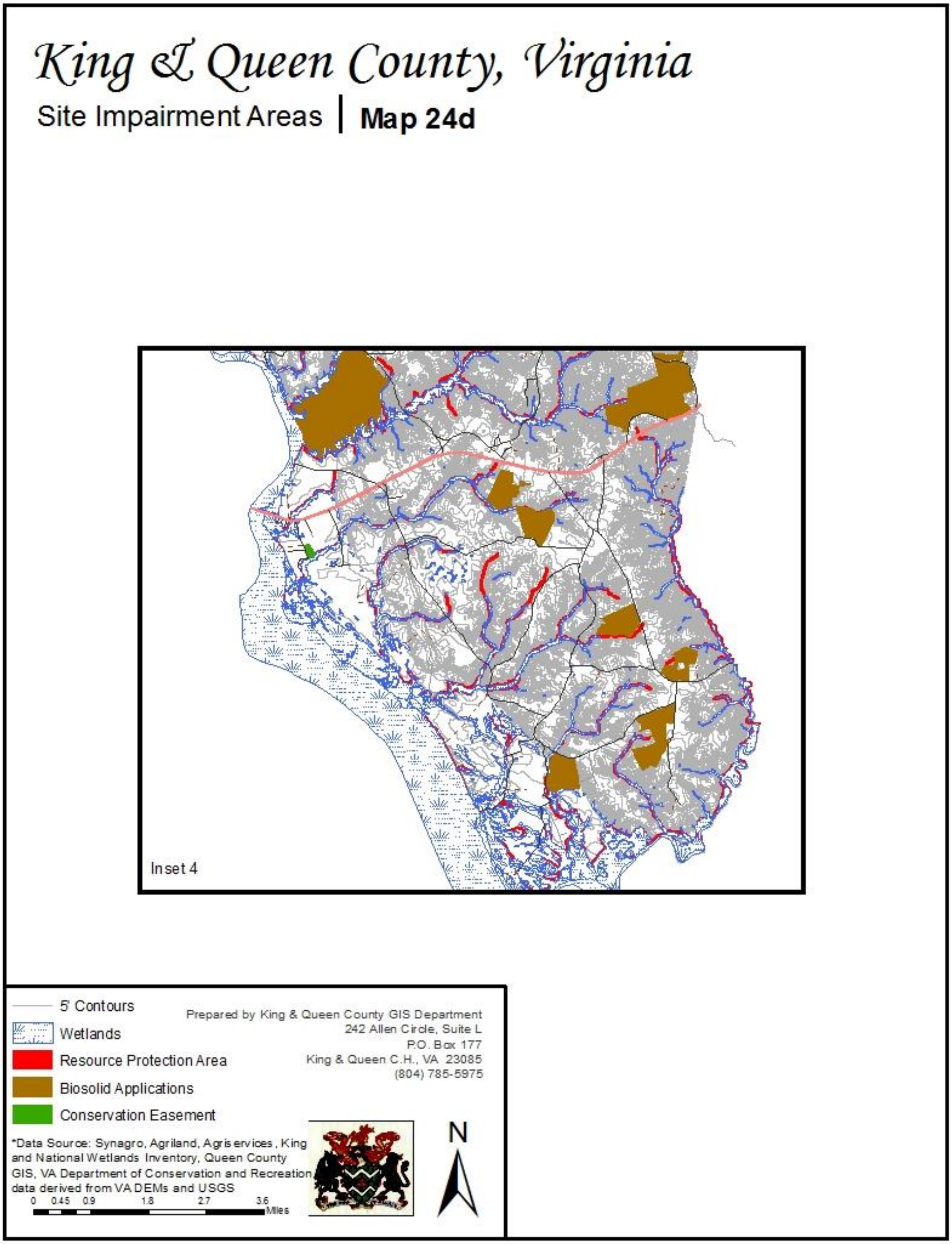
*Data Source: Synagro, Agriland, Agriservices, King and Queen County GIS, National Wetlands Inventory, VA Department of Conservation and Recreation, data derived from VA DEMs and USGS

0 0.5 1 2 3 4 Miles

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

N


King & Queen County, Virginia
Site Impairment Areas | Map 24c
Inset 3
5' Contours
Wetlands
Resource Protection Area
Biosolid Applications
Conservation Easement
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: Synagro, Agriland, Agriservices, King and National Wetlands Inventory, Queen County GIS, VA Department of Conservation and Recreation, data derived from VA DEMs and USGS
0 0.5 1 2 3 4 Miles
N


King & Queen County, Virginia
Site Impairment Areas | Map 24d
Inset 4
5' Contours
Wetlands
Resource Protection Area
Biosolid Applications
Conservation Easement
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: Synagro, Agriland, Agriservices, King and National Wetlands Inventory, Queen County GIS, VA Department of Conservation and Recreation data derived from VA DEMs and USGS
0 0.45 0.9 1.8 2.7 3.6 Miles
N

Chapter 7: Public Services and Infrastructure

Government Administration

King and Queen County operates under a traditional form of county government. Under this structure, an elected Board of Supervisors acts as a legislative committee and appoints a County Administrator to act as a full time executive officer directly responsible to the Board of Supervisors to execute county functions under the direction and guidance of the Board.

In addition, the County is also served by elected Constitutional Officers. These Offices consist of the Treasurer, Commissioner of Revenue, Sheriff, Commonwealth Attorney, and the Clerk of Circuit Court.

Emergency Management and Public Safety

Emergency Services within the county are provided through a combination career and volunteer delivery system. The Department of Emergency Services consists of several functional areas:

Fire Suppression services are provided 24 hours-a-day to the residents and visitors of King and Queen County through combination staffing and all-volunteer equipped fire departments.

Emergency Medical Services provides 24 hours-a-day, basic and advanced life support emergency medical services to the residents and visitors of King and Queen County through a combination career and volunteer staffed EMS delivery system.

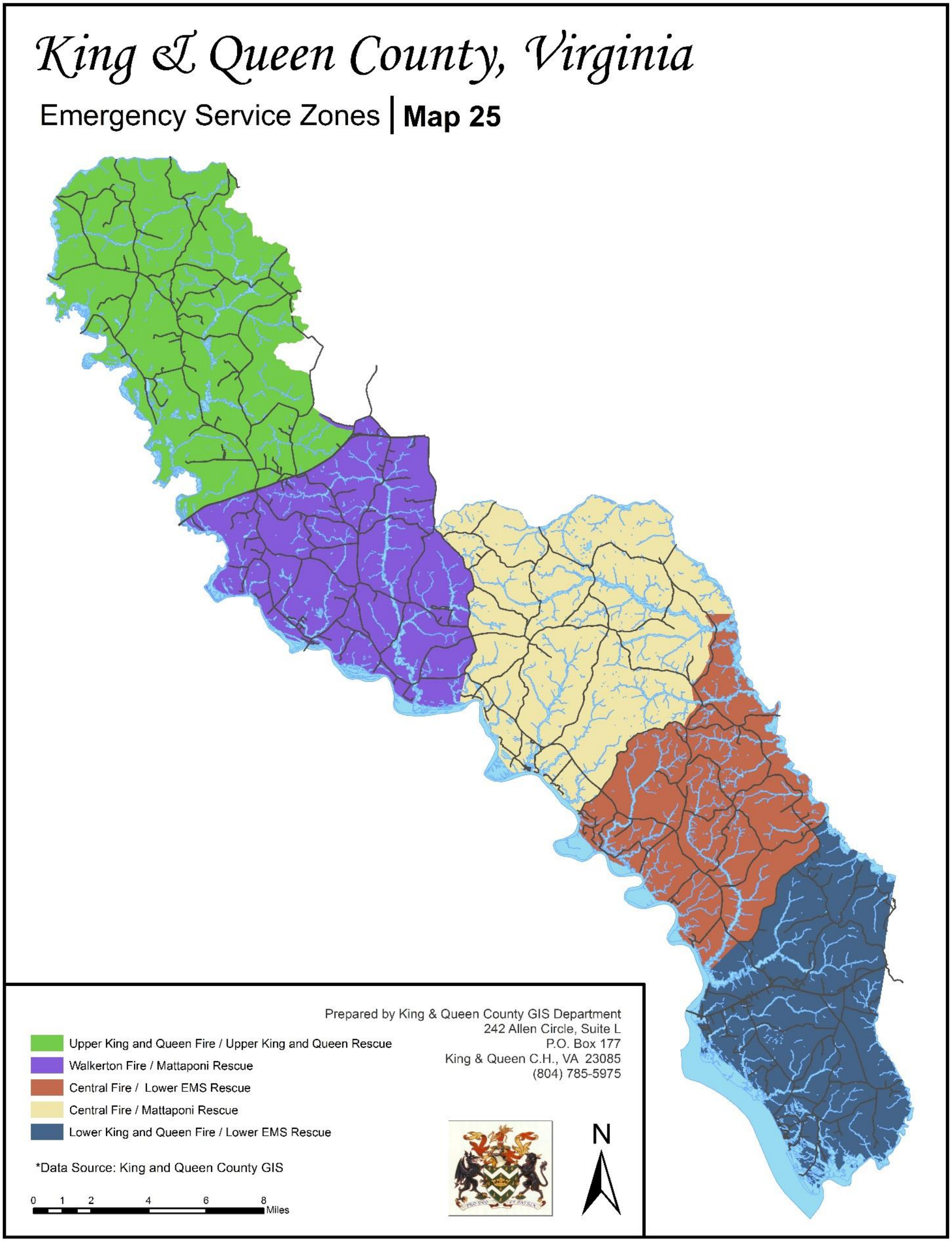
Emergency communications are provided 24 hours-a-day by King and Queen County through a modern, state of the art 9-1-1 communications dispatch center and the middle peninsulas first P25 compliant radio communications system.

Emergency Management provides preparedness, response and recovery services to the residents of King and Queen County by writing and maintaining the Emergency Operations Plan, managing the County's emergency operations center, and by coordinating post disaster recovery and mitigation activities. Emergency Management also provides emergency planning in such areas as special needs, continuity of operations and emergency operations. Emergency management staff members are available to give presentations on emergency preparedness to your homeowner's association, civic group, business or faith community.

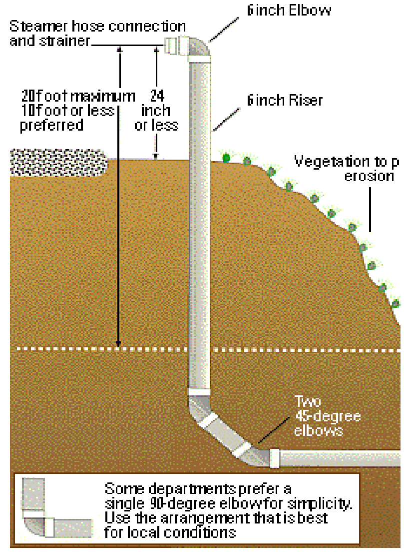
The County's Emergency Service Zones are shown on Map 25 on the next page.

Electric Service

King and Queen County is served by two electric company providers. Rappahannock Electrical Coop and Dominion Energy. The distribution services are shown in Map 27 in this Chapter, and in Appendix F.


King & Queen County, Virginia
Emergency Service Zones | Map 25
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
Upper King and Queen Fire / Upper King and Queen Rescue
Walkerton Fire / Mattaponi Rescue
Central Fire / Lower EMS Rescue
Central Fire / Mattaponi Rescue
Lower King and Queen Fire / Lower EMS Rescue
*Data Source: King and Queen County GIS
0 1 2 4 6 8 Miles
N

Dry Hydrants



Dry hydrants are located throughout the County and displayed in a map further below in this Chapter. Dry hydrants are non-pressurized pipe systems permanently installed in lakes, streams and ponds that can provide a suction supply of water to fire engines and tanks. These are especially important in rural localities where there is commonly a lack of water mains and pressurized hydrants.

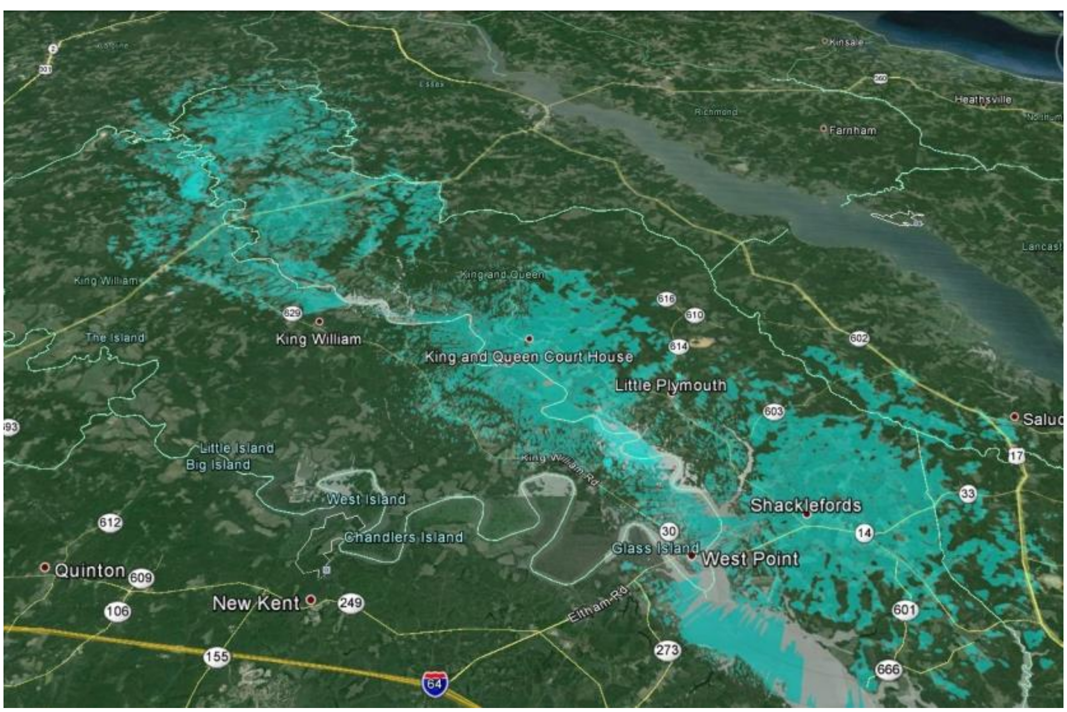
Dry hydrants are tested once a year and backflushed as part of training exercises.

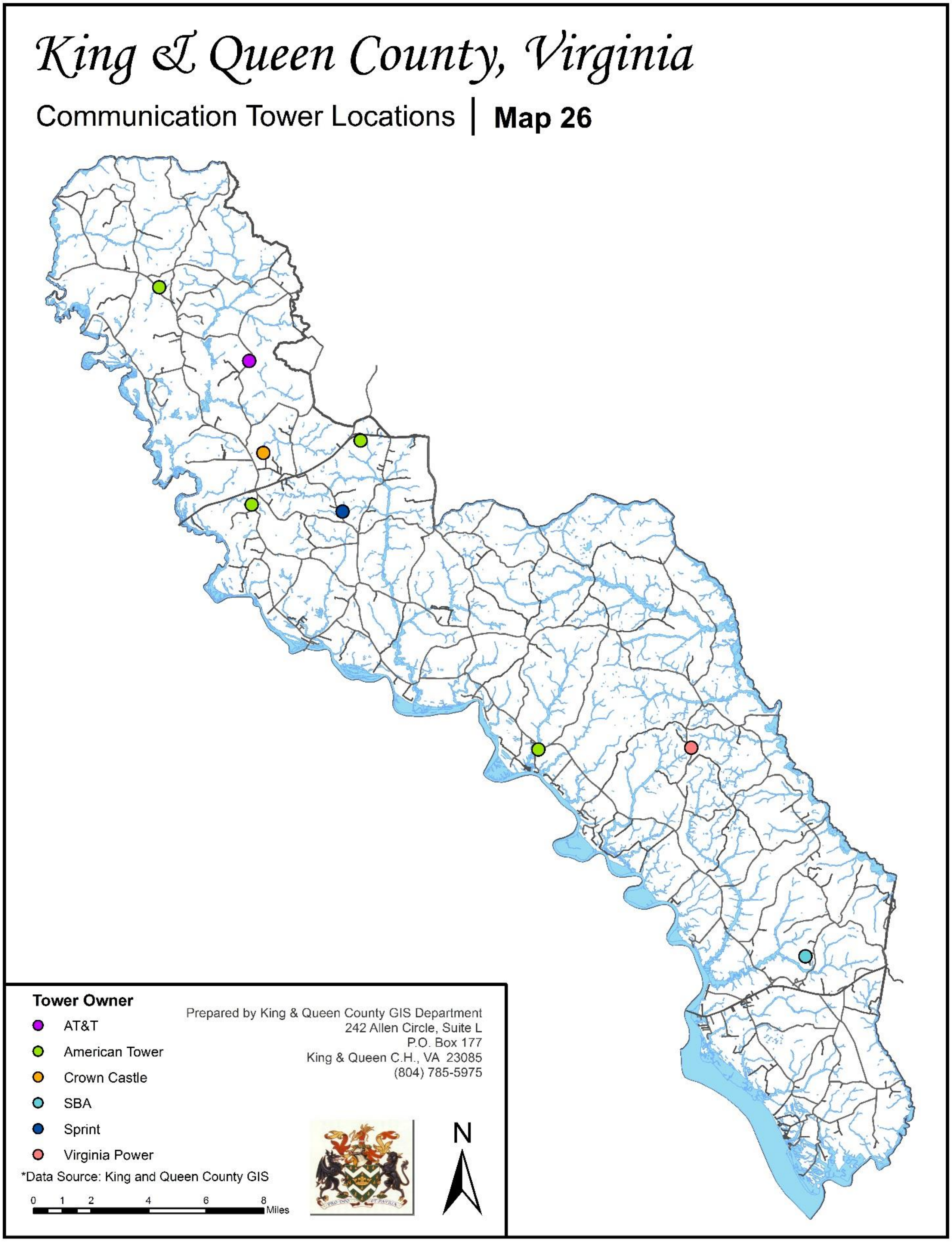
The location of the dry hydrants located throughout the County is included in Map 28.

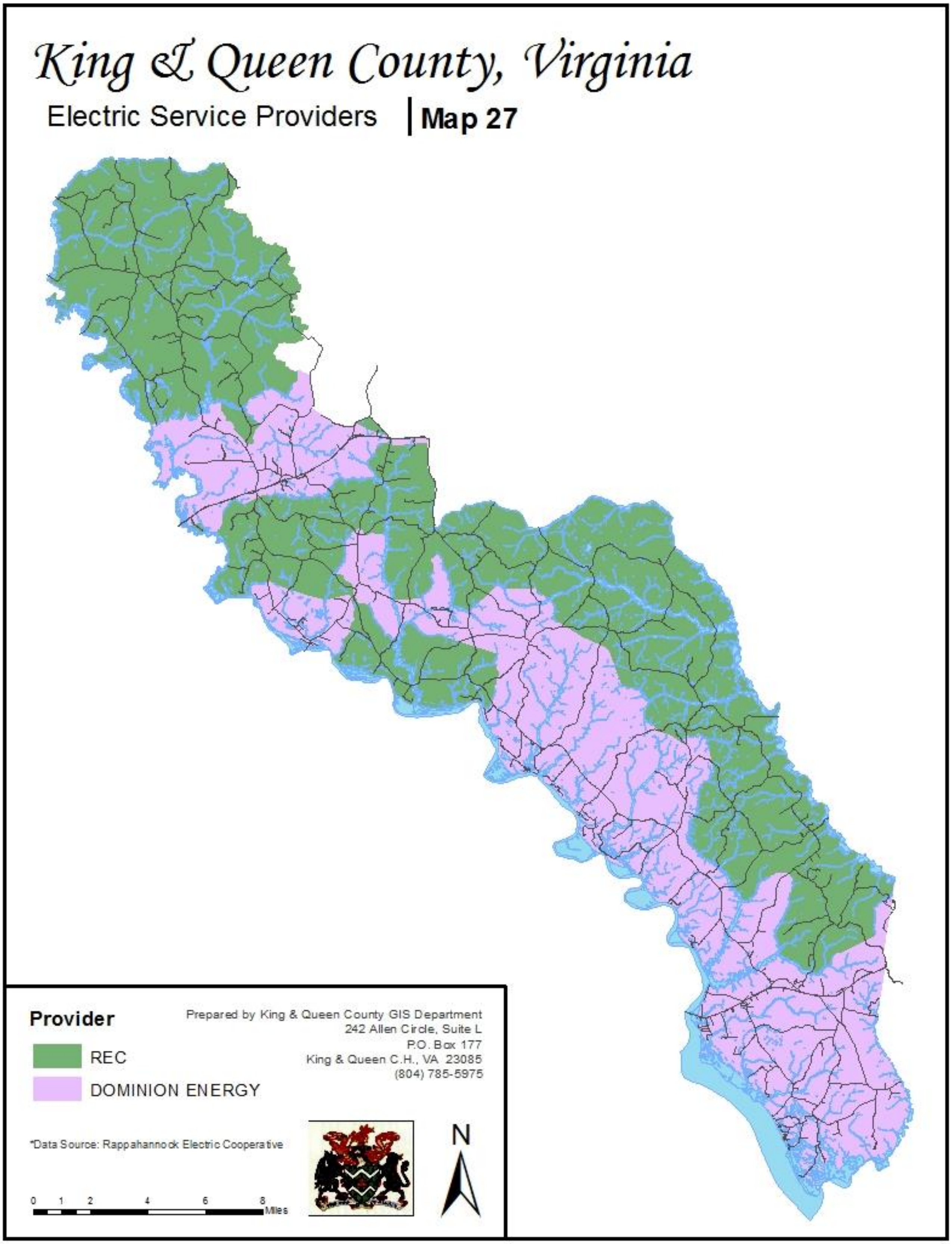
Communication Towers and Broadband Internet

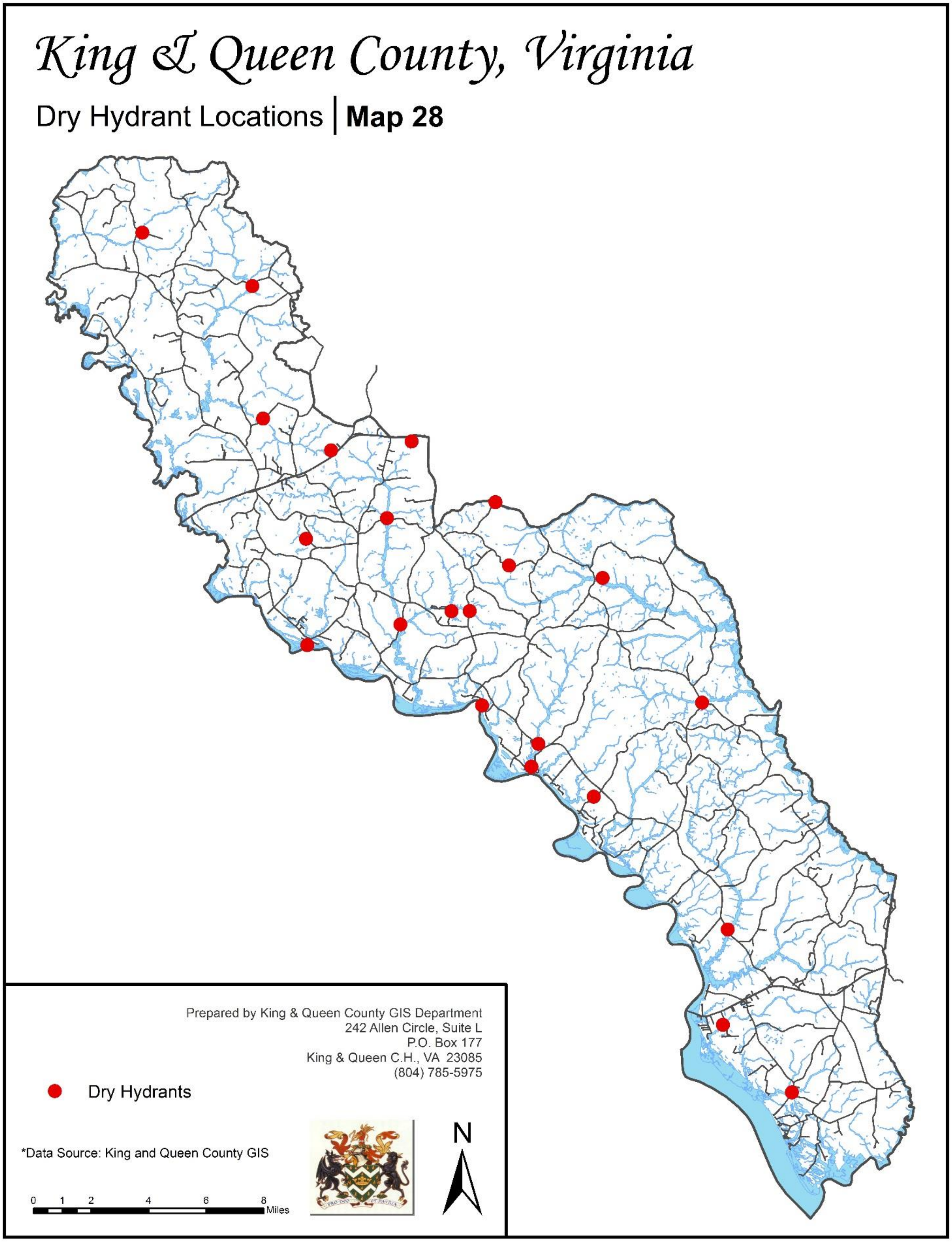
Broadband has been a topic of discussion on the Middle Peninsula for several years. The Middle Peninsula Broadband Authority was established in 2010 to find a solution to the region's lack of high-speed Internet availability. After years with no progress, King and Queen County decided to move forward with its own broadband initiative. In 2012, the County established the King and Queen County Wireless Services Authority and partnering with Gamewood Technology Group to provide wireless broadband coverage. King and Queen's network was incorporated into the design and "rides upon" the public safety communications linear microwave backhaul to distribute broadband the length of the County. The program, available online at KQVA.net, utilized four existing tower sites, which allow 70-75 percent coverage throughout the county.

Coverage Map from KQvA.net




King & Queen County, Virginia
Communication Tower Locations | Map 26
Tower Owner
AT&T
American Tower
Crown Castle
SBA
Sprint
Virginia Power
*Data Source: King and Queen County GIS
0 1 2 4 6 8 Miles
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
N


King & Queen County, Virginia
Electric Service Providers
Map 27
Provider
REC
DOMINION ENERGY
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: Rappahannock Electric Cooperative
0 1 2 4 6 8 Miles
N


King & Queen County, Virginia
Dry Hydrant Locations | Map 28
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
Dry Hydrants
*Data Source: King and Queen County GIS
0 1 2 4 6 8 Miles
N

County Schools

King and Queen County has three fully accredited public schools serving approximately 837 children, including virtual students. The mission of the King and Queen County Schools is to provide a quality and individualized education while challenging each student to reach the highest level of achievement according to his or her unique abilities, talents, and aspirations. The County is dedicated to enabling all students to become effective, productive, and contributing citizens in our competitive global society.

King and Queen Elementary School

King and Queen Elementary School is a fully accredited elementary school serving 308 children in grades preschool through seven. This school has received numerous grants and awards for the study of the Chesapeake Bay watershed, technology, and journalism. The school offers a complete educational program in academics, the arts, and recreation.

Lawson-Marriott Elementary School

Lawson-Marriott Elementary School is a fully accredited elementary school serving 320 children in grades preschool through seven. The school was selected as Distinguished Title I in 2005 for the continued outstanding academic performance of its children. The school offers a well-rounded educational program including academics, the arts, and recreation.

Central High School

Central High School is a fully accredited high school serving 209 students in grades eight through twelve. Central High School is a comprehensive high school offering programs focused on college preparation, the arts, career and technical education, sports and extra-curricular activities. Small, but competitive, the school has received awards for its academic and athletic achievements.

Map 29 on the following page displays the locations of King and Queen Elementary School, Lawson-Marriott Elementary School, and Central High School.


King & Queen County, Virginia
County School Locations | Map 29
Lawson-Marriott Elementary School
Central High School
King and Queen Elementary School
Schools
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975
*Data Source: King and Queen County GIS
0 1 2 4 6 8 Miles
N

Chapter 8: Plan Implementation

The adoption of this update to the Comprehensive Plan is not the end of the planning process. Planning is an ongoing process that is intended to periodically review changes that are occurring and the effects of those changes on the County.

In addition to this Plan, many other agencies have plans that must be considered and coordinated with this plan. Planning is not done in a vacuum and will be ineffective if done that way. There are a number of implementation measures available to local government. This chapter summarizes these measures and actions, which should be undertaken to help implement the Comprehensive Plan.

Linking the Plan to the Future

The Comprehensive Plan is intended to capture a vision of the future of the County, but the key to its success is how well it is implemented by County officials. The Plan provides the basis for public and private initiatives which should be undertaken over time, but it will incumbent upon King and Queen's leadership to direct its implementation. The Plan will serve as a dynamic document designed to provide flexibility and adaptability to change in the coming years. As such, it should not gather dust on the bookshelf. The Plan provides general guidelines and recommendations for future growth with regard to its implementation of long range planning goals and objectives in day-to-day regulatory, management and service operations. The Plan also includes a section on capital improvement programming. The County staff, as well as elected and appointed decision-makers, are committed to the Plan so that key decisions will be evaluated based on their long-range impact upon County residents, landowners and businesses.

The Comprehensive Plan represents only "Step 1" in the County's growth management and economic development process. However, it is foundational to the success of future land use planning activities. In pursuit of the County's policy of "smart growth", land use implementation responsibilities must be intelligently shouldered by both the public and private sector.

From a Countywide perspective, the implementation process must be carefully orchestrated over an extended timeframe as development occurs. While the Comprehensive Plan serves as the framework around which relevant future land use decisions are based, its implementation must be directed by new growth management tools and initiatives (i.e. zoning, subdivision, and site plan regulations; erosion control standards; corridor design guidelines, capital improvements plans; etc.) that embody the technical aspects of the Plan's "vision" for the County.

The Comprehensive Plan, standing alone, is insufficient to implement "smart growth". Neither can the zoning and subdivision ordinances, standing alone, fully ensure that private development actions be created sensitively. Through mutual hard work, and in a cooperative pursuit of maintaining and enhancing the "Vision for King and Queen", developers and local officials need to become unique partners in this process of moving the County into the 21st century.

As King and Queen develops its prime land and seeks to conserve its sensitive environmental areas, the full effect of the Comprehensive Plan will be measured by the success or failure of any given site development project. The Plan's "vision" for future land use is going to ultimately be defined by the many discrete decisions (both public and private) which address the matters of location, density, scale, infrastructure, visual quality, and phasing of any particular land use application. Accordingly, the tools, techniques, and methods to be incorporated into future growth management efforts must focus on each individual aspect of the land development process.

Capital Improvement Plan

Continuously update the Capital Improvement Plan (CIP).

King and Queen County has adopted a Capital Improvement Plan. Each year the process has been improved and the Capital Improvement Plan has become an important planning document. The Capital Improvement

Plan should continue to be reviewed and updated annually with continuous efforts to improve the document and the process to update it. For a complete copy of the latest adopted Capital Improvement Plan, see Appendix L.

Planning Commission and Board of Supervisors

Establish periodic Comprehensive Plan review sessions between the Planning Commission and the Board of Supervisors.

As previously noted, planning is an ongoing process. The Comprehensive Plan is not designed to be taken off of the shelf every five years, revised, and placed back on the shelf. The plan is the guide for everyday land use decisions. As a means of more consistently reviewing the Plan, the Board of Supervisors and the Planning Commission should periodically meet for the purpose of reviewing the Plan. This will ensure a continuous dialogue between the two bodies and provide a better means of evaluating the implementation of the Plan.

Comprehensive Plan Amendments

Establish policy on Comprehensive Plan amendments.

The Board of Supervisors should establish a policy on amendments to the Comprehensive Plan. This policy should require development proposals, including public improvements that are inconsistent with the Comprehensive Plan to provide additional analysis above and beyond the standard development review. Such a policy would benefit the development community, citizens, staff and the Board of Supervisors by clearly identifying the process through which inconsistent development proposals will be evaluated.

Zoning Ordinance Update

Zoning is the legal means by which State law allows the County to achieve its purposes of (1) promulgating the health, safety, and general welfare of King and Queen's citizens and (2) implementing the Comprehensive Plan. Within the zoning ordinance, the Board of Supervisors establishes zoning districts in order to classify, regulate, and restrict the location, use and geometry of buildings, structures, land, and water; to regulate and restrict the height and bulk of buildings; to regulate the area of yards and other open spaces around buildings; to regulate the intensity and density of land uses; and to regulate historic areas and major entrance corridors within the geographical territory of King and Queen County. It is ideal to continue to review and update the ordinance and its context so that it is "user friendly" and provides landowners and the County leaders with needed information to intelligently design, coordinate, submit, and review basic site plans and subdivision plats for the envisioned range of uses that King and Queen County will attract in the future.

Analysis of Existing Zoning Districts

In conjunction with establishing the Future Land Use Map, the individual zoning districts as defined in the existing Zoning Ordinance were evaluated to assess their compatibility with the Comprehensive Plan. This evaluation of each zoning district focused on a range of characteristics essential to the land use program identified by the Plan, including (a) permitted uses, (b) conditional uses, (c) land use density and lot size, (d) yard and setback regulations, (e) landscape and open space regulations, (f) building heights and lot coverage criteria, (g) environmental design standards, and (h) relationship to other sections of the zoning ordinance.

Due to the age of the existing ordinance, its zoning districts were generally "out of touch". Moreover, the zoning districts, in some instances, did not enable the landowner to realize the "highest and best use" for any given land development opportunity.

Signs, Corridors, and Visual Quality in King and Queen County

Signs are vital to the economic vitality of any business which operates in the County. During the preparation of the Plan, both the Board of Supervisors and Planning Commission expressed much concern relative to improving the visual quality of King and Queen's entrance corridors and, in particular, to the proliferation of undesirable signs throughout the County. County officials quickly reached a consensus that the vast majority highways, does not convey an image that is consistent with its vision for quality growth and development. Officials support the introduction of more creative and contemporary sign regulations into the newly revised zoning ordinance.

The updated Zoning Ordinance will incorporate a progressive approach towards the County's regulation of signage. The enhancements to the sign ordinance have been created in a manner consistent with the community's goals and objectives as expressed by members of the Board of Supervisors and Planning Commission during strategic planning work sessions held early in the ongoing Comprehensive Plan Update process. A well-crafted and properly administered sign ordinance will encourage new signage that will improve public safety, promote commerce, enhance property values, and promote attractive community development.

The County's general objectives for the new sign regulations are as follows: (1) to regulate the size, location, height, and construction of all signs for public observance; (2) to protect the public health, safety, convenience and general welfare; (3) to facilitate the creation of a convenient, attractive, and harmonious community; (4) to protect property values; and (5) to enhance the visual quality of new land uses while fulfilling the economic development objectives of King and Queen County. All exterior signs are subject to these regulations.

The updated sign regulations are organized and designed to reduce the visual clutter caused by unattractive signs which overwhelm major portions of the County's commercial corridors. Over time, the proposed sign regulations will reduce the number and size of signs on King and Queen's commercial corridors. The ordinance prohibits signs which advertise anything other than the business on the property on which the sign is located. Placing reasonable limits on the height of signs will balance the goal of private businesses to attract customers with the County's desire to promote attractive highway corridors in a manner that is consistent with current trends in signage in communities throughout Virginia. Further, the new sign regulations are intended to encourage signs which are of a scale that is in better proportion to the size of the building being identified.

Subdivision Ordinance Update

The County's Subdivision Ordinance is primarily concerned with regulations related to the platting of lots, the layout of streets, the location of public spaces, and the construction of public improvements associated with the process of subdividing land. In addition, the ordinance contributes the foundation for the maintenance of clear and accurate land records. Subdivision ordinances typically respond to the need to protect the flood plains, wetlands and other sensitive environmental areas. These environmental issues and conservation matters are intricately associated with the Comprehensive Plan as well as its policies on the overall pattern of growth and the prospects of expenditures for public facilities.

The subdivision ordinance needs to incorporate greater detail on subdivision design particulars and geometric standards for both public and private streets, as well as factors relating to when and where other public improvements (such as sidewalks, bike trails and curb gutter) would be required.

Implementation of Capital Improvements

The Comprehensive Plan recognizes that certain components necessary for its successful implementation are dependent on public sector actions which would be undertaken by the County. The capital-intensive projects or programs could involve public/private partnerships and address any number of possible long-range opportunities for King and Queen County.

King and Queen has established a capital improvements program as a part of its normal annual budgeting process. It is the County's intent that the Comprehensive Plan be consulted annually by the Board of Supervisors and the County Administrator in the development of the Capital Improvements Program. For the current copy of the approved Capital Improvement Plan, see Appendix L.

Other Capital Improvements Plans and Program Activities

In addition to the CIP recommendation summarized above, there are other programs, projects and advanced planning efforts which have been recognized by the Comprehensive Plan. These include:

• *Update zoning, subdivision and site plan controls as needed to achieve compatibility with the recommendations contained in the Comprehensive Plan.*

• *Proactively enforce zoning regulations to protect the viability and value of neighborhoods and other properties within the County.*

• *Utilize existing regional and state agencies and boards to optimally market the image of King and Queen County.*

King and Queen County, Virginia

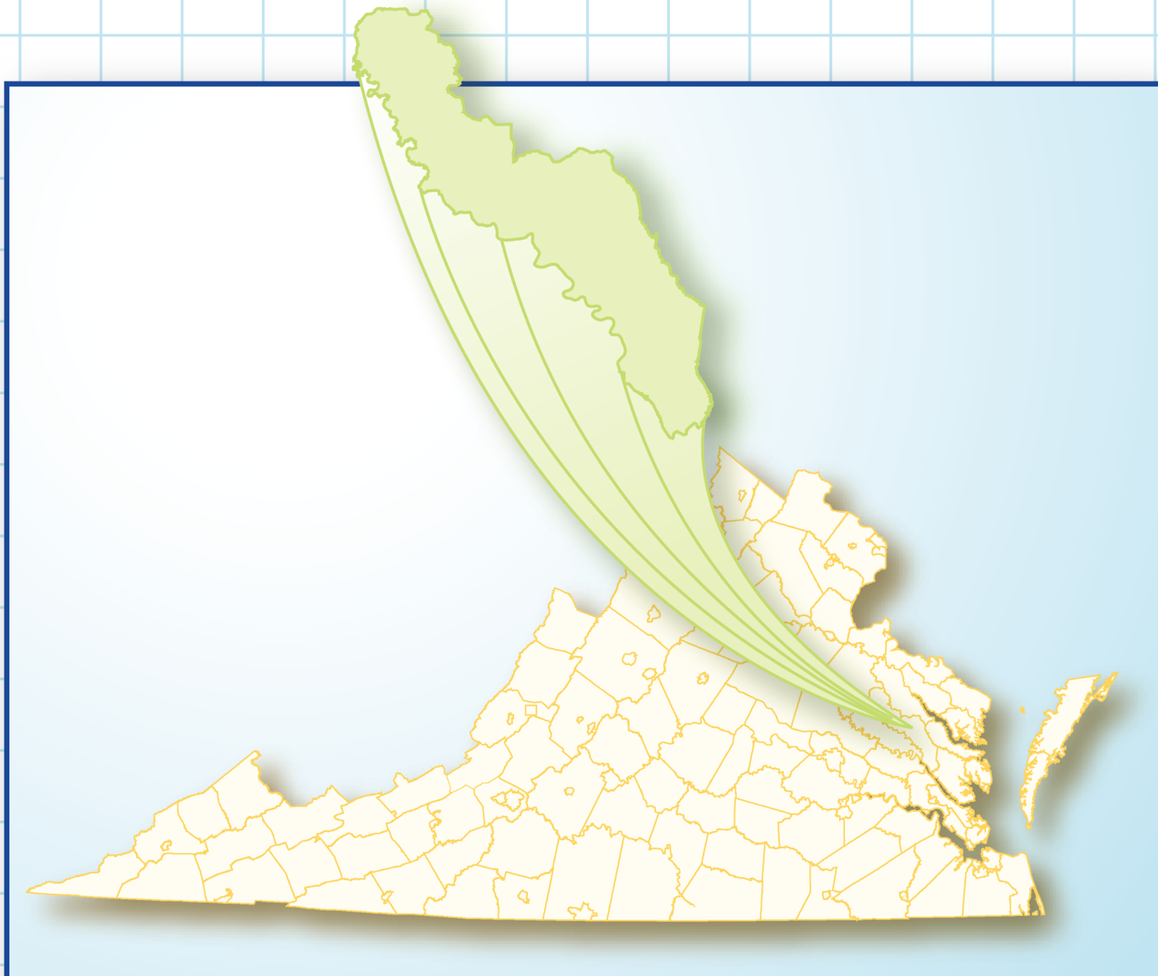
2030 Comprehensive Plan

Appendix A:
Virginia Employment Commission
Community Profile

Virginia

COMMUNITY PROFILE

King and Queen County



Virginia Employment Commission

703 East Main Street • Richmond, Virginia 23219

Tel: (804) 786-8223 • www.VirginiaLMI.com

Last updated: 4/7/2016 1:28:02 AM

Table of Contents

I. Introduction

This report provides a community profile of King and Queen County. It is intended to complement the information found in our Virginia Workforce Connection application, which can be accessed online at:

www.VirginiaLMI.com

The report is divided into three major sections. The first contains a profile of regional demographic characteristics and trends, the second supplies similar information for the regional economy, and the third provides a profile of regional education characteristics.

II. Demographic Profile

Overview

This Demographic Profile provides an in-depth analysis of the population in King and Queen County. Most of the data is produced by the U.S. Census Bureau, and includes demographic characteristics such as age, race/ethnicity, and gender.

Related Terms and Definitions

Ability to speak English
For people who speak a language other than English at home, the response represents the person's own perception of his or her ability to speak English. Because census questionnaires are usually completed by one household member, the responses may represent the perception of another household member.

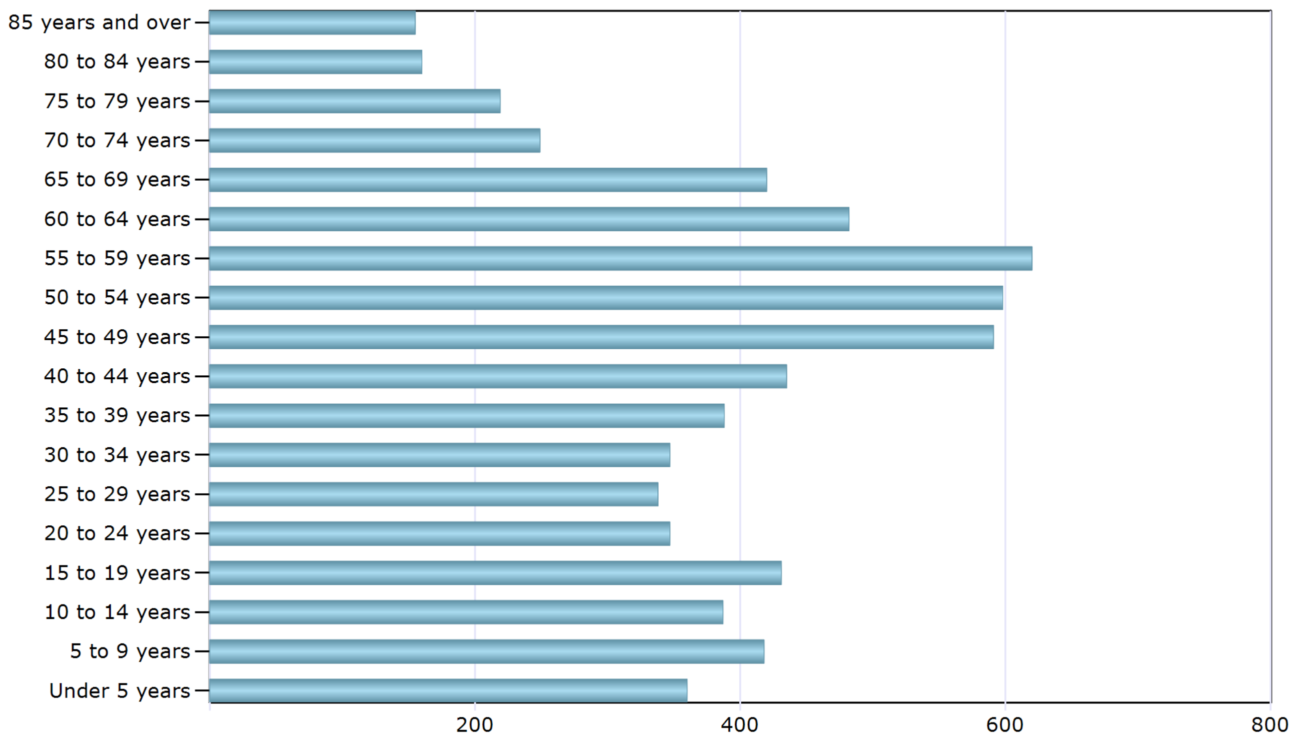
Age
The age classification is based on the age of the person in complete years as of April 1, 2010. The age of the person usually was derived from their date of birth information. Their reported age was used only when date of birth information was unavailable.

Gender
The data on gender were derived from answers to a question that was asked of all people. Individuals were asked to mark either "male" or "female" to indicate their gender. For most cases in which gender was not reported, it was determined by the appropriate entry from the person's given (i.e., first) name and household relationship. Otherwise, gender was imputed according to the relationship to the householder and the age of the person.

Race
The concept of race as used by the Census Bureau reflects self-identification by people according to the race or races with which they most closely identify. The categories are sociopolitical constructs and should not be interpreted as being scientific or anthropological in nature. Furthermore, the race categories include both racial and national-origin groups.

Please note: In the past, our population by race/ethnicity data has always excluded the Hispanic ethnicity from each race category. Starting in January 2013, each race category now includes all ethnicities.

Population by Age



	King and Queen County	Virginia	United States
Under 5 years	360	509,625	20,201,362
5 to 9 years	418	511,849	20,348,657
10 to 14 years	387	511,246	20,677,194
15 to 19 years	431	550,965	22,040,343
20 to 24 years	347	572,091	21,585,999
25 to 29 years	338	564,342	21,101,849
30 to 34 years	347	526,077	19,962,099
35 to 39 years	388	540,063	20,179,642
40 to 44 years	435	568,865	20,890,964
45 to 49 years	591	621,155	22,708,591
50 to 54 years	598	592,845	22,298,125
55 to 59 years	620	512,595	19,664,805
60 to 64 years	482	442,369	16,817,924
65 to 69 years	420	320,302	12,435,263
70 to 74 years	249	229,502	9,278,166
75 to 79 years	219	173,929	7,317,795
80 to 84 years	160	130,801	5,743,327
85 years and over	155	122,403	5,493,433
	6,945	**8,001,024**	**308,745,538**

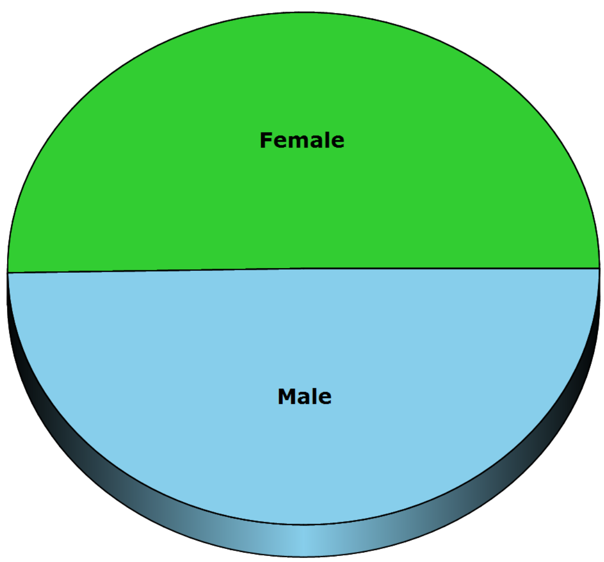
Source: 2010 Census.

Population by Race/Ethnicity

	King and Queen County	Virginia	United States
Total			
Total Population	6,945	8,001,024	308,745,538
Race			
White	4,663	5,486,852	223,553,265
Black or African American	1,975	1,551,399	38,929,319
American Indian or Alaska Native	111	29,225	2,932,248
Asian	17	439,890	14,674,252
Native Hawaiian/Pacific Islander		5,980	540,013
Other	55	254,278	19,107,368
Multiple Races	124	233,400	9,009,073
Ethnicity			
Not Hispanic or Latino (of any race)	6,761	7,369,199	258,267,944
Hispanic or Latino (of any race)	184	631,825	50,477,594

Source: 2010 Census.

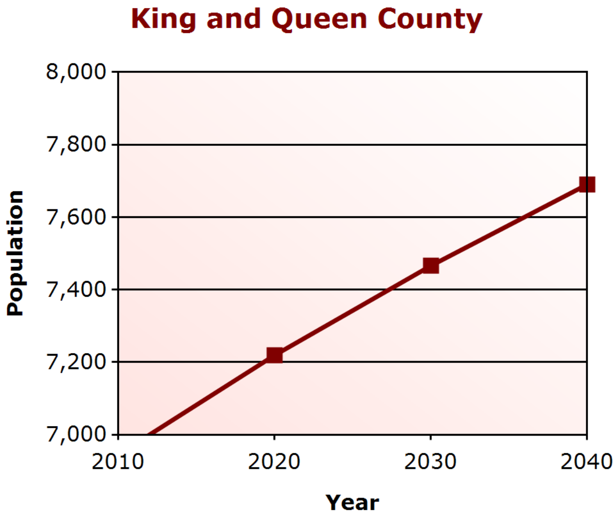
Population by Gender

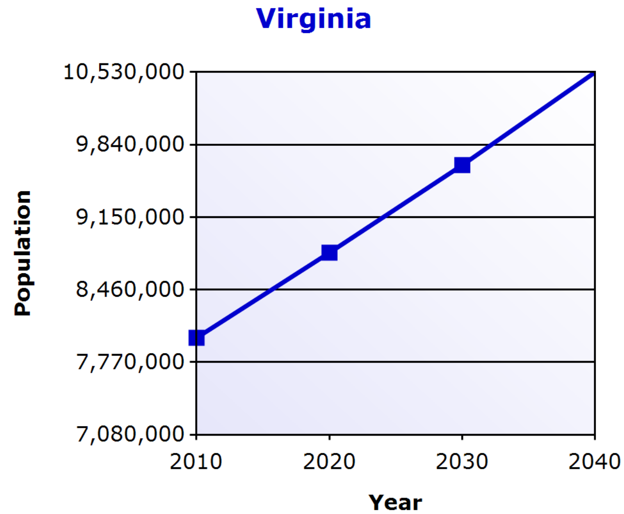


	King and Queen County	Virginia	United States
Male	3,454	3,925,983	151,781,326
Female	3,491	4,075,041	156,964,212
	6,945	**8,001,024**	**308,745,538**

Source: 2010 Census.

Population Change





	King and Queen County	(% change)	Virginia	(% change)
2000	6,630		7,079,030	
2010	6,945	4.75 %	8,001,024	13.02 %
2020	7,219	3.95 %	8,811,512	10.13 %
2030	7,466	3.42 %	9,645,281	9.46 %
2040	7,690	3.00 %	10,530,229	9.17 %

Source: U.S. Census Bureau, Virginia Employment Commission.

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Population Projections by Age and Gender

	2020		2030		2040	
	Female	Male	Female	Male	Female	Male
Under 5 years	159	173	157	172	156	171
5 to 9 years	183	184	187	188	189	191
10 to 14 years	194	191	185	182	188	186
15 to 19 years	192	237	174	215	183	226
20 to 24 years	133	159	137	163	134	160
25 to 29 years	168	187	173	193	161	180
30 to 34 years	176	171	153	149	162	157
35 to 39 years	189	214	205	232	217	246
40 to 44 years	214	185	221	191	197	171
45 to 49 years	211	225	226	241	253	270
50 to 54 years	252	262	238	248	254	264
55 to 59 years	366	345	279	263	308	290
60 to 64 years	311	319	276	283	269	276
65 to 69 years	294	305	347	361	273	283
70 to 74 years	214	180	288	243	263	222
75 to 79 years	175	122	257	179	313	218
80 to 84 years	93	59	152	96	211	134
85 years and over	124	51	150	61	221	90
	3,648	**3,569**	**3,805**	**3,660**	**3,952**	**3,735**
	7,217		**7,465**		**7,687**	

Source: Virginia Employment Commission.

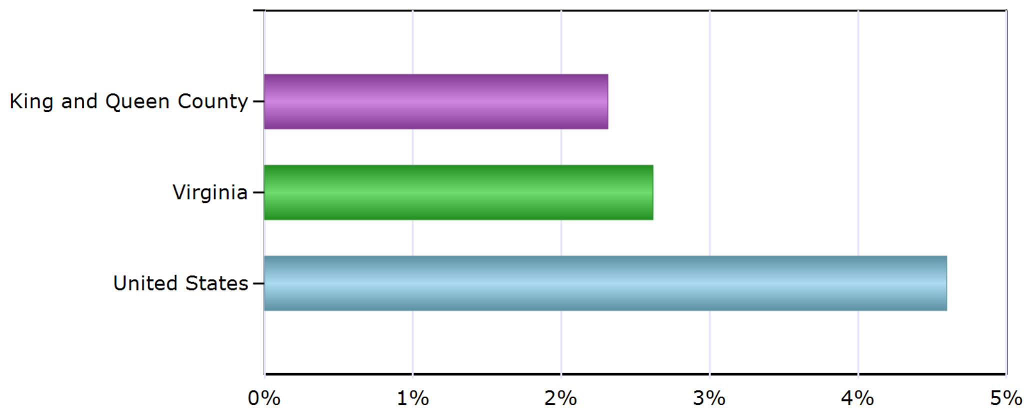
Population Projections by Race/Ethnicity

	2020	2030	2040
Total			
Total Population	7,219	7,466	7,690
Race			
White	4,796	4,833	4,805
Black or African American	1,988	1,981	1,932
Asian	23	32	47
Other	413	620	906
Ethnicity			
Not Hispanic or Latino (of any race)	6,883	6,884	6,809
Hispanic or Latino (of any race)	336	582	882

Source: Virginia Employment Commission.

English Language Skills

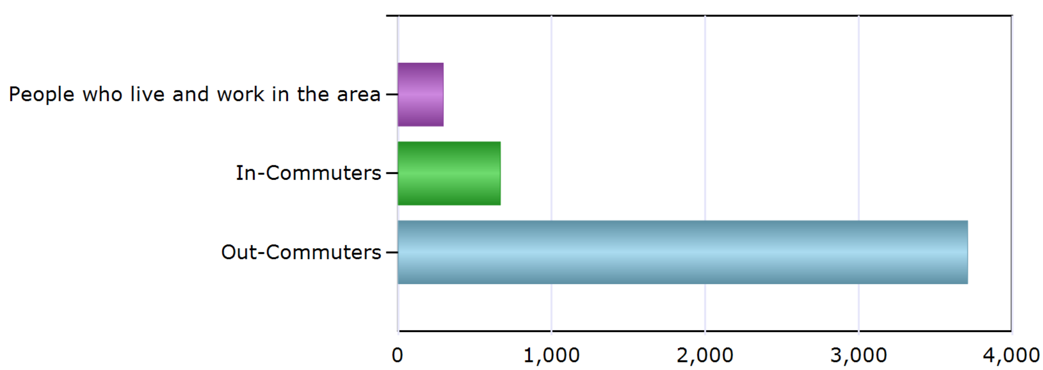
(Age 5 and over that speak English less than well)



	Total	Speak English less than well	Percent
King and Queen County	6,527	151	2.31%
Virginia	7,590,865	198,700	2.62%
United States	291,484,482	13,402,711	4.60%

Source: U.S. Census Bureau
American Community Survey, 2009-2013.

Commuting Patterns



Commuting Patterns	
People who live and work in the area	293
In-Commuters	665
Out-Commuters	3,710
Net In-Commuters (In-Commuters minus Out-Commuters)	-3,045

Source: U.S. Census Bureau,
OnTheMap Application and LEHD Origin-Destination Employment Statistics, 2012.

Top 10 Places Residents are Commuting To

Area	Workers
Henrico County, VA	364
Richmond city, VA	291
King William County, VA	268
Hanover County, VA	227
James City County, VA	217
Chesterfield County, VA	170
Newport News city, VA	157
Essex County, VA	146
Gloucester County, VA	134
Fairfax County, VA	114

Top 10 Places Workers are Commuting From

Area	Workers
King William County, VA	120
Middlesex County, VA	94
Essex County, VA	55
Gloucester County, VA	55
Henrico County, VA	22
Hanover County, VA	21
James City County, VA	20
Chesterfield County, VA	20
Mathews County, VA	19
Caroline County, VA	19

Source: U.S. Census Bureau,
OnTheMap Application and LEHD Origin-Destination Employment Statistics, 2012.

Please Note: Commuting patterns data is no longer produced from the Decennial Census. As an alternative, we are providing commuting data from the U.S. Census Bureau's OnTheMap application and LEHD Origin-Destination Employment Statistics program. Since this data is produced from an entirely different data set, it is not advisable to compare the new data with previously released commuting patterns. For more information about the OnTheMap application or the LEHD program, please visit the following website:

http://lehd.ces.census.gov

III. Economic Profile

Overview

The Economic Profile of King and Queen County consists primarily of data produced by the Virginia Employment Commission, U.S. Census Bureau, and the Bureau of Labor Statistics.

Related Terms and Definitions

Average Weekly Wage
Computed as average quarterly wages divided by 13.

Consumer Price Index (CPI)
The Consumer Price Index measures the average change over time in the prices paid by urban consumers for a representative market basket of consumer goods and services.

Local Employment Dynamics (LED)
The Local Employment Dynamics Program at the Census Bureau, together with its state partners, provides employment information at the county, city, and Workforce Investment Area level. This information tracks workers in different industries by age and gender and provides statistics on job creation, separation, turnover, and wages.

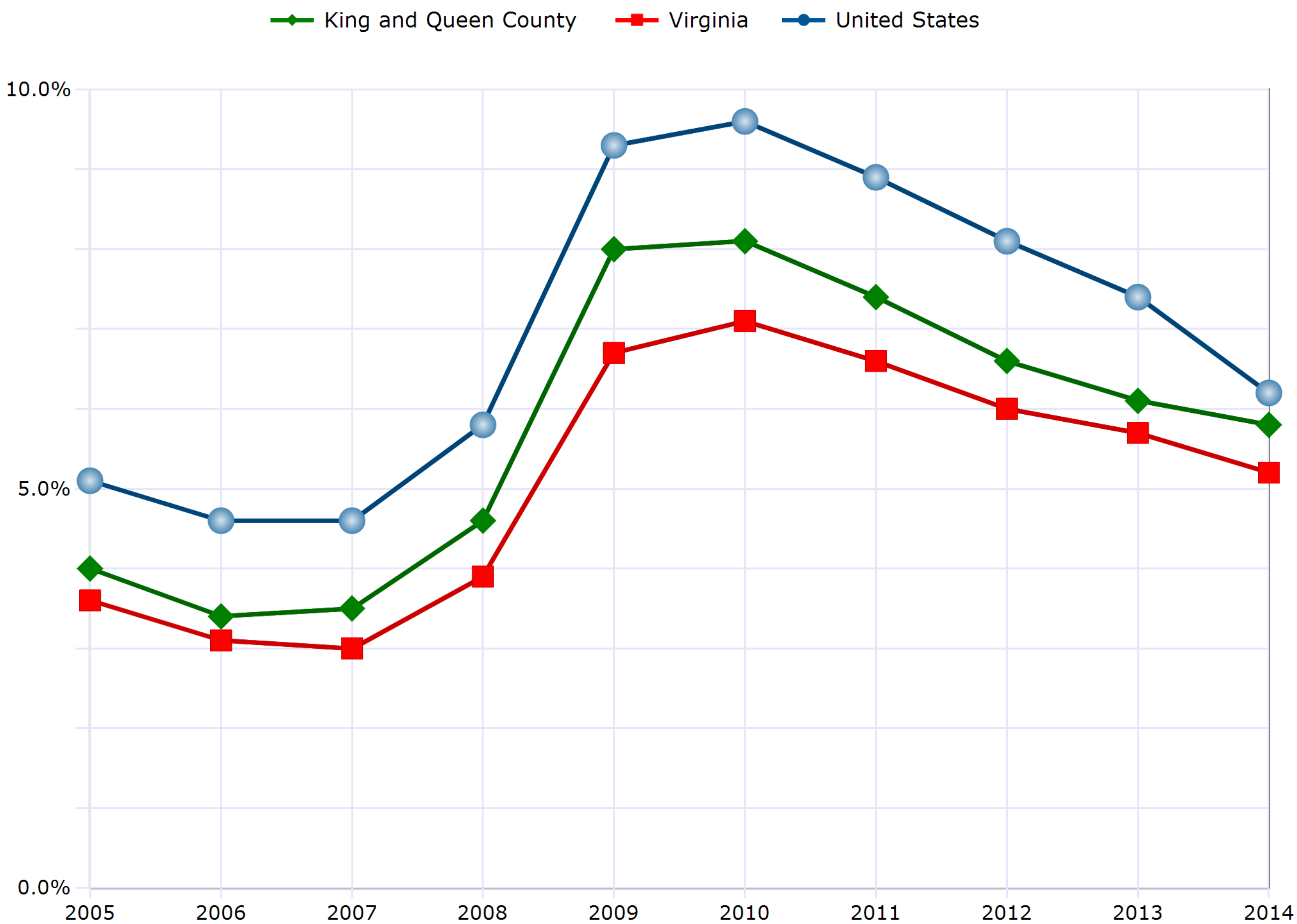
Quarterly Census of Employment & Wages (QCEW)
A federal/state cooperative program that collects and compiles employment and wage data for workers covered by state unemployment insurance (UI) laws and the federal civilian workers covered by Unemployment Compensation for Federal Employees (UCFE). These data are maintained at the state in micro and macro levels and also sent to BLS quarterly.

Unemployment Insurance (UI)
Unemployment insurance is a program for the accumulation of funds paid by employers to be used for the payment of unemployment insurance to workers during periods of unemployment which are beyond the workers' control. Unemployment insurance replaces a part of the worker's wage loss if he becomes eligible for payments.

Unemployment Rate
The number of unemployed people as a percentage of the labor force.

Unemployment Rates

Trends

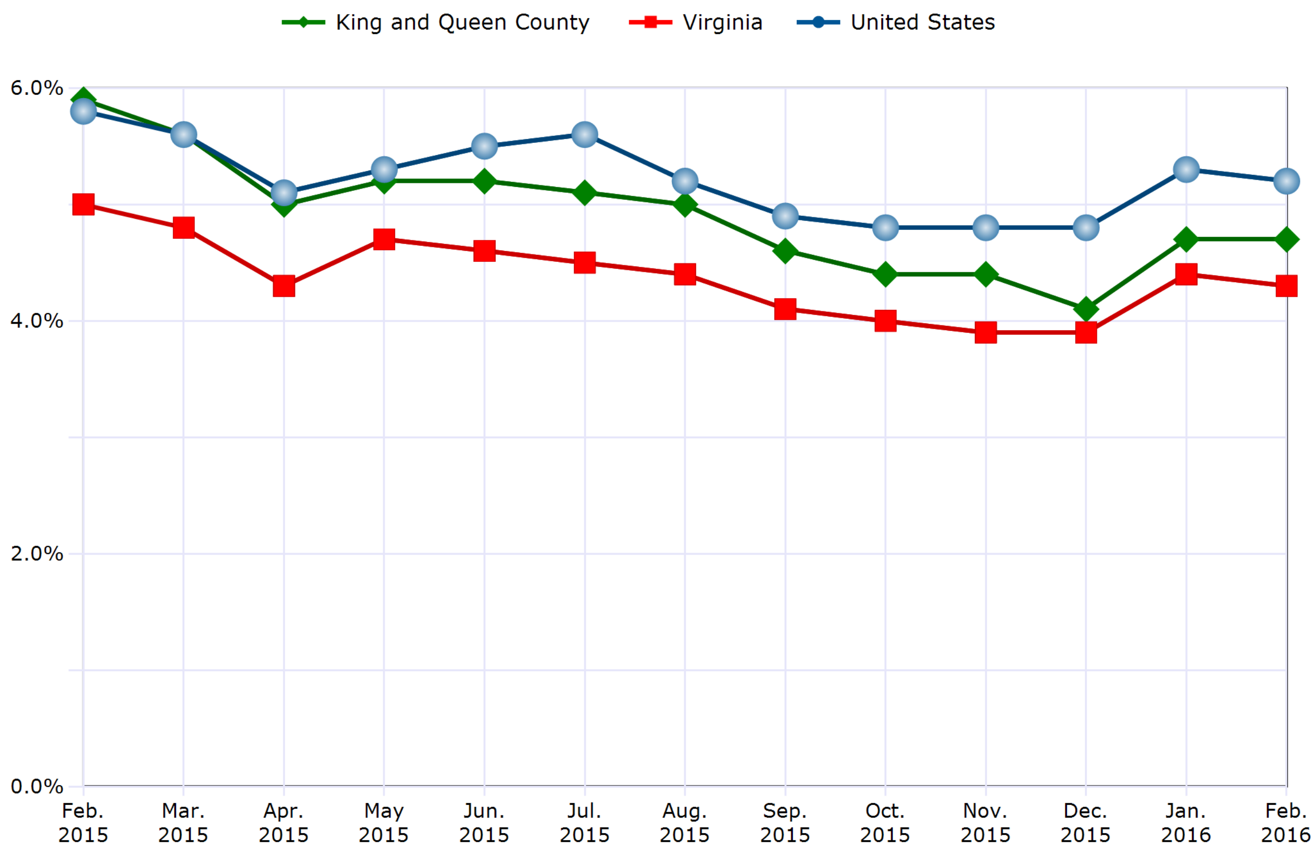


	King and Queen County	Virginia	United States
2005	4.0%	3.6%	5.1%
2006	3.4%	3.1%	4.6%
2007	3.5%	3.0%	4.6%
2008	4.6%	3.9%	5.8%
2009	8.0%	6.7%	9.3%
2010	8.1%	7.1%	9.6%
2011	7.4%	6.6%	8.9%
2012	6.6%	6.0%	8.1%
2013	6.1%	5.7%	7.4%
2014	5.8%	5.2%	6.2%

Source: Virginia Employment Commission,
Local Area Unemployment Statistics.

Unemployment Rates

Past 12 Months



	King and Queen County	Virginia	United States
Feb. 2015	5.9%	5.0%	5.8%
Mar. 2015	5.6%	4.8%	5.6%
Apr. 2015	5.0%	4.3%	5.1%
May 2015	5.2%	4.7%	5.3%
Jun. 2015	5.2%	4.6%	5.5%
Jul. 2015	5.1%	4.5%	5.6%
Aug. 2015	5.0%	4.4%	5.2%
Sep. 2015	4.6%	4.1%	4.9%
Oct. 2015	4.4%	4.0%	4.8%
Nov. 2015	4.4%	3.9%	4.8%
Dec. 2015	4.1%	3.9%	4.8%
Jan. 2016	4.7%	4.4%	5.3%
Feb. 2016	4.7%	4.3%	5.2%

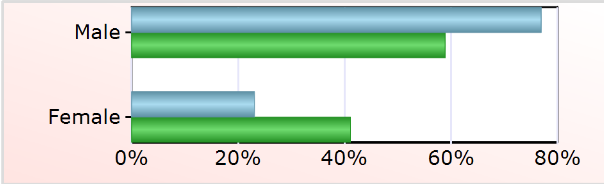
Source: Virginia Employment Commission,
Local Area Unemployment Statistics.

Characteristics of the Insured Unemployed

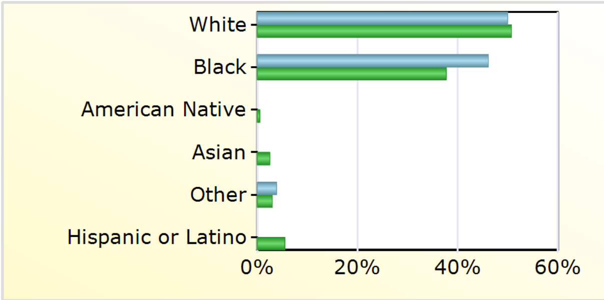
King and Queen County - (26 claimants)

Virginia - (35,968 claimants)

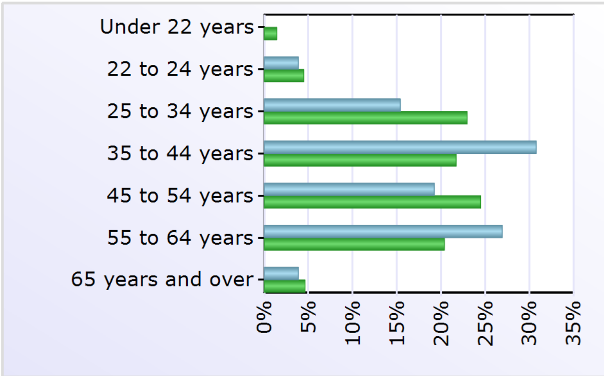
Gender	King and Queen County	Virginia
Male	20	21,181
Female	6	14,787
Unspecified		



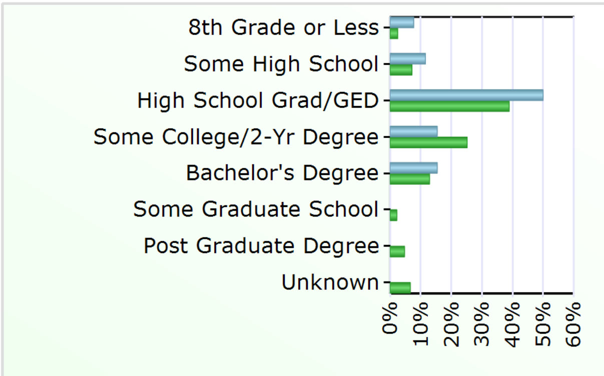
Race	King and Queen County	Virginia
White	13	18,258
Black	12	13,576
American Native		181
Asian		902
Other	1	1,073
Hispanic or Latino		1,978



Age	King and Queen County	Virginia
Under 22 years		509
22 to 24 years	1	1,608
25 to 34 years	4	8,254
35 to 44 years	8	7,807
45 to 54 years	5	8,803
55 to 64 years	7	7,328
65 years and over	1	1,659
Unknown		



Education	King and Queen County	Virginia
8th Grade or Less	2	885
Some High School	3	2,557
High School Grad/GED	13	13,995
Some College/2-Yr Degree	4	9,055
Bachelor's Degree	4	4,637
Some Graduate School		784
Post Graduate Degree		1,688
Unknown		2,367

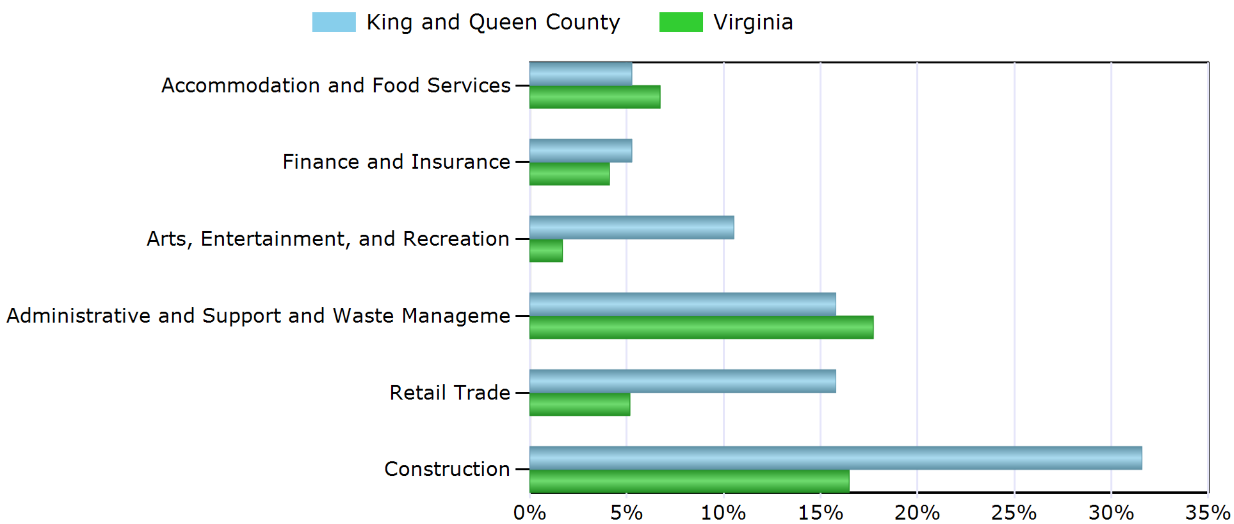


Source: Virginia Employment Commission,
Characteristics of the Insured Unemployed, March 2016.

Characteristics of the Insured Unemployed

Top 5 Industries With Largest Number of Claimants in King and Queen County

(excludes unclassified)

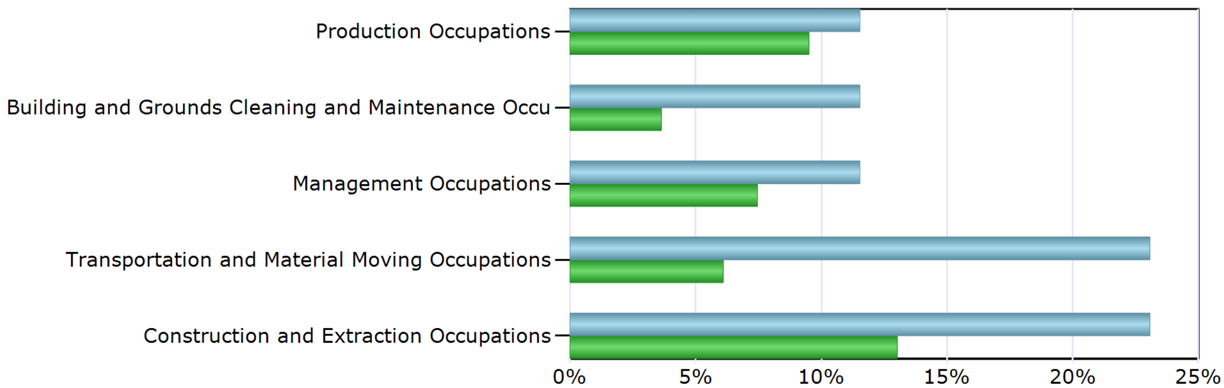


Industry	King and Queen County	Virginia
Agriculture, Forestry, Fishing and Hunting		152
Mining, Quarrying, and Oil and Gas Extraction		445
Utilities		25
Construction	6	4,926
Manufacturing		632
Wholesale Trade		1,141
Retail Trade	3	1,543
Transportation and Warehousing		847
Information		796
Finance and Insurance	1	1,227
Real Estate and Rental and Leasing		574
Professional, Scientific, and Technical Servi		3,249
Management of Companies and Enterprises		255
Administrative and Support and Waste Manageme	3	5,298
Educational Services		343
Health Care and Social Assistance		2,415
Arts, Entertainment, and Recreation	2	504
Accommodation and Food Services	1	2,009
Other Services (except Public Administration)		830
Unclassified	3	2,686

Source: Virginia Employment Commission,
Characteristics of the Insured Unemployed, March 2016.

Characteristics of the Insured Unemployed

Top 5 Occupation Groups With Largest Number of Claimants in King and Queen County
(excludes unclassified)

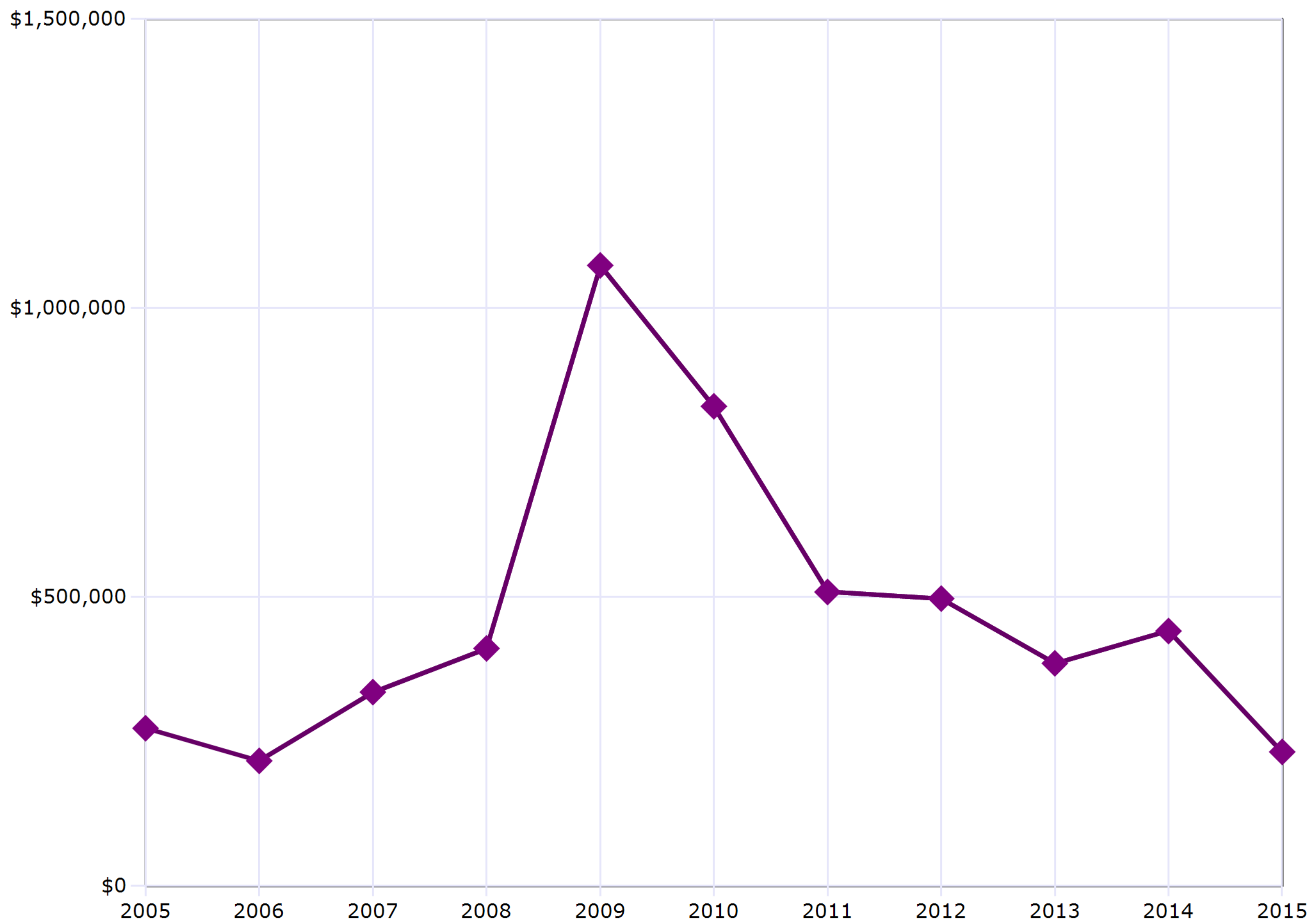


Occupation	King and Queen County	Virginia
Management Occupations	3	2,684
Business and Financial Operations Occupations		1,339
Computer and Mathematical Occupations		1,055
Architecture and Engineering Occupations		585
Life, Physical, and Social Science Occupations		133
Community and Social Service Occupations		225
Legal Occupations		175
Education, Training, and Library Occupations	1	402
Arts, Design, Entertainment, Sports, and Media Occ		536
Healthcare Practitioners and Technical Occupations		495
Healthcare Support Occupations		852
Protective Service Occupations		346
Food Preparation and Serving Related Occupations		1,467
Building and Grounds Cleaning and Maintenance Occu	3	1,309
Personal Care and Service Occupations		503
Sales and Related Occupations	1	2,187
Office and Administrative Support Occupations	1	4,434
Farming, Fishing, and Forestry Occupations		249
Construction and Extraction Occupations	6	4,684
Installation, Maintenance, and Repair Occupations	1	1,414
Production Occupations	3	3,420
Transportation and Material Moving Occupations	6	2,193
Military Specific Occupations		286
Unknown Occupation Code	1	4,995

Source: Virginia Employment Commission,
Characteristics of the Insured Unemployed, March 2016.

Unemployment Insurance Payments

Trends

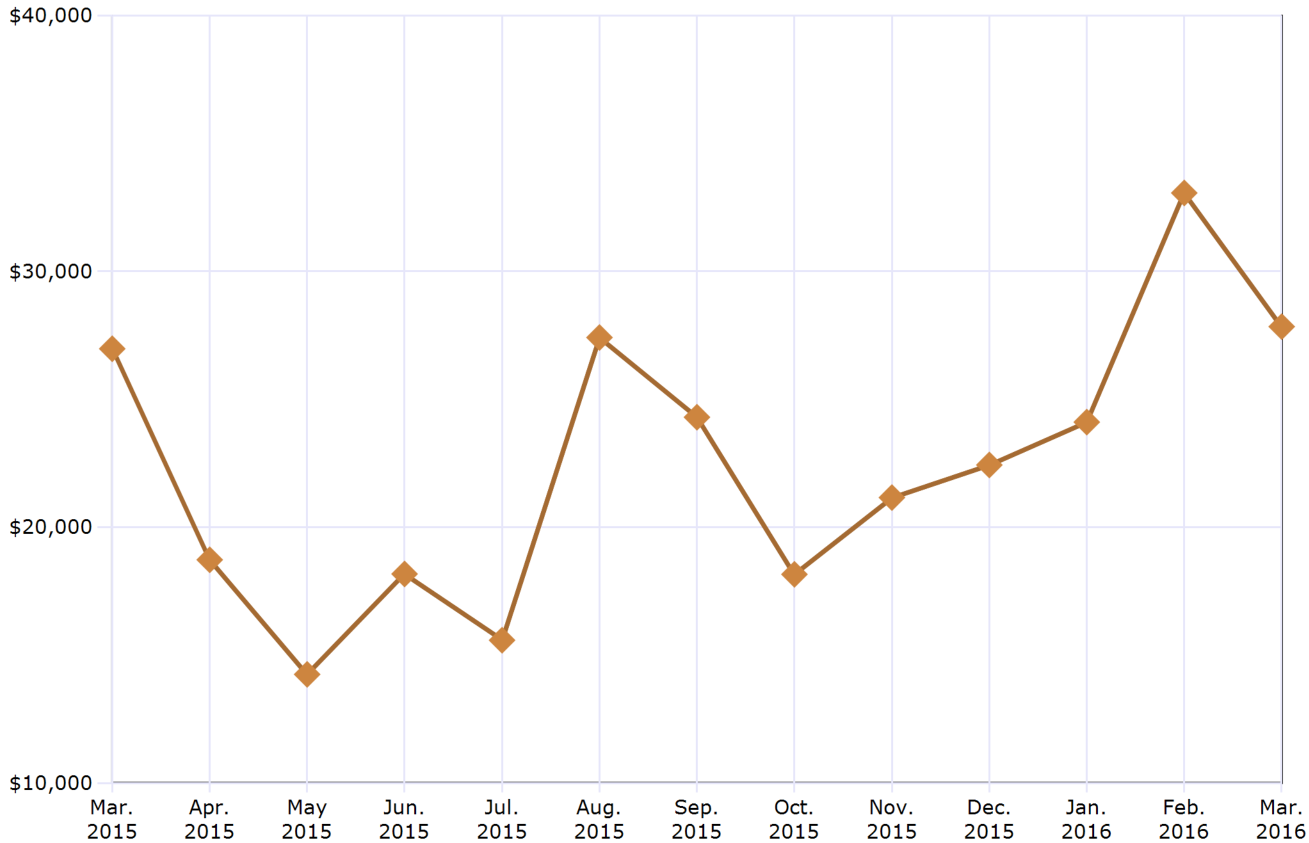


	King and Queen County		Virginia	
	Weeks Paid	Amount Paid	Weeks Paid	Amount Paid
2005	1,233	$272,779	1,382,659	$327,192,126
2006	958	$216,379	1,334,848	$334,996,815
2007	1,337	$335,405	1,384,335	$364,789,088
2008	1,499	$410,994	1,699,923	$468,544,246
2009	3,811	$1,073,821	3,782,630	$1,069,206,277
2010	3,089	$829,973	2,727,738	$748,174,724
2011	2,038	$508,610	2,242,341	$612,702,314
2012	1,901	$497,191	2,102,986	$592,044,339
2013	1,431	$385,222	1,999,039	$574,074,609
2014	1,622	$441,037	1,684,690	$490,522,709
2015	850	$231,915	1,198,476	$351,290,100

Source: Virginia Employment Commission, Unemployment Insurance Program.

Unemployment Insurance Payments

Past 12 Months



	King and Queen County		Virginia	
	Weeks Paid	Amount Paid	Weeks Paid	Amount Paid
Mar. 2015	102	$26,978	148,614	$43,288,405
Apr. 2015	70	$18,730	103,605	$30,399,717
May 2015	52	$14,252	95,303	$27,960,737
Jun. 2015	68	$18,176	119,837	$34,597,061
Jul. 2015	64	$15,587	104,901	$30,135,402
Aug. 2015	95	$27,418	113,783	$33,126,995
Sep. 2015	86	$24,303	90,254	$27,056,818
Oct. 2015	60	$18,163	86,235	$25,959,114
Nov. 2015	74	$21,162	100,537	$30,148,966
Dec. 2015	78	$22,436	104,030	$30,759,228
Jan. 2016	80	$24,112	112,944	$32,977,566
Feb. 2016	103	$33,067	143,184	$42,572,243
Mar. 2016	83	$27,843	121,436	$36,553,108

Source: Virginia Employment Commission, Unemployment Insurance Program.

Employers by Size of Establishment

	King and Queen County	Virginia
0 to 4 employees	0	0
5 to 9 employees	0	0
10 to 19 employees	0	0
20 to 49 employees	0	0
50 to 99 employees	0	0
100 to 249 employees	0	0
250 to 499 employees	0	0
500 to 999 employees	0	0
1000 and over employees	0	0
	0	**0**

Employment by Size of Establishment

	King and Queen County	Virginia
0 to 4 employees	0	0
5 to 9 employees	0	0
10 to 19 employees	0	0
20 to 49 employees	0	0
50 to 99 employees	0	0
100 to 249 employees	0	0
250 to 499 employees	0	0
500 to 999 employees	0	0
1000 and over employees	0	0
	0	**0**

Note: Asterisks (***) indicate non-disclosable data.
'Zero; no employment' typically represents new startup firms or sole-proprietorships.

Source: Virginia Employment Commission,
Quarterly Census of Employment and Wages (QCEW), 3rd Quarter (July, August, September) 2015.

50 Largest Employers

Source: Virginia Employment Commission,
Quarterly Census of Employment and Wages (QCEW), 3rd Quarter (July, August, September) 2015.

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www.VirginiaLMI.com

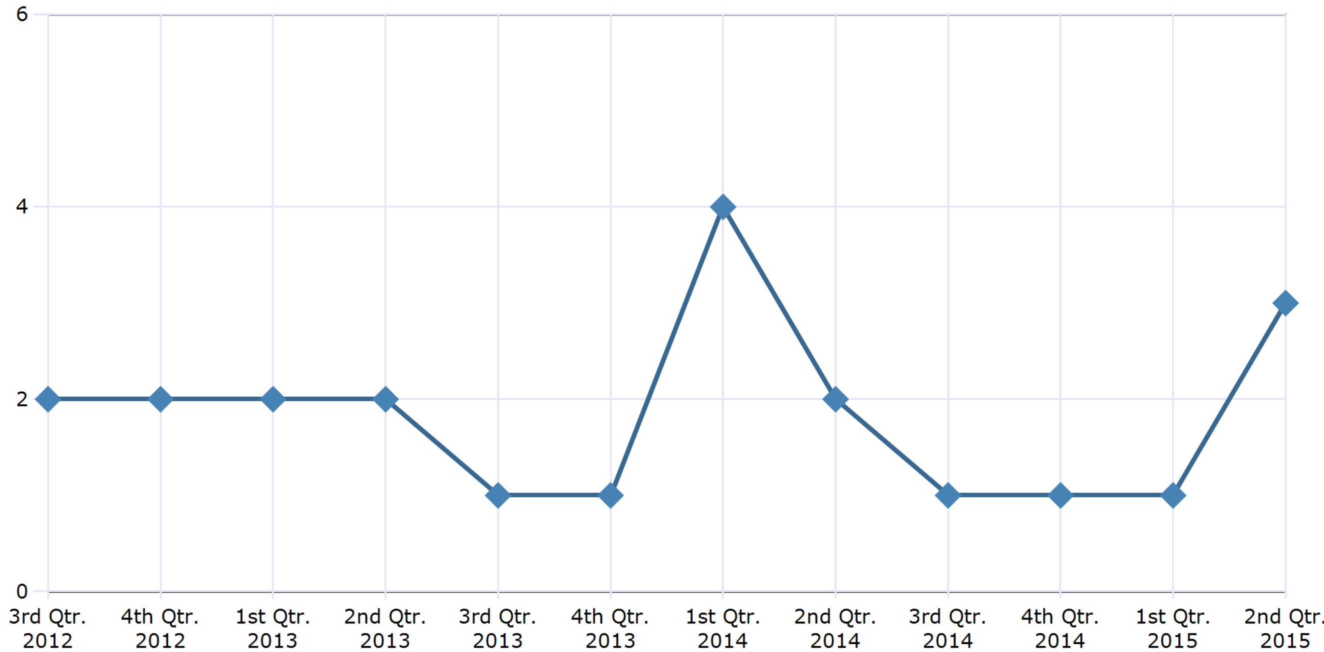
Employment by Industry

Total: 0

Note: Asterisk (*) indicates non-disclosable data.

Source: Virginia Employment Commission,
Quarterly Census of Employment and Wages (QCEW), 3rd Quarter (July, August, September) 2015.

New Startup Firms

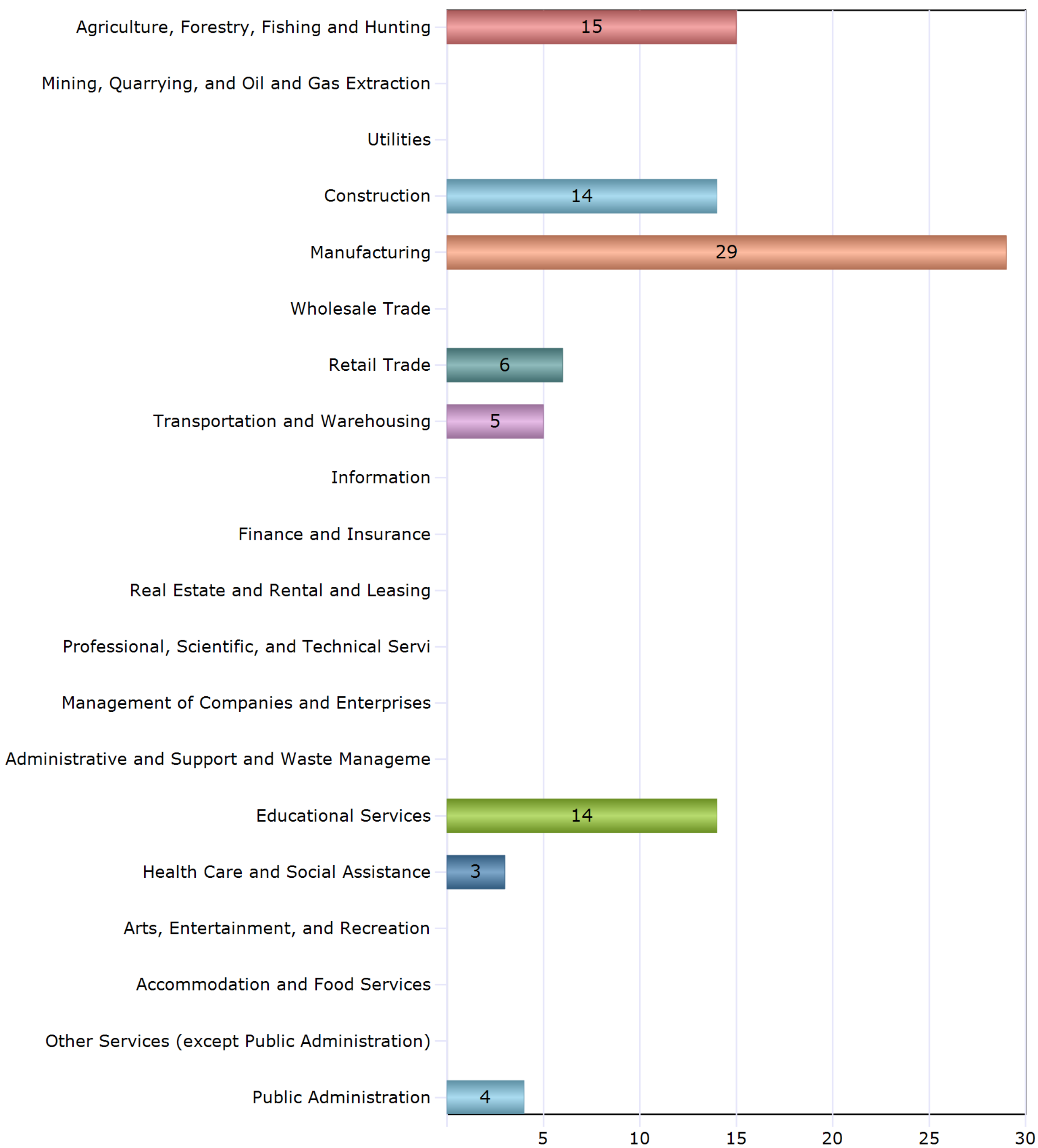


	King and Queen County	Virginia
3rd Qtr. 2012	2	3,977
4th Qtr. 2012	2	2,999
1st Qtr. 2013	2	3,238
2nd Qtr. 2013	2	1,538
3rd Qtr. 2013	1	2,792
4th Qtr. 2013	1	2,751
1st Qtr. 2014	4	3,404
2nd Qtr. 2014	2	3,299
3rd Qtr. 2014	1	3,317
4th Qtr. 2014	1	4,531
1st Qtr. 2015	1	3,923
2nd Qtr. 2015	3	3,465

Note: The following criteria was used to define new startup firms:
1.) Setup and liability date both occurred during 3rd Quarter (July, August, September) 2015
2.) Establishment had no predecessor UI Account Number
3.) Private Ownership
4.) Average employment is less than 250
5.) For multi-unit establishments, the parent company must also meet the above criteria.

Source: Virginia Employment Commission,
Quarterly Census of Employment and Wages (QCEW), 3rd Quarter (July, August, September) 2015.

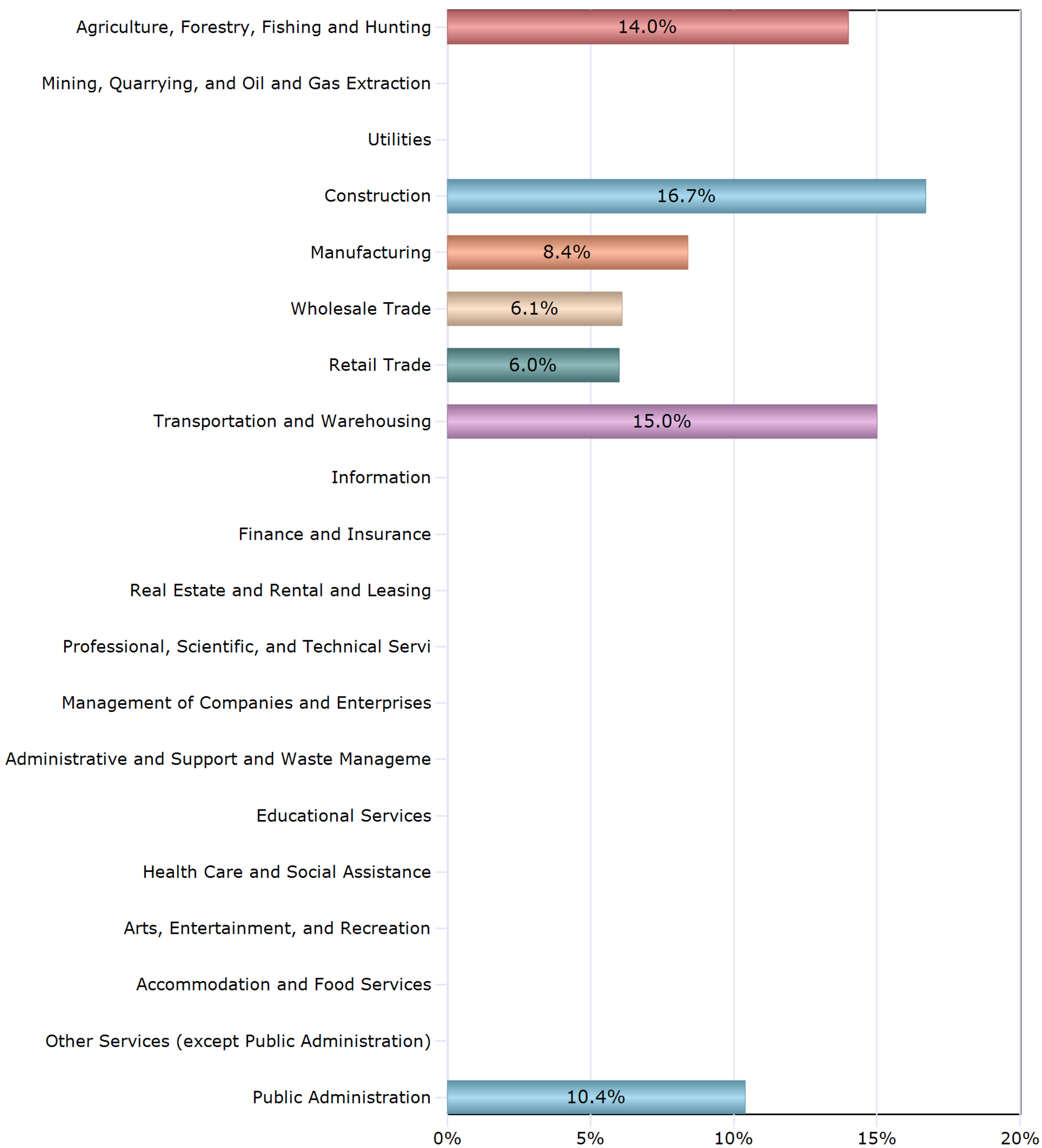
New Hires by Industry



Total: 90

Source: U.S. Census Bureau,
Local Employment Dynamics (LED) Program, 1st Quarter (January, February, March) 2014, all ownerships.

Turnover by Industry



Average: 10.9%

Source: U.S. Census Bureau,
Local Employment Dynamics (LED) Program, 4th Quarter (October, November, December) 2013, all ownerships.

Average Weekly Wage by Industry

Note: Asterisk (*) indicates non-disclosable data.

Source: Virginia Employment Commission,
Quarterly Census of Employment and Wages (QCEW), 3rd Quarter (July, August, September) 2015.

Age of Workers by Industry

	14—18	19—21	22—24	25—34	35—44	45—54	55—64	65+
Total, All Industries	8	20	33	135	138	217	176	84
Agriculture, Forestry, Fishing and Hunting			3	11	9	15	8	8
Mining, Quarrying, and Oil and Gas Extraction								
Utilities								
Construction		5	6	12	13	19	9	11
Manufacturing		5	7	25	14	41	28	11
Wholesale Trade				6	10	8	15	6
Retail Trade				7	9	12	13	6
Transportation and Warehousing				3	3	12	11	3
Information								
Finance and Insurance								
Real Estate and Rental and Leasing								
Professional, Scientific, and Technical Servi					4	4	3	
Management of Companies and Enterprises								
Administrative and Support and Waste Manageme				3	6	3		
Educational Services				24	40	48	48	18
Health Care and Social Assistance			2	7	7	13	11	4
Arts, Entertainment, and Recreation								
Accommodation and Food Services	4		3	6	4	4	4	3
Other Services (except Public Administration)				7	3	7		3
Public Administration				19	12	23	14	7

Source: U.S. Census Bureau,
Local Employment Dynamics (LED) Program, 1st Quarter (January, February, March) 2014, all ownerships.

What is LED?

Developed by the U.S. Census Bureau, the Local Employment Dynamics (LED) program merges Virginia's Unemployment Compensation wage and employer records with Census demographic data. Read more about LED on the following website:

http://lehd.did.census.gov/led/

Industry Employment and Projections

Long Term

	Employment			Percent	
	Estimated 2012	Projected 2022	Change	Total	Annual
Total, All Industries	162,160	189,818	27,658	17.06%	1.59%
Agriculture, Forestry, Fishing and Hunting	469	525	56	11.94%	1.13%
Mining, Quarrying, and Oil and Gas Extraction	186	185	-1	-.54%	-.05%
Utilities	509	452	-57	-11.2%	-1.18%
Construction	7,051	9,070	2,019	28.63%	2.55%
Manufacturing	8,607	8,468	-139	-1.62%	-.16%
Wholesale Trade	4,312	4,655	343	7.95%	.77%
Retail Trade	21,622	23,700	2,078	9.61%	.92%
Transportation and Warehousing	3,112	3,379	267	8.58%	.83%
Information	1,543	1,473	-70	-4.54%	-.46%
Finance and Insurance	7,330	9,246	1,916	26.14%	2.35%
Real Estate and Rental and Leasing	1,616	1,808	192	11.88%	1.13%
Professional, Scientific, and Technical Servi	9,436	12,577	3,141	33.29%	2.92%
Management of Companies and Enterprises	1,934	1,780	-154	-7.96%	-.83%
Administrative and Support and Waste Manageme	4,526	5,360	834	18.43%	1.71%
Educational Services	17,456	20,035	2,579	14.77%	1.39%
Health Care and Social Assistance	19,072	25,807	6,735	35.31%	3.07%
Arts, Entertainment, and Recreation	1,989	2,282	293	14.73%	1.38%
Accommodation and Food Services	15,616	20,761	5,145	32.95%	2.89%
Other Services (except Public Administration)	5,476	6,489	1,013	18.5%	1.71%

Note: Asterisks (***) indicate non-disclosable data.
Projections data is for Bay Consortium (LWIA XIII). No data available for King and Queen County.

Source: Virginia Employment Commission,
Long Term Industry and Occupational Projections, 2012-2022.

Industry Employment and Projections

Short Term

	Employment			Percent	
	Estimated 2015	Projected 2017	Change	Total	Annual
Total, All Industries	3,977,496	4,093,656	116,160	2.92%	1.45%
Agriculture, Forestry, Fishing and Hunting	4,210	4,433	223	5.3%	2.61%
Mining, Quarrying, and Oil and Gas Extraction	6,805	5,869	-936	-13.75%	-7.13%
Utilities	10,717	10,695	-22	-.21%	-.1%
Construction	185,026	195,598	10,572	5.71%	2.82%
Manufacturing	232,632	233,073	441	.19%	.09%
Wholesale Trade	110,001	111,188	1,187	1.08%	.54%
Retail Trade	412,345	421,889	9,544	2.31%	1.15%
Transportation and Warehousing	112,837	117,619	4,782	4.24%	2.1%
Information	69,554	68,654	-900	-1.29%	-.65%
Finance and Insurance	131,712	136,266	4,554	3.46%	1.71%
Real Estate and Rental and Leasing	52,593	53,535	942	1.79%	.89%
Professional, Scientific, and Technical Servi	394,584	409,625	15,041	3.81%	1.89%
Management of Companies and Enterprises	74,086	75,252	1,166	1.57%	.78%
Administrative and Support and Waste Manageme	224,339	236,780	12,441	5.55%	2.74%
Educational Services	365,350	372,071	6,721	1.84%	.92%
Health Care and Social Assistance	427,570	446,476	18,906	4.42%	2.19%
Arts, Entertainment, and Recreation	56,096	57,991	1,895	3.38%	1.68%
Accommodation and Food Services	334,516	349,857	15,341	4.59%	2.27%
Other Services (except Public Administration)	133,850	136,332	2,482	1.85%	.92%

Note: Asterisks (***) indicate non-disclosable data.
Projections data is for Virginia Statewide. No data available for King and Queen County.

Source: Virginia Employment Commission,
Short Term Industry and Occupational Projections, 2015-2017.

Occupation Employment and Projections

Long Term

	Employment			Openings		
	Estimated 2012	Projected 2022	% Change	Replace -ments	Growth	Total
Total, All Occupations	162,160	189,818	17.06%	3,932	2,854	6,786
Management Occupations	6,734	7,527	11.78%	138	84	222
Business and Financial Operations Occupations	6,310	7,187	13.9%	119	90	209
Computer and Mathematical Occupations	5,852	7,232	23.58%	94	142	236
Architecture and Engineering Occupations	4,029	4,156	3.15%	93	21	114
Life, Physical, and Social Science Occupations	1,452	1,511	4.06%	37	11	48
Community and Social Service Occupations	2,038	2,419	18.69%	46	38	84
Legal Occupations	791	892	12.77%	13	11	24
Education, Training, and Library Occupations	12,835	14,987	16.77%	274	215	489
Arts, Design, Entertainment, Sports, and Media Occupations	1,791	1,991	11.17%	42	22	64
Healthcare Practitioners and Technical Occupations	7,795	10,263	31.66%	168	247	415
Healthcare Support Occupations	3,717	5,182	39.41%	72	146	218
Protective Service Occupations	3,574	3,946	10.41%	111	37	148
Food Preparation and Serving Related Occupations	15,006	19,996	33.25%	588	499	1,087
Building and Grounds Cleaning and Maintenance Occupations	10,578	13,051	23.38%	213	248	461
Personal Care and Service Occupations	8,610	10,902	26.62%	168	230	398
Sales and Related Occupations	18,210	19,841	8.96%	588	164	752
Office and Administrative Support Occupations	21,433	23,729	10.71%	497	255	752
Farming, Fishing, and Forestry Occupations	1,184	1,129	-4.65%	29	3	32
Construction and Extraction Occupations	6,608	8,097	22.53%	109	149	258
Installation, Maintenance, and Repair Occupations	7,219	8,166	13.12%	170	97	267
Production Occupations	5,864	6,010	2.49%	131	32	163
Transportation and Material Moving Occupations	10,530	11,604	10.2%	234	110	344

Note: Asterisks (***) indicate non-disclosable data.
Projections data is for Bay Consortium (LWIA XIII). No data available for King and Queen County.

Source: Virginia Employment Commission,
Long Term Industry and Occupational Projections, 2012-2022.

Occupation Employment and Projections

Short Term

	Employment			Openings		
	Estimated 2015	Projected 2017	% Change	Replace -ments	Growth	Total
Total, All Occupations	3,977,496	4,093,656	2.92%	92,736	59,171	151,907
Management Occupations	211,684	216,918	2.47%	4,446	2,618	7,064
Business and Financial Operations Occupations	276,201	284,397	2.97%	4,962	4,098	9,060
Computer and Mathematical Occupations	203,891	212,732	4.34%	2,536	4,451	6,987
Architecture and Engineering Occupations	78,184	79,032	1.08%	1,861	488	2,349
Life, Physical, and Social Science Occupations	33,613	34,156	1.62%	820	278	1,098
Community and Social Service Occupations	53,847	56,057	4.1%	1,101	1,105	2,206
Legal Occupations	43,892	44,747	1.95%	712	428	1,140
Education, Training, and Library Occupations	243,781	249,029	2.15%	5,092	2,624	7,716
Arts, Design, Entertainment, Sports, and Media Occupations	61,233	62,553	2.16%	1,408	678	2,086
Healthcare Practitioners and Technical Occupations	205,158	211,360	3.02%	4,160	3,102	7,262
Healthcare Support Occupations	90,672	94,357	4.06%	1,859	1,842	3,701
Protective Service Occupations	105,361	107,514	2.04%	2,354	1,081	3,435
Food Preparation and Serving Related Occupations	327,173	342,449	4.67%	14,249	7,644	21,893
Building and Grounds Cleaning and Maintenance Occupations	151,649	157,036	3.55%	2,839	2,694	5,533
Personal Care and Service Occupations	155,803	163,251	4.78%	3,230	3,728	6,958
Sales and Related Occupations	423,418	432,998	2.26%	13,691	4,790	18,481
Office and Administrative Support Occupations	554,516	566,160	2.1%	11,737	5,962	17,699
Farming, Fishing, and Forestry Occupations	6,868	7,147	4.06%	168	141	309
Construction and Extraction Occupations	187,792	195,659	4.19%	2,884	4,098	6,982
Installation, Maintenance, and Repair Occupations	152,257	156,081	2.51%	3,384	2,080	5,464
Production Occupations	181,313	183,120	1%	3,937	1,364	5,301
Transportation and Material Moving Occupations	229,190	236,903	3.37%	5,304	3,878	9,182

Note: Asterisks (***) indicate non-disclosable data.
Projections data is for Virginia Statewide. No data available for King and Queen County.

Source: Virginia Employment Commission,
Short Term Industry and Occupational Projections, 2015-2017.

Growth Occupations

	Employment			Average Annual Openings			Average Annual Salary
	Estimated 2012	Projected 2022	% Change	Replace -ments	Growth	Total	
Physical Therapist Aides	169	299	76.92%	4	13	17	$26,241
Airline Pilots, Copilots, and Flight Engineers	***	***	***	***	***	***	N/A
Physical Therapist Assistants	140	241	72.14%	3	10	13	$45,565
Nurse Anesthetists	68	117	72.06%	1	5	6	N/A
Dental Hygienists	200	331	65.5%	5	13	18	$67,415
Physician Assistants	***	***	***	***	***	***	$96,408
Physical Therapists	293	471	60.75%	7	18	25	$77,593
Occupational Therapists	144	228	58.33%	2	8	10	$73,573
Dental Assistants	333	517	55.26%	7	18	25	$40,221
Emergency Medical Technicians and Paramedics	555	851	53.33%	15	30	45	$31,558
Telemarketers	***	***	***	***	***	***	$25,056
Personal Care Aides	2,261	3,442	52.23%	16	118	134	$20,303
Nurse Practitioners	98	149	52.04%	2	5	7	$104,123
Information Security Analysts	321	487	51.71%	5	17	22	$93,032
Home Health Aides	347	511	47.26%	7	16	23	$22,002
Cooks, Restaurant	1,522	2,179	43.17%	30	66	96	$23,414
Animal Trainers	264	375	42.05%	12	11	23	N/A
Dentists, General	146	206	41.1%	4	6	10	$215,227
Industrial Engineering Technicians	***	***	***	***	***	***	N/A
Meeting, Convention, and Event Planners	95	133	40%	1	4	5	$56,274

Note: Asterisks (***) indicate non-disclosable data.
Projections and OES wage data are for Bay Consortium (LWIA XIII). No data available for King and Queen County.

Source: Virginia Employment Commission,
Long Term Industry and Occupational Projections, 2012-2022
Occupational Employment Statistics (OES) Survey, 2014.

Declining Occupations

	Employment			Openings		
	Estimated 2012	Projected 2022	% Change	Replace -ments	Growth	Total
Postal Service Clerks	112	83	-25.89%	2	0	2
Data Entry Keyers	197	150	-23.86%	2	0	2
Postal Service Mail Carriers	366	293	-19.95%	13	0	13
Fishers and Related Fishing Workers	***	***	***	***	***	***
Mail Clerks and Mail Machine Operators, Except Postal Service	103	90	-12.62%	2	0	2
Information and Record Clerks, All Other	225	202	-10.22%	5	0	5
Paper Goods Machine Setters, Operators, and Tenders	***	***	***	***	***	***
Computer Occupations, All Other	446	407	-8.74%	7	0	7
Physicists	***	***	***	***	***	***
Social Scientists and Related Workers, All Other	199	183	-8.04%	3	0	3
Engineering Technicians, Except Drafters, All Other	245	226	-7.76%	5	0	5
Legal Support Workers, All Other	118	109	-7.63%	2	0	2
Financial Specialists, All Other	157	146	-7.01%	2	0	2
Human Resources Assistants, Except Payroll and Timekeeping	131	123	-6.11%	3	0	3
Engineers, All Other	453	429	-5.3%	8	0	8
Computer Hardware Engineers	166	158	-4.82%	4	0	4
Aerospace Engineers	227	218	-3.96%	5	0	5
Electronics Engineers, Except Computer	581	561	-3.44%	13	0	13
Industrial Truck and Tractor Operators	548	530	-3.28%	13	0	13
Electrical Power-Line Installers and Repairers	145	141	-2.76%	5	0	5

Note: Asterisks (***) indicate non-disclosable data.
Projections data is for Bay Consortium (LWIA XIII). No data available for King and Queen County.

Source: Virginia Employment Commission,
Long Term Industry and Occupational Projections, 2012-2022.

Consumer Price Index (CPI)

All Urban Consumers (CPI-U)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ann.	% chg
2006	198.300	198.700	199.800	201.500	202.500	202.900	203.500	203.900	202.900	201.800	201.500	201.800	201.600	3.2
2007	202.416	203.499	205.352	206.686	207.949	208.352	208.299	207.917	208.490	208.936	210.177	210.036	207.342	2.8
2008	211.080	211.693	213.528	214.823	216.632	218.815	219.964	219.086	218.783	216.573	212.425	210.228	215.303	3.8
2009	211.143	212.193	212.709	213.240	213.856	215.693	215.351	215.834	215.969	216.177	216.330	215.949	214.537	-0.4
2010	216.687	216.741	217.631	218.009	218.178	217.965	218.011	218.312	218.439	218.711	218.803	219.179	218.056	1.6
2011	220.223	221.309	223.467	224.906	225.964	225.722	225.922	226.545	226.889	226.421	226.230	225.672	224.939	3.2
2012	226.665	227.663	229.392	230.085	229.815	229.478	229.104	230.379	231.407	231.317	230.221	229.601	229.594	2.1
2013	230.280	232.166	232.773	232.531	232.945	233.504	233.596	233.877	234.149	233.546	233.069	233.049	232.957	1.5
2014	233.916	234.781	236.293	237.072	237.900	238.343	238.250	237.852	238.031	237.433	236.151	234.812	236.736	1.6
2015	233.707	234.722	236.119	236.599	237.805	238.638	238.654	238.316	237.945	237.838	237.336	236.525	237.017	0.1
2016	236.916	237.111												

Urban Wage Earners and Clerical Workers (CPI-W)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Ann.	% chg
2006	194.000	194.200	195.300	197.200	198.200	198.600	199.200	199.600	198.400	197.000	196.800	197.200	197.100	3.2
2007	197.559	198.544	200.612	202.130	203.661	203.906	203.700	203.199	203.889	204.338	205.891	205.777	202.767	2.9
2008	206.744	207.254	209.147	210.698	212.788	215.223	216.304	215.247	214.935	212.182	207.296	204.813	211.053	4.1
2009	205.700	206.708	207.218	207.925	208.774	210.972	210.526	211.156	211.322	211.549	212.003	211.703	209.630	-0.7
2010	212.568	212.544	213.525	213.958	214.124	213.839	213.898	214.205	214.306	214.623	214.750	215.262	213.967	2.1
2011	216.400	217.535	220.024	221.743	222.954	222.522	222.686	223.326	223.688	223.043	222.813	222.166	221.575	3.6
2012	223.216	224.317	226.304	227.012	226.600	226.036	225.568	227.056	228.184	227.974	226.595	225.889	226.229	2.1
2013	226.520	228.677	229.323	228.949	229.399	230.002	230.084	230.359	230.537	229.735	229.133	229.174	229.324	1.4
2014	230.040	230.871	232.560	233.443	234.216	234.702	234.525	234.030	234.170	233.229	231.551	229.909	232.771	1.5
2015	228.294	229.421	231.055	231.520	232.908	233.804	233.806	233.366	232.661	232.373	231.721	230.791	231.810	-0.4
2016	231.061	230.972												

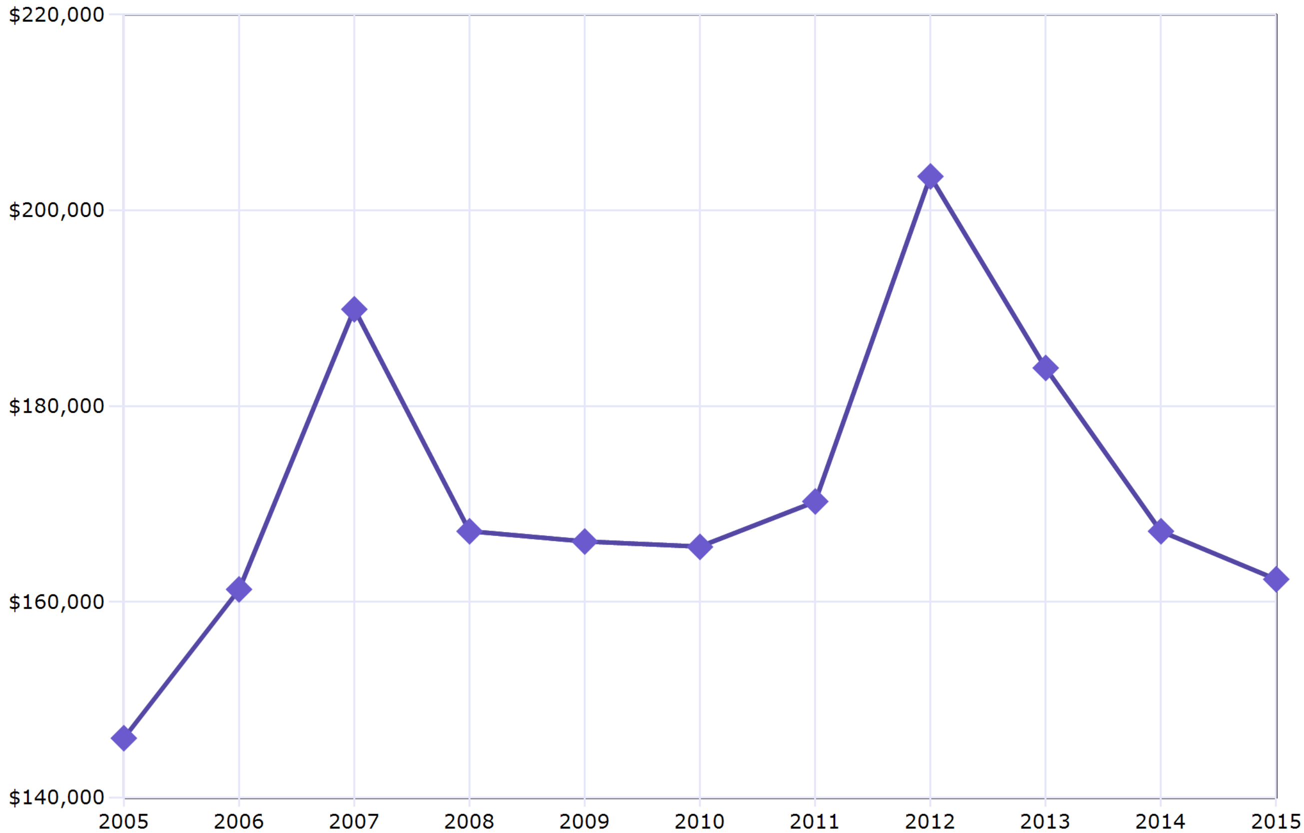
Note: CPI data is for the United States only. No data available for King and Queen County.

The CPI-U includes expenditures by urban wage earners and clerical workers, professional, managerial, and technical workers, the self-employed, short-term workers, the unemployed, retirees and others not in the labor force. The CPI-W only includes expenditures by those in hourly wage earning or clerical jobs.

Source: Bureau of Labor Statistics,
Consumer Price Indexes (CPI) Program.

Local Option Sales Tax

Trends



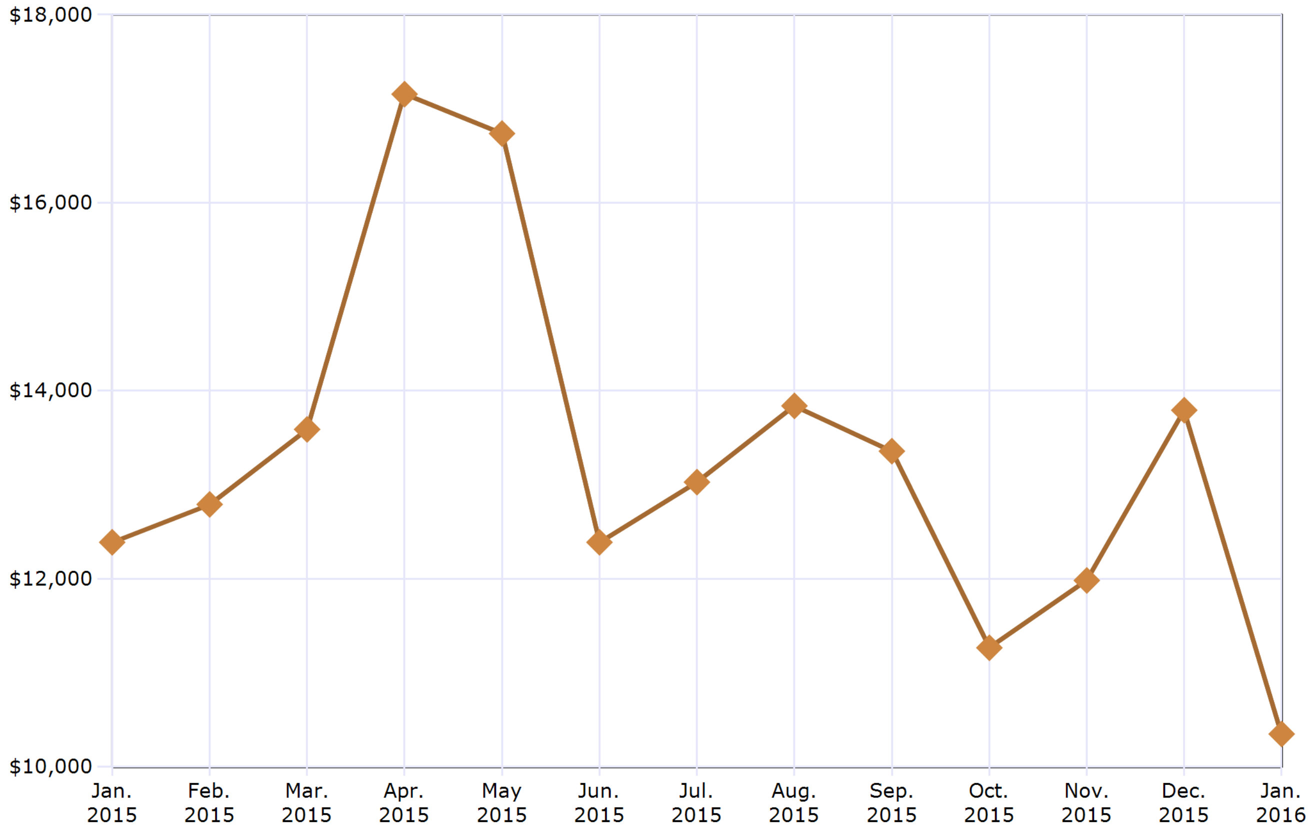
	King and Queen County	Virginia
2005	$146,083	$976,923,577
2006	$161,287	$1,028,544,074
2007	$189,903	$1,056,766,678
2008	$167,221	$1,032,815,078
2009	$166,178	$979,594,664
2010	$165,630	$992,820,512
2011	$170,271	$1,035,981,229
2012	$203,474	$1,080,663,042
2013	$183,909	$1,093,292,668
2014	$167,223	$1,131,194,860
2015	$162,322	$1,159,296,384

Note: This data is based on Virginia sales tax revenues deposited, rather than the actual taxable sales figures as reported on a dealer's return.

Source: Virginia Department of Taxation,
Revenue Forecasting.

Local Option Sales Tax

Past 12 Months



	King and Queen County	Virginia
Jan. 2015	$12,389	$83,115,661
Feb. 2015	$12,792	$82,043,204
Mar. 2015	$13,590	$98,055,674
Apr. 2015	$17,155	$97,102,804
May 2015	$16,736	$100,527,553
Jun. 2015	$12,389	$83,115,661
Jul. 2015	$13,029	$98,165,027
Aug. 2015	$13,840	$97,815,827
Sep. 2015	$13,358	$100,643,142
Oct. 2015	$11,267	$103,779,216
Nov. 2015	$11,983	$95,879,771
Dec. 2015	$13,794	$119,052,844
Jan. 2016	$10,350	$82,117,925

Note: This data is based on Virginia sales tax revenues deposited, rather than the actual taxable sales figures as reported on a dealer's return.

Source: Virginia Department of Taxation, Revenue Forecasting.

IV. Education Profile

Overview

The Education Profile for King and Queen County provides an assortment of data collected from the United States Census Bureau and the National Center for Education Statistics (NCES).

Related Terms and Definitions

Associate's degree
An award that normally requires at least two but less than four years of full-time equivalent college work.

Bachelor's degree
An award that normally requires at least four but not more than five years of full-time equivalent college-level work.

Post-baccalaureate certificate
An award that requires completion of an organized program of study equivalent to 18 semester credit hours beyond the bachelor's. It is designed for persons who have completed a bachelor's degree, but do not meet the requirements of a master's degree.

Master's degree
An award that requires the successful completion of a program of study of at least the full-time equivalent of one but not more than two academic years of work beyond the bachelor's degree.

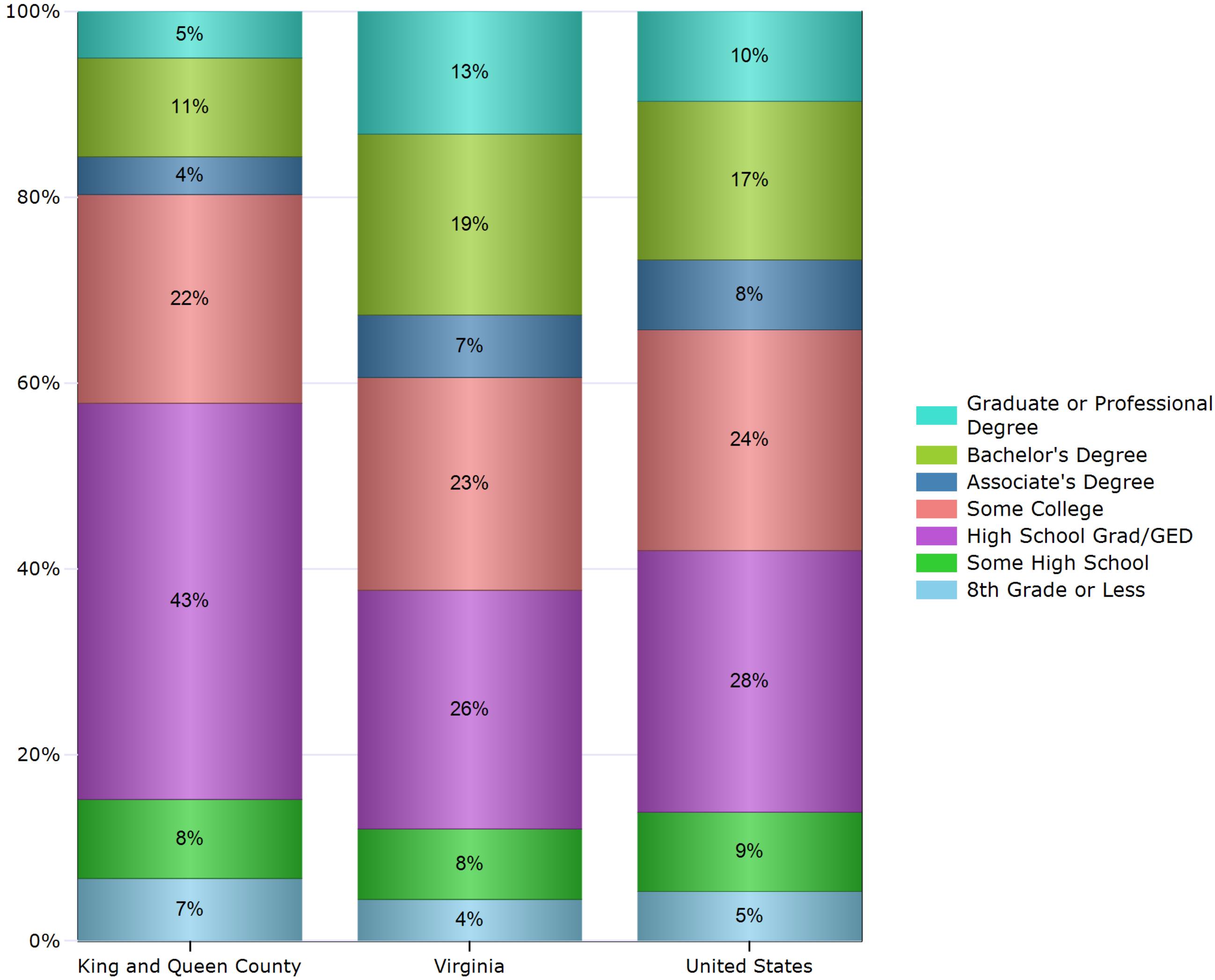
Post-master's certificate
An award that requires completion of an organized program of study equivalent to 24 semester credit hours beyond the master's degree, but does not meet the requirements of academic degrees at the doctor's level.

Doctor's degree
The highest award a student can earn for graduate study.

First-professional degree
An award that requires completion of a program that meets all of the following criteria: (1) completion of the academic requirements to begin practice in the profession; (2) at least two years of college work prior to entering the program; and (3) a total of at least six academic years of college work to complete the degree program, including prior required college work plus the length of the professional program itself.

Educational Attainment

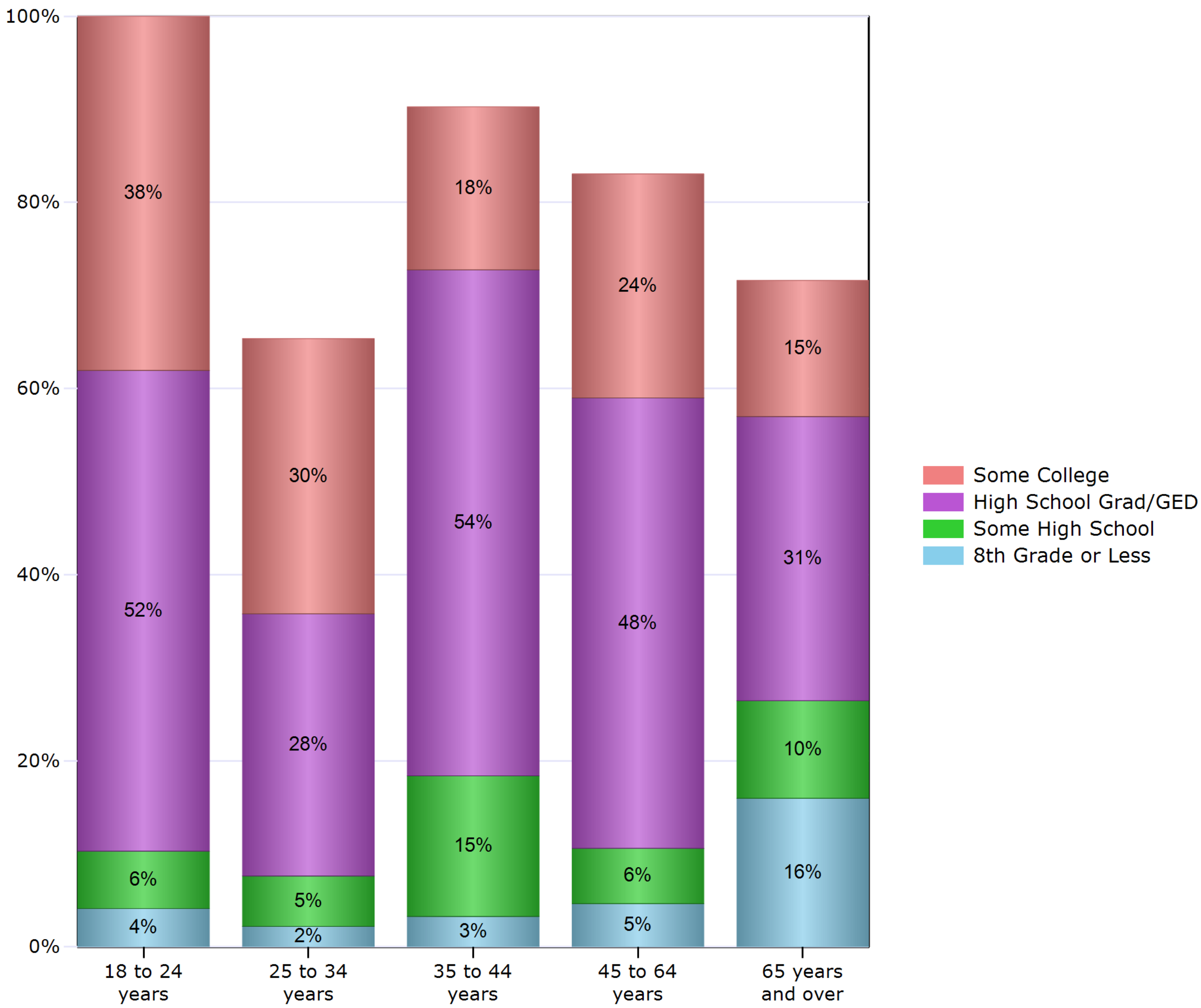
(Population 18 years and over)



	King and Queen County	Virginia	United States
8th Grade or Less	384	283,115	12,784,424
Some High School	484	478,399	20,503,405
High School Grad/GED	2,430	1,624,572	67,676,791
Some College	1,280	1,446,589	57,067,855
Associate's Degree	232	425,110	18,086,174
Bachelor's Degree	606	1,230,312	40,974,057
Graduate or Professional Degree	285	834,750	23,236,720
	5,701	**6,322,847**	**240,329,426**

Source: U.S. Census Bureau
American Community Survey, 2010-2014.

Educational Attainment by Age

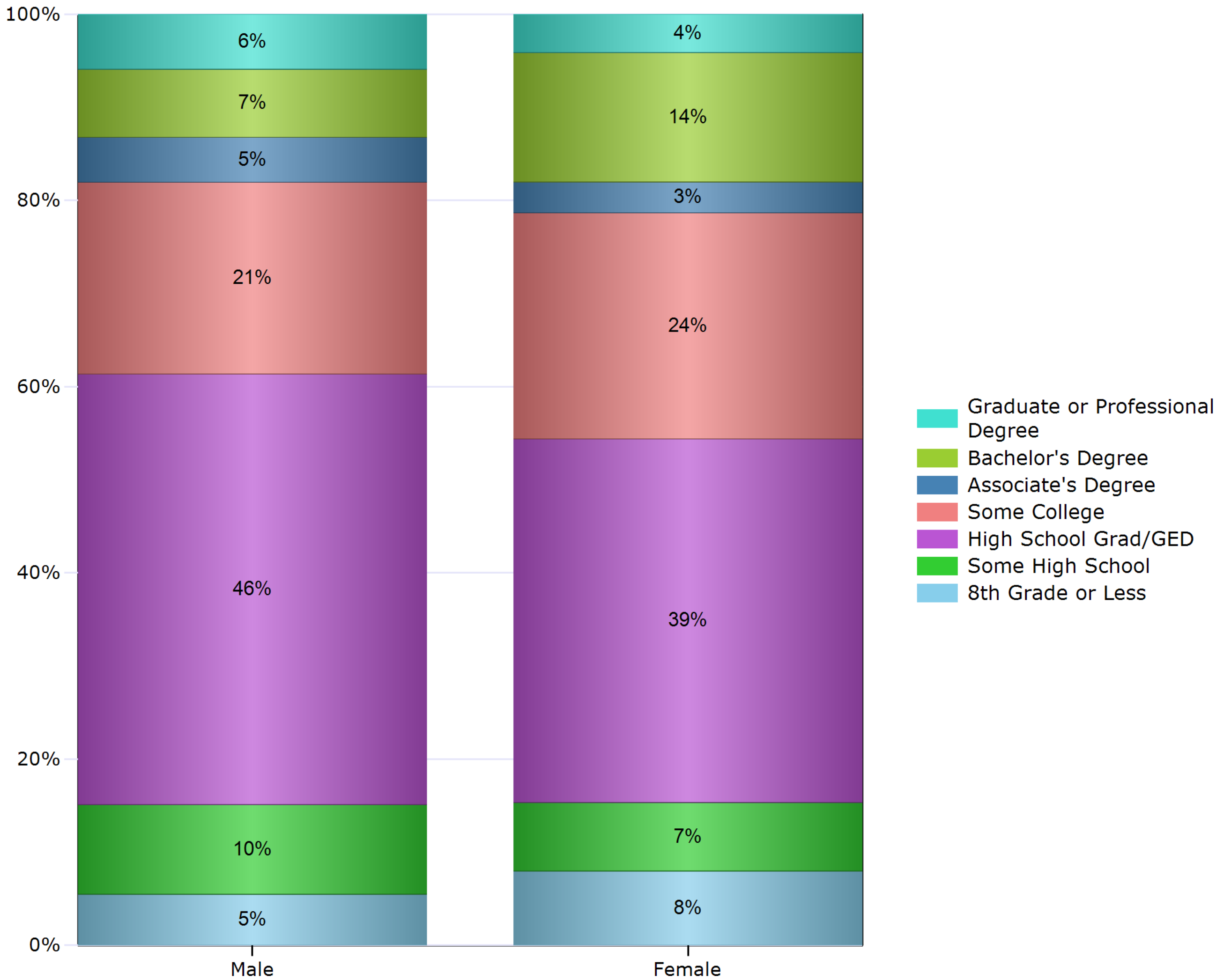


	18 - 24	25 - 34	35 - 44	45 - 64	65+	Total
8th Grade or Less	16	17	31	104	216	**384**
Some High School	24	42	143	133	142	**484**
High School Grad/GED	201	218	515	1,083	413	**2,430**
Some College	148	229	166	539	198	**1,280**
Associate's Degree		60	28	119	25	**232**
Bachelor's Degree		200	56	188	162	**606**
Graduate or Professional Degree		8	8	72	197	**285**
	389	**774**	**947**	**2,238**	**1,353**	**5,701**

Source: U.S. Census Bureau
American Community Survey, 2010-2014.

Educational Attainment by Gender

(Population 18 years and over)

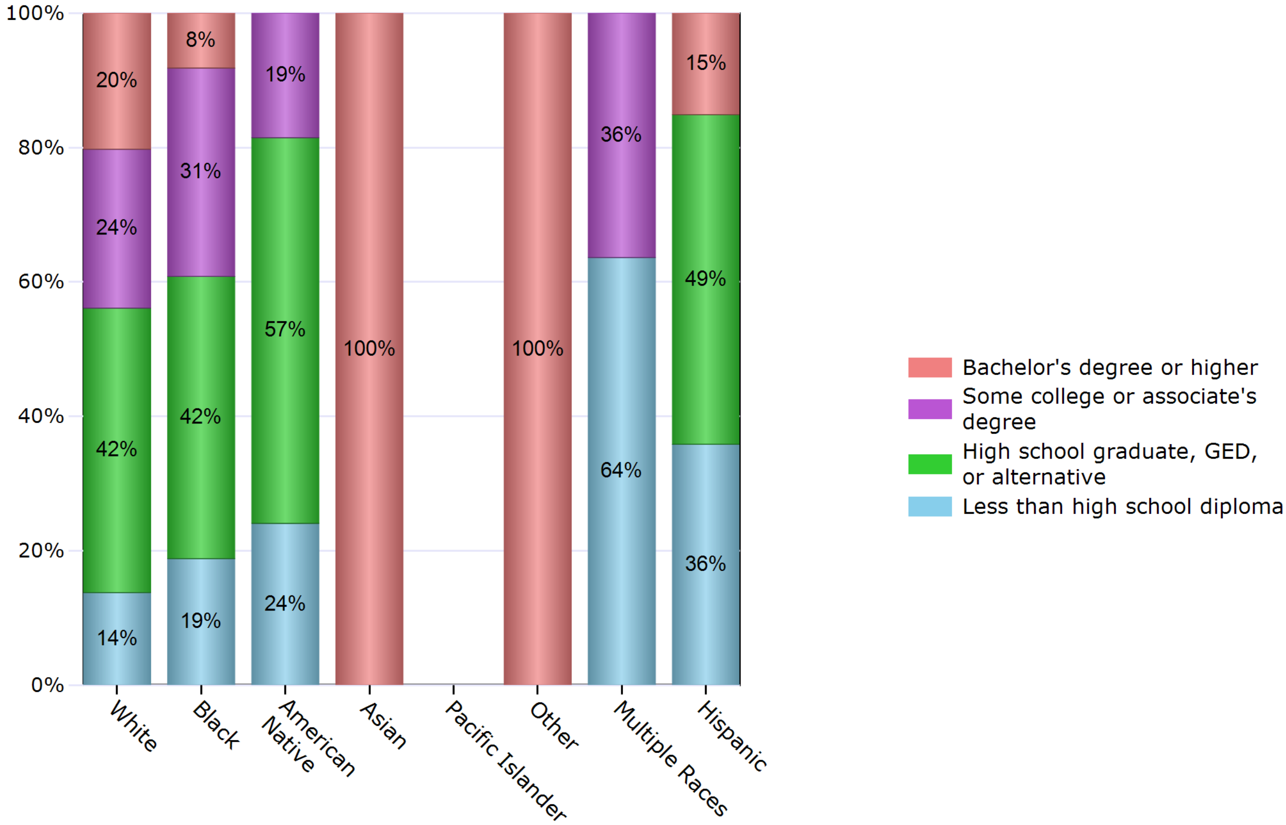


	Male	Female	Total
8th Grade or Less	155	229	**384**
Some High School	273	211	**484**
High School Grad/GED	1,309	1,121	**2,430**
Some College	583	697	**1,280**
Associate's Degree	137	95	**232**
Bachelor's Degree	207	399	**606**
Graduate or Professional Degree	167	118	**285**
	2,831	**2,870**	**5,701**

Source: U.S. Census Bureau
American Community Survey, 2010-2014.

Educational Attainment by Race/Ethnicity

(Population 25 years and over)



	Less than high school diploma	High school graduate, GED, or alternative	Some college or associate's degree	Bachelor's degree or higher	Total
Race					
White	508	1,560	871	746	**3,685**
Black or African American	286	638	471	124	**1,519**
American Indian or Alaska Native	13	31	10	0	**54**
Asian	0	0	0	13	**13**
Native Hawaiian/Pacific Islander	0	0	0	0	**0**
Other	0	0	0	8	**8**
Multiple Races	21	0	12	0	**33**
Ethnicity					
Hispanic or Latino (of any race)	38	52	0	16	**106**
	866	**2,281**	**1,364**	**907**	**5,418**

Source: U.S. Census Bureau
American Community Survey, 2010-2014.

Graduate Data Trends

King and Queen County

	Cert. <1 yr.	Cert. 1-2 yrs.	Assoc.	Cert. 2-4 yrs.	BA	Cert. Post-BA	MA	Cert. Post-MA	Ph.D.	1st Prof.
2003										
2004										
2005										
2006										
2007										
2008										
2009										
2010										
2011										
2012										
2013										

Note: This table only reflects the degrees completed from institutions within King and Queen County.

Virginia Statewide

	Cert. <1 yr.	Cert. 1-2 yrs.	Assoc.	Cert. 2-4 yrs.	BA	Cert. Post-BA	MA	Cert. Post-MA	Ph.D.	1st Prof.
2003	5,245	3,079	11,174	97	32,635	178	9,948	447	974	2,133
2004	4,465	3,772	11,400	76	33,392	247	10,487	360	1,033	2,407
2005	3,983	3,831	11,833	77	34,615	476	11,255	251	1,268	2,496
2006	4,213	4,298	14,431	102	39,247	608	12,429	225	1,440	2,490
2007	4,478	3,686	15,519	116	40,381	650	12,781	252	1,516	2,626
2008	5,197	3,813	16,207	134	39,160	725	13,802	334	1,080	2,168
2009	6,259	4,587	17,179	85	40,233	756	15,445	300	925	2,064
2010	7,648	8,158	21,014	374	45,361	915	18,889	601	2,100	2,598
2011	6,972	12,557	24,306	473	49,109	1,055	20,697	727	2,329	2,658
2012	8,825	12,801	26,199	620	53,051	1,215	21,516	686	2,095	3,298
2013	8,153	12,179	25,854	484	54,778	1,067	22,782	706	2,230	2,963

Source: U.S. Department of Education,
Institute of Education Sciences (IES).

Did you know...

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Training Providers

University of Mary Washington
1301 College Ave
Fredericksburg, VA 22401-5300

Phone: (540) 654-1000
http://www.umw.edu
Number of 2013 graduates: 1,288

Career Training Solutions
10304 Spotsylvania Ave, Suite 400
Fredericksburg, VA 22408-

Phone: (540) 373-2200   ext. 221
http://www.careertrainingsolutions.edu
Number of 2013 graduates: 194

Eastern Shore Community College
29300 Lankford Hwy
Melfa, VA 23410-

Phone: (757) 789-1789
http://www.es.vccs.edu
Number of 2013 graduates: 182

Source: U.S. Department of Education,
Institute of Education Sciences (IES), 2013.

King and Queen County, Virginia

2030 Comprehensive Plan

Appendix B:
MPPDC Regional Long Range Transportation Plan

Middle Peninsula Planning District Commission

2035 Regional Long Range Transportation Plan

Technical Report

Final Report

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CHAPTER 1 – INTRODUCTION

The *Middle Peninsula Planning District Commission 2035 Regional Long Range Transportation Plan* (the Plan) provides a blueprint for the development and maintenance of a rural multi-modal transportation system that supports existing and projected travel demands to the year 2035 and complements previously established metropolitan area plans throughout the State. This Technical Report provides details on the identification of existing transportation needs, forecasting of future travel demands, identification of future travel needs, and the development of transportation improvement recommendations for the region's transportation system. Recommendations were developed to satisfy both current and future needs. The Middle Peninsula Planning District Commission adopted this Plan for use as a regional and local planning tool on January 25, 2012.

Purpose and Scope

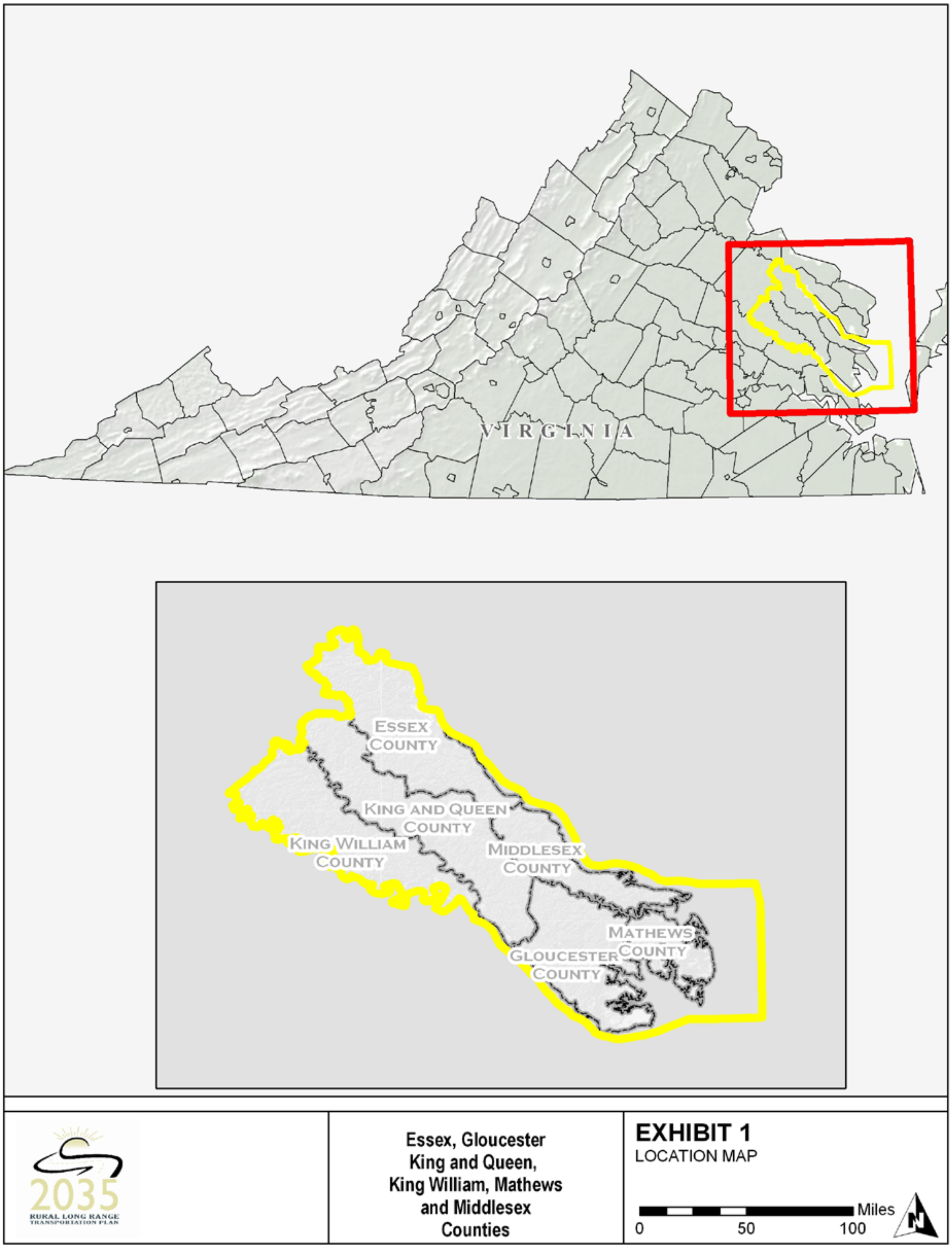
The Plan was developed as a cooperative effort between the Virginia Department of Transportation (VDOT), the Middle Peninsula Planning District Commission (MPPDC), and the member jurisdictions represented. The purpose of the study was to evaluate the region's rural transportation system and recommend a set of transportation improvements that could best satisfy existing and future travel needs. The study identified needs for all modes of transportation, and interaction between modes where a reduction in vehicle trips might be possible.

Improved transportation systems remain vital to Virginia's, as well as the region's, continued economic growth and development. The provision for the effective, safe, and efficient movement of people and goods is a basic goal of all transportation programs in the Commonwealth of Virginia. This guiding principle, together with consideration of environmental issues, local mobility needs, and associated development policies, was the basis for the development of this transportation Plan.

The region, its member localities, and VDOT will use this Plan when initiating or evaluating requests for specific transportation projects. The list of recommendations will also be used in the statewide transportation planning process in order to better quantify the magnitude of statewide needs.

Study Area

The MPPDC serves the Counties of Essex, Gloucester, King and Queen, King William, Mathews, and Middlesex, and the Towns of Tappahannock, Urbanna, and West Point (Exhibit 1). The Middle Peninsula is a predominantly rural area with denser development occurring in the southeast portion of the region in Gloucester County. The geography of the MPPDC is primarily influenced by waterways including the Rappahannock, Mattaponi, Pamunkey, and York rivers, and the Chesapeake Bay. The region lies on the edge of three larger metropolitan areas, Fredericksburg, Richmond, and Hampton Roads. The transportation network is influenced by the waterways, which generally travel northwest to southeast; many of the primary arterials also run in this direction. The majority of the MPPDC is rural, however, part of Gloucester County lies within the Hampton Roads Transportation Planning Organization (HRTPO) area. For this Plan's purposes, Gloucester County is included in its entirety, but the road network within the HRTPO was not analyzed. There are two state-recognized Native American Reservations located in the Region: the Mattaponi Indian Reservation and the Pamunkey Indian Reservation.


VIRGINIA
ESSEX COUNTY
KING AND QUEEN COUNTY
KING WILLIAM COUNTY
MIDDLESEX COUNTY
MATHEWS COUNTY
GLOUCESTER COUNTY
2035 RURAL LONG RANGE TRANSPORTATION PLAN
Essex, Gloucester
King and Queen,
King William, Mathews
and Middlesex
Counties
EXHIBIT 1
LOCATION MAP
Miles
0
50
100
N

I-95 passes just west of the region and I-64 runs northwest to southeast just south of the region. The roadways of the region tend to run in a northwest to southeast direction due to the location of waterways within and between the counties. Primary corridors running generally east to west include US 360, VA 14, VA 30, and VA 33. The main north-south corridors are US 17 and VA 14 (Exhibit 2).

There are two state-recognized Native American Reservations located in the Region: the Mattaponi Indian Reservation and the Pamunkey Indian Reservation. The Mattaponi Reservation stretches along the borders of the Mattaponi River in King William County and today encompasses approximately 150 acres. The Pamunkey Reservation is located on the Pamunkey River, adjacent to King William County and covers approximately 1,200 acres.

Demographic Overview

The Middle Peninsula region has experienced steady population growth, which is expected to continue. Total population was estimated in 2008 at 89,237. Beginning in the 1970s, Gloucester County population began to grow more rapidly than the other counties, rising from 30% of the region's population to just over 40% by 2008. This trend is expected to continue. All of the counties experienced growth in population between 2000 and 2008; Essex and King William Counties experienced the most growth. By 2030, only Mathews County is expected to have minimal growth. Gloucester and King William Counties are expected to have the most growth by 2030 of 43% and 41%, respectively.

Exhibit 3. Current and Projected Population

	1990	2000	2008	2000-2008	2010	2020	2030	2008-2030
Essex County	8,689	9,989	10,732	7.4%	10,969	11,960	12,974	20.9%
Gloucester County	30,131	34,780	36,109	3.8%	40,474	46,013	51,824	43.5%
King and Queen County	6,289	6,630	6,935	4.6%	6,891	7,187	7,564	9.1%
King William County	10,913	13,146	15,765	19.9%	16,187	19,119	22,227	41.0%
Mathews County	8,348	9,207	9,418	2.3%	9,097	9,077	9,068	-3.7%
Middlesex County	8,653	9,932	10,277	3.5%	11,012	12,055	13,181	28.3%
Middle Peninsula	73,023	83,684	89,237	6.6%	94,630	105,411	116,838	30.9%

Sources: US Census, 1990, 2000; Weldon, 2009; and VEC, 2009.

The three largest employment sectors within the region are government, retail trade, and health care and social assistance (VEC, 2010). The unemployment rate in region's jurisdictions ranged from 5.0% to 8.4% in November 2009. Median household income in the counties had a range of $35,941-$49,876 in 2000, which was in general below the median in the Commonwealth in 2000, $46,677 (VEC, 2008).

Please note that this demographics section was developed before all results from the 2010 Census were made available. The current population data and projections will be used when updating this plan in the future.

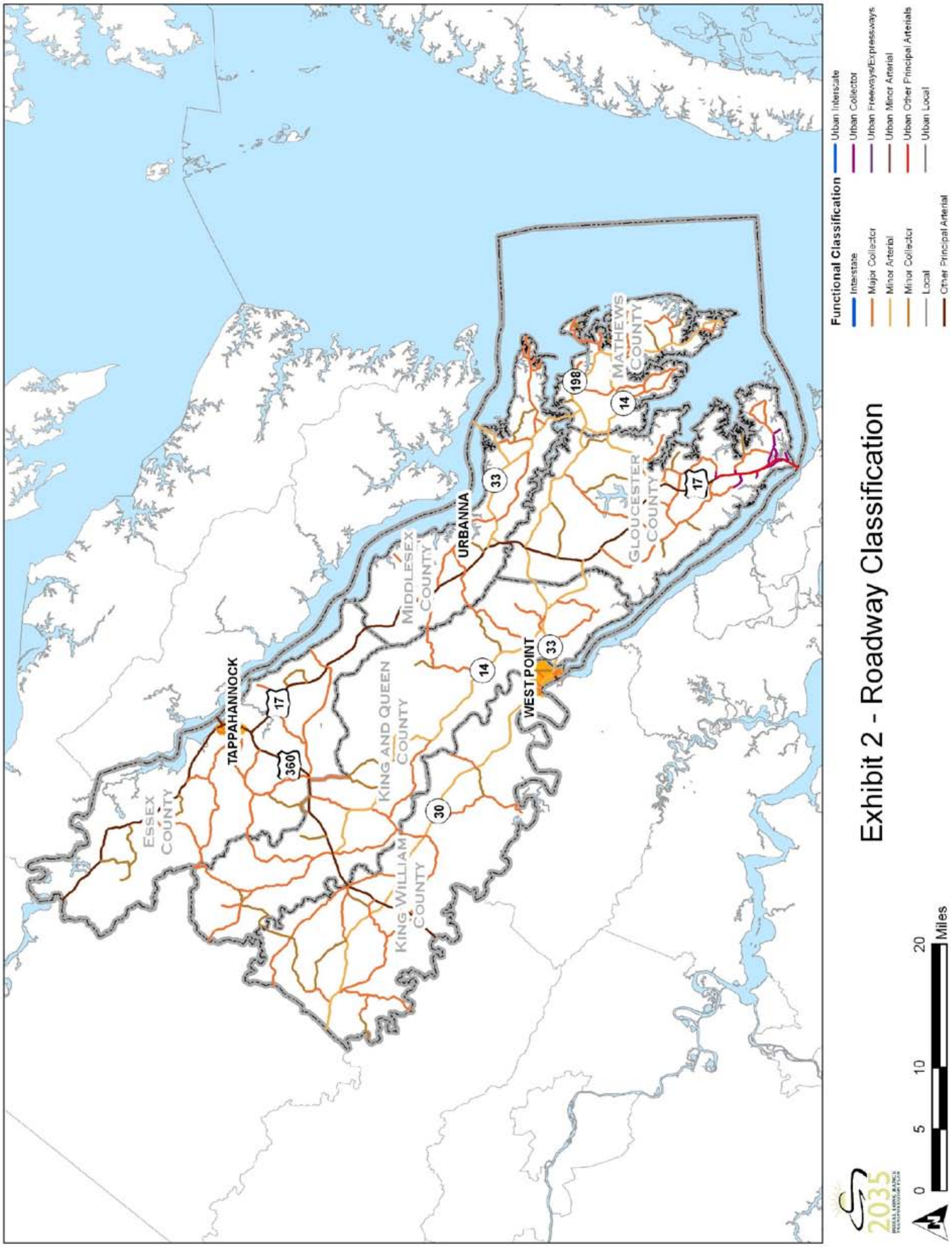


Exhibit 2 - Roadway Classification

CHAPTER 2 - STUDY APPROACH AND ANALYSIS METHODS

The Transportation Plan was developed as part of a structured approach including:

- Development of regional transportation goals and objectives,
- Public involvement,
- Data compilation and collection,
- Data analysis,
- Identification of transportation deficiencies and recommendations, and
- Environmental overview.

Goals and Objectives

Common Rural Regional Long Range Plan Goals

It is important for each region to develop transportation goals and objectives to serve as a guide for future development. These goals directly and indirectly affect transportation in the individual PDCs. Goals with direct impacts upon transportation include improvements to various modes of travel, greater multi-modal coordination, and enhanced ridesharing opportunities. Goals with indirect impacts upon transportation include designated growth and development areas, preservation of conservation areas, and the enhancement of tourism.

Each of the 20 PDCs in Virginia that include rural areas within their boundaries established goals and objectives as a part of this project. Similar concepts within the goals of the PDCs were found and used to shape common regional long range plan goals to address rural transportation planning across the Commonwealth. The goals and objectives served as a guide in the transportation needs assessment and development phases of the Plan. These goals are also consistent with the goals of *VTrans 2035*:

Goal 1. Enhance the connectivity of the existing transportation network within and between regions across all modes for both people and freight.

Objectives

Enhance access and connections to ports, airports, transit stations, or other modal facilities, as well as between neighborhoods and subdivisions, in order to enhance and optimize the efficiency of the region's transportation system.

Encourage the development of passenger rail service in regions where it is limited or unavailable.

Improve roadways and intersections on key trucking corridors.

Support existing and expand fixed-route rural transit, park and ride lots serving designated growth areas, and demand-responsive services.

Ensure adequate access to major activity centers for vehicles, mass transit, pedestrians, and bicyclists.

Evaluate alternative transportation modes during the development of transportation plans.

Goal 2. Provide a safe and secure transportation system.

Objectives

Identify dangerous transportation mode/user conflicts within the transportation system.

Increase safety awareness of users and providers of transportation systems.

Use traffic calming measures at appropriate locations.

Use intelligent transportation systems, such as variable message signs, on appropriate roadways.

Increase visibility on roadways as an additional safety measure.

Goal 3. Support and improve the economic vitality of the individual regions by providing access to economic opportunities, such as industrial access or recreational travel and tourism, as well as enhancing intermodal connectivity.

Objectives

Encourage projects within all modes of transportation that improve the global competitiveness of the region.

Encourage regional transportation planning, investment, and projects that support new and/or expanding economic development opportunities.

Develop individual bicycle and pedestrian trails within the PDCs that have been identified as priorities for tourism and recreation as well as coordinating with local park and recreation plans and the small urban area plans.

Designate additional scenic byways as needed to promote tourism.

Emphasize commercial rail as an increasingly important means of goods movement.

Promote and establish attractive gateway/entrance corridors.

Goal 4. Ensure continued quality of life during project development and implementation by considering natural, historic, and community environments, including special populations.

Objectives

Design and build developments and transportation facilities that are compatible with the aesthetic, historic, and physical characteristics of area localities.

Minimize transportation impacts to historic, cultural, and environmental resources and local communities.

Include public awareness and outreach in planning and development of projects.

Develop a set of design criteria, including landscaping, setbacks, and buffers, specifically for rural roadways that improve mobility and safety while keeping rural aesthetic conditions intact.

Formulate and adopt Context Sensitive Design criteria in transportation planning and project development.

Goal 5. Preserve the existing transportation network and promote efficient system management in order to promote access and mobility for both people and freight.

Objectives

Coordinate transportation planning between jurisdictions and between PDCs to improve mobility.

Support the implementation of traffic flow measures to alternative routes through the region in times of highway accidents, congestion, and lane closures.

Support and expand alternative passenger transportation efforts such as public transit, transit programs for the elderly or disabled within and between regions, ride sharing, and other alternative transportation options.

Consider congestion management techniques in transportation planning, such as using secondary roads, inter-parcel connection, and shared commercial streets/entrances.

Ensure corridor preservation by identifying and preserving right-of-way for future transportation improvements.

Goal 6. Encourage land use and transportation coordination, including but not limited to, development of procedures or mechanisms to incorporate all modes, while engaging the private sector.

Objectives

Promote the coordination of transportation improvements as land use changes and focus the majority of improvements within designated growth areas.

Within designated growth areas, encourage mixed-use developments with adequate internal circulation systems to minimize the length and number of vehicular trips and optimize traffic flow.

Promote street design in proposed new developments that facilitates non-motorized trips and investments in an interconnected transportation network (transit and bicycle/pedestrian facilities).

Consider innovative land development patterns and site designs to prevent additional congestion and improve accessibility.

Coordinate planning and development with Indian Tribal governments, governmental transportation agencies at all levels, and environmental land use plans and regulations.

Middle Peninsula PDC Goals and Objectives

While it is crucial for the well-being of the general public and important for economic development purposes to have a safe and efficient statewide and regional fully integrated multi-modal transportation system, it is also recognized that each region has its own unique perspective on how this can best be accomplished. Rural transportation planning in the MPPDC is guided by the Rural Technical Committee (RTC), which was formed in Fall 2006. The RTC has reviewed the needs of the region and formulated goals and objectives for the region. Information contained here served as a guide in the transportation needs assessment and development phases of the Plan. These goals and objectives, when combined with the analysis of the transportation network, support the Plan recommendations.

Goal 1. Support the economic vitality of the region, especially by enabling global competitiveness, productivity, and efficiency.

Goal 2. Increase the safety of the transportation system for motorized and non-motorized users.

Measures/Strategies

Recent crash rates in the region.

Crash locations in the region.

Goal 3. Increase the security of the transportation system for motorized and non-motorized users.

Measures/Strategies

Increased safety for bicycle and pedestrian facilities along existing routes.

Provide a more pedestrian friendly/walkable community in urban areas.

Address alternative forms of transportation in communities.

Goal 4. Increase the accessibility and mobility of people and freight.

Measures/Strategies

Assess enhancement of freight movement using current daily truck volumes.

Provide for long range mobility for persons and goods in order to serve regional employment needs.

Enhance inter-regional connections in order to access intermodal facilities and major activity centers.

Encourage walkable communities to increase the mobility of non-drivers.

Increase availability of regional transit providers.

Utilize any available funding to increase transit service providers in the region.

Goal 5. Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and state and locally planned growth and economic development patterns.

Maintain and enhance connectivity between state and local roads that support rural economic growth.

Study alternative routes to enhance local traffic movement and relieve pressure on arterials and collectors.

Consider recreational travel and tourism in transportation planning.

Evaluate the overall social, economic, and environmental effects of transportation decisions.

Evaluate the effect of transportation decisions on land use and land development.

Focus on transportation enhancements such as: designating roads as scenic byways; utilizing available landscape programs; access management; and setbacks and buffers on scenic roads to protect vistas.

Goal 6. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.

Utilize existing rights-of-way.

Promote greenway corridors and trails for connectivity across the region.

Acquire new rights-of-way for future uses.

Goal 7. Promote efficient system management and operation.

Improve system performance and preservation through: methods to address under and over utilized facilities; preservation of rights-of-way; transportation needs identified through analysis of existing/future conditions; methods to expand and enhance transit services; and improvements that reduce traffic flow and emissions.

Enhance the efficient movement of people and goods: current level of service; current volume to capacity ratio; current passenger car equivalents; and alternative traffic routing.

Goal 8. Emphasize the preservation of the existing transportation system, where appropriate.

Planning coordination to include: coordination with local government officials and Indian Tribal governments; local, county, metropolitan, and state transportation plans; and environmental land use plans and regulations.

Present conditions measures: bridge conditions (both current state and life of bridge) and road conditions.

Public Involvement

The advancement and acceptance of the study depended greatly upon outreach to the public, local governing bodies, and the PDCs. An effective and efficient communications effort must be well-planned and flexible. Public involvement elements incorporated into this study included:

- Development of a Public Involvement Plan,
- Information sharing with the general public and public officials through meetings and use of the VDOT website,
- Provision of media relations through the development and use of press kits, press releases, and the coordination of media-related events,
- Focus groups to determine needs of the traditionally underserved, and
- Public meetings and public hearings.

Events held to date include the public meeting introducing the project to the public on November 21, 2008. A meeting was held to present the draft Plan to the public on May 5, 2011. Comments on the draft Plan obtained from the public meeting have been addressed in this report. A full list of the comments appears here.

Comment	Response
• Updated Census data needs to be used.	• Only Total population and race data are available from the 2010 Census for counties and census tracts. The other data presented (Disabilities and Low-Income) are not available in the decennial census.

Comment	Response
• The bypass around Tappahannock in Essex County (Rec. # 31)will result in the death of businesses in town. However, the road width through town is insufficient and should be widened with the minimum amount of relocations. This is a hurricane evacuation route and bottlenecks occur.	• The bypass will alleviate bottlenecks but is at sufficient proximity to the town that it should not adversely affect the economy of the town. • The bypass would be the best solution to hurricane evacuation. • The turn lanes proposed as a part of Rec. #22 and #24 would also alleviate some bottlenecks in the town.
• The regional goals should be revised.	• The regional goals were produced through a regionally collaborative process combining participants and stakeholders from both the public and private sectors.
• Bike planning needs to be addressed better.	• The Middle Peninsula is one of a few regions in the entire Commonwealth that has a specific bike focus group that developed a regional plan. The focus group took a realistic look at existing roadway facilities and future improvements to enhance bicycling to the extent possible in a rural environment.
• The airports in the region are too close together. They should have been better planned.	• The Virginia Department of Aviation makes recommendations on issues such as airport overlap. The airport overlap is analyzed based on travel time not necessarily distance between existing airports.
• The plan was developed using Sustainable Development Agenda 21 framework.	• The plan was modeled on the long range plans used for small urban areas and metropolitan areas within the Commonwealth not any part of the Sustainable Development Agenda 21 framework.

Comment	Response
• The plan affects individuals' property rights.	• The plan provides recommendations for the transportation network that could be adopted by local and state agencies. If any projects were approved that could affect individual properties, effects on all aspects of the environment would be assessed before the project was constructed. Public involvement would also be a part of the environmental process.
• The plan is unnecessary and bike paths are unneeded. A transportation plan should be about safety.	• Transportation planning is necessary for the environmental planning and construction process. Bicycle planning is an important component to the transportation network.
• The PDC should be dissolved and the money used for local planning instead.	• Regional planning is important to balance local needs with regional and state needs.
• Fixing and repairing the existing roads is not addressed.	• Many of the recommendations address these concerns, and these concerns only, e.g., sight-distance, geometric deficiencies, shoulder and lane-width.
• There has been no public involvement.	• A previous meeting was held on November 21, 2008.
• The meeting time and place were inconvenient. Meetings should have been held in each jurisdiction. The meetings were unpublished.	• One meeting per PDC was used in order to minimize cost to the taxpayers. Standard VDOT advertisement times and locations were used.

Data Compilation and Collection

An extensive effort was made to compile and collect data to be used in the study analysis. The information obtained and how it was used follows:

- Socioeconomic, US Census, and employment data was used not only to determine where trip origins and destinations occur, but also to assist in determining those areas where the greatest demands for improvements might take place.
- Previously identified needs from other studies (by mode of travel) were reviewed to determine how the needs were identified and recommendations defined, and as a tool to identify those potential improvements that are still applicable.
- Capital improvement programs (by mode of travel) were needed to gain insight on modal deficiencies receiving top priority for improvement through the assignment of funding. These funded improvements automatically qualify for the top tier of needs due to their

advanced status as active projects.

- Facility inventory (by mode of travel) was used to determine what currently exists and to help assess how much of the inventory may be deficient.
- Roadway accident data were used in the determination of high accident locations in need of improvement to reduce the levels of occurrence.
- Freight generator inventory information was crucial both in the determination of work activity destination centers and the goods movement analysis.
- Location and attributes of major activity centers and high growth areas were necessary to assist in the determination of areas likely having the greatest current needs and where additional needs might exist in the future.
- Location and attributes of water and sewer infrastructure proved useful as a tool in determining areas within the MPPDC where future growth can be anticipated.
- Data on commuting patterns and labor market trends were used in the determination of trip origins and destinations and the analysis for ridesharing potential.
- Mapping of disadvantaged population groups was used in the determination of recommendations for improvements to accommodate those groups.
- Summaries and copies of existing regional and local plans and studies provided insight on regional and local development scenarios and proposals for the accommodation of transportation needs.
- Aerial photography was used for a myriad of needs from determination of development patterns to serving as a check on mapping accuracy.
- Traffic count data (roadway segments and intersections) were necessary to determine existing needs for both mobility and safety, and to serve as the basis for determination of future traffic growth and how that growth could best be accommodated.

All information and data obtained were reviewed for sufficiency in extent and quality through the consideration of its comprehensiveness, age, and degree of geographic coverage. Through this review, identification was made of the extent to which the available data supported analysis that either quantified or qualified transportation and safety concerns, along with regional goals and objectives. The information and data obtained were supplemented with input received from meetings held with local elected and other government officials and the general public, whereby additional transportation and safety concerns were discussed.

CHAPTER 3 – TRANSPORTATION DATA ANALYSIS

Data for each mode was analyzed for the current and forecast year conditions.

Roadways

Traffic data collected for the priority locations were incorporated into the VDOT Statewide Planning System (SPS) data base. Traffic forecasts were developed for 2035 based on appropriate trend lines obtained through a "best fit" of traffic count historical data points and further modified with consideration given to available information on projections for growth areas and water and sewer line extension. Forecast year peak hour to daily travel demand ratios generally followed existing peak hour to daily volume ratios, unless available information indicated a different ratio was appropriate.

Roadway analysis consisted of four separate reviews:

- Roadway link-level mobility performance, measured through Level-of-Service (LOS) analysis. Relevant information available in the VDOT SPS database and other travel data collected for this Plan was reviewed for reasonableness for both the base year and forecast year conditions. Deficiencies noted from the database and additional analysis, coupled with information received at public meetings and from local officials, constituted those roadway locations considered deficient based on mobility.
- Safety and accidents. Safety and crash database information and input from local officials and the public were used to identify twenty locations within the MPPDC for which field safety assessments were conducted. The assessments identified physical features, traffic control features, operational issues, and other factors contributing to safety concerns.
- Structure sufficiency. Any structure with a current sufficiency rating of less than 50 (out of 100) was considered deficient and in need of structural upgrade or replacement. Sufficiency evaluates factors such as load, visual structural deficiencies (cracks, concrete visibly missing), adequacy of the foundation, and the remaining life of the superstructure including pavement condition).
- Roadway geometric sufficiency. Roadway segments were reviewed for geometric sufficiency, such as insufficient lane or shoulder width; inadequate horizontal or vertical alignment, passing sight distance, and/or crossover spacing; and availability of turn lanes.

Roadways analyzed for all four categories of deficiencies were those assigned a Federal Functional Classification as an arterial or collector, which together generally comprise between 30-40 percent of total jurisdictional mileage. There are currently 240 miles of arterials and 414 miles of collectors within the MPPDC. The remaining mileage, functionally classified as local roadways, was not included in this study.

The MPPDC, in conjunction with the local jurisdictions, prepared a list of roadway detailed study locations based on reviews of available data sources, input at public meetings, and information provided by local and regional officials. The list is based on roadway performance measures, safety considerations, or a combination of the two. Some priority locations had current improvement recommendations from recent studies and required no further analysis. Other priority locations required a new or updated analysis. Within the MPPDC, twenty detailed study locations were identified and traffic count data (24 hour machine counts and/or peak hour intersection turning movements) were collected at these locations (Exhibits 4 and 5).

Exhibit 4. Roadway Detailed Study Locations

• **Jurisdiction**	**Detailed Study Location**
• Essex County	VA 659 (Desha Road) from VA 618 to VA 627
• Town of Tappahannock	Intersection US 17 with US 360 from US 360 to VA 627
•	Intersection US 17 with VA 657 (Marsh Street)
• Gloucester	VA 606 (Fary’s Mill Road) from VA 198 in Harcum to US

• **Jurisdiction**	**Detailed Study Location**
County	17/VA 14 in Ark
•	VA 610 (Pinetta Road) and VA 614 (Hickory Ford Road) to Belroi Road
•	VA 198 (Glenn's Road and Dutton Road) from US 17 at Glenn's to Mathews County line
• King and Queen County	VA 635 (Bradley Farm Road) from Essex County line to VA 721 (Newtown Road)
•	VA 602 (Mount Olive Road) from Middlesex County line to VA 614 (Devil's Three Jump Road)
•	VA 634 from VA 636 to US 360
• King William County	VA 30 (King William Road) from VA 613 to VA 617 East
•	Intersection of VA 629 (Walkerton Road) and VA 30
•	VA 629 (Acquinton Church Road) and VA 618 (Acquinton Church Road) from VA 30 to US 360
• Town of West Point	VA 30 from VA 33 to Magnolia Avenue
• Mathews County	VA 626 (Halliford Road) from VA 198 to VA 666
•	VA 660 (E. River Road) from VA 618 to the last fork with VA 617
•	VA 3 from VA 3/VA 198 in Dixie to the John Andrew Twigg Bridge
• Middlesex County	VA 3/VA 33 then VA 3 from VA 3/VA 33 in Hartfield to VA 624 in Topping
•	VA 603 (Farley Park Road)from King and Queen County line to VA 612
•	VA 3 (Twiggs Ferry Road) from VA 33 (Stampers Bay Road) over the Twiggs Ferry Bridge to Mathews County
• Town of Urbanna	Intersection of Urbanna Road/Virginia Street and Rappahannock Avenue

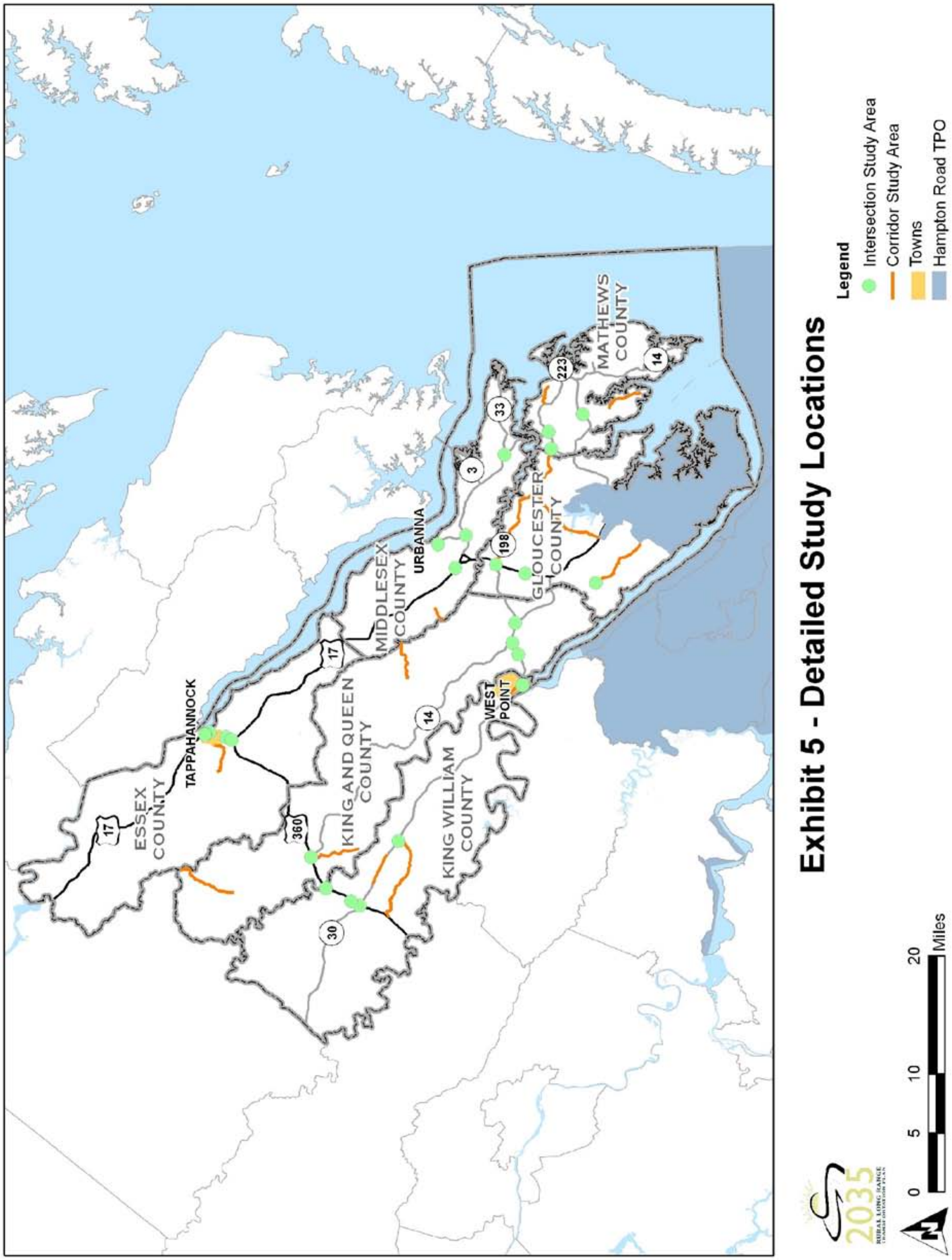


Exhibit 5 - Detailed Study Locations

Public Transportation

Fixed-route service is not widely available in the Middle Peninsula. Bay Transit buses offer fixed-route service in the Town of West Point, and a fixed-route trolley service is offered in the Town of Urbanna during the summer months and on some holiday weekends. In May 2011, Bay Transit reported that they were currently providing regular routes to the Rappahannock Community College campus in Glenns (Gloucester County). Providing additional fixed-route service in the Region would be beneficial, but would contain extra costs.

Demand-responsive transit is provided by Bay Aging, a non-profit organization, through Bay Transit. Bay Transit serves the entire PDC as well as three counties in the Northern Neck and two in the Richmond Regional PDC. The price is $1 one-way within one county. The service does not cross jurisdictional lines. To go from one county to another, a rider must make two demand-responsive requests each way, with a transfer at the county line. The price is then $2 each way. The service is 6 am to 6 pm Monday through Friday. Ridership for 2006 is in Exhibit 6. The Middle Peninsula area contains approximately 55% of the total service area population of Bay Transit.

Exhibit 6. Bay Transit Ridership, Fiscal Year 2006

• **Jurisdiction**	**Vehicles**	**Rides**
• Essex County	2	19,952
• Gloucester County	3	38,663
• Mathews County	1	6,189
• Middlesex County	1	7,644
• King William/ King and Queen County/ West Point	2	12,268
• Total	9	84,716

Organizations that do not serve the general public but do serve the transportation needs of specific disadvantaged groups include ARC of the Peninsula, the Virginia Department of Rehabilitative Services, and the Middle Peninsula/Northern Neck Community Services Board. In addition, the United Way Volunteer wheels program is a volunteer network of drivers who use privately owned vehicles for transport.

The Virginia Department of Rail and Public Transportation (DRPT) recently completed a Coordinated Human Service Mobility Plan for each PDC in the Commonwealth. The plan for the Middle Peninsula examined and analyzed the existing fixed-route transit and demand-responsive transit services and identified strategies to address existing unmet transit needs of the region's population (DRPT, 2008). The Plan identified unmet transportation needs in the region that included the following:

- Expanded transportation options and capacity to improve access within and outside of the region, evenings and weekend service, and access to educational programs;
- Additional service vehicles, including better accessible vans and larger vehicles;
- Better brand image and marketing of human services transportation to riders, local government, and businesses;

- A clearinghouse of services and related information that could also coordinate stakeholders;
- Coordination with 211 service;
- Ability to tap into non-traditional funding sources and to expand the breadth of available sources; and
- Provision for more bicycle racks on buses.

Disadvantaged population groups were not only studied as a part of the DRPT Mobility Plan but also studied as a part of this Plan's process in order to determine deficiencies in the transportation network which affect these groups. For the purposes of this Plan, disadvantaged groups include persons with low-income, minorities, the elderly, and persons with disabilities. US Census 2000 data at the block group level were examined in order to determine locations and densities of all of these groups. These are graphically displayed in Exhibits 7-10. This information was reviewed to identify potential areas of service expansion for all transit providers.

Bicycle and Pedestrian Facilities

The MPPDC, through the Middle Peninsula Regional Bike Plan Focus Group, developed the Middle Peninsula Regional Bicycle Facility Plan in 2004. The plan represents a realistic look at existing roadway facilities and future improvements to enhance bicycling to the extent possible in a rural environment. Mathews County has several Class III or shared road facilities. In addition, there are several roadways that are a part of rides designated by bike groups. The Bike Plan Focus Group recommended routes that had been proven to be good cycling facilities. The group examined safety, funding constraints, and the quality of rides in a more subjective manner than is possible using a purely technical process such as relying on only the objective data obtained from lengthy studies. Most of the recommendations in this plan concern routing and signage.

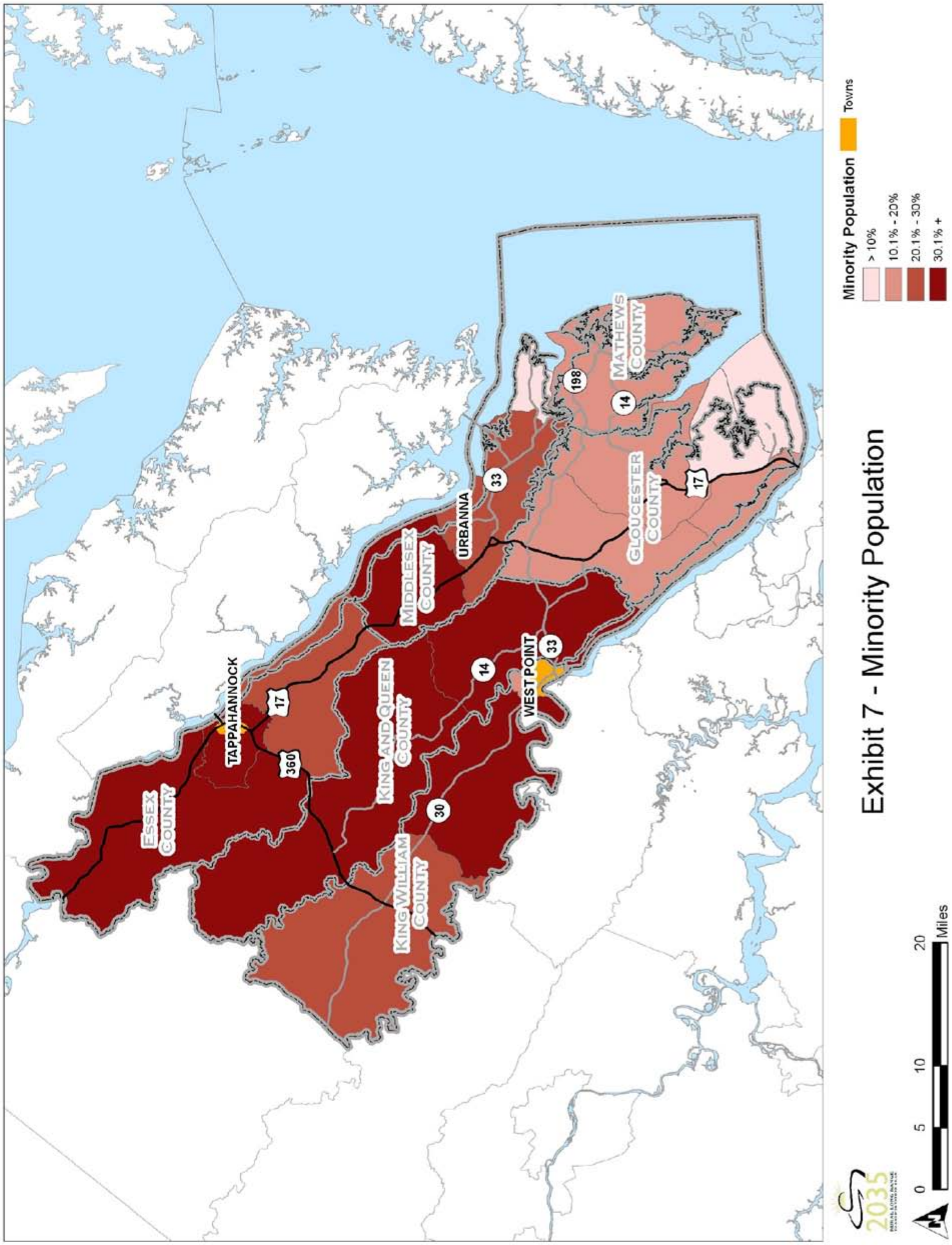


Exhibit 7 - Minority Population

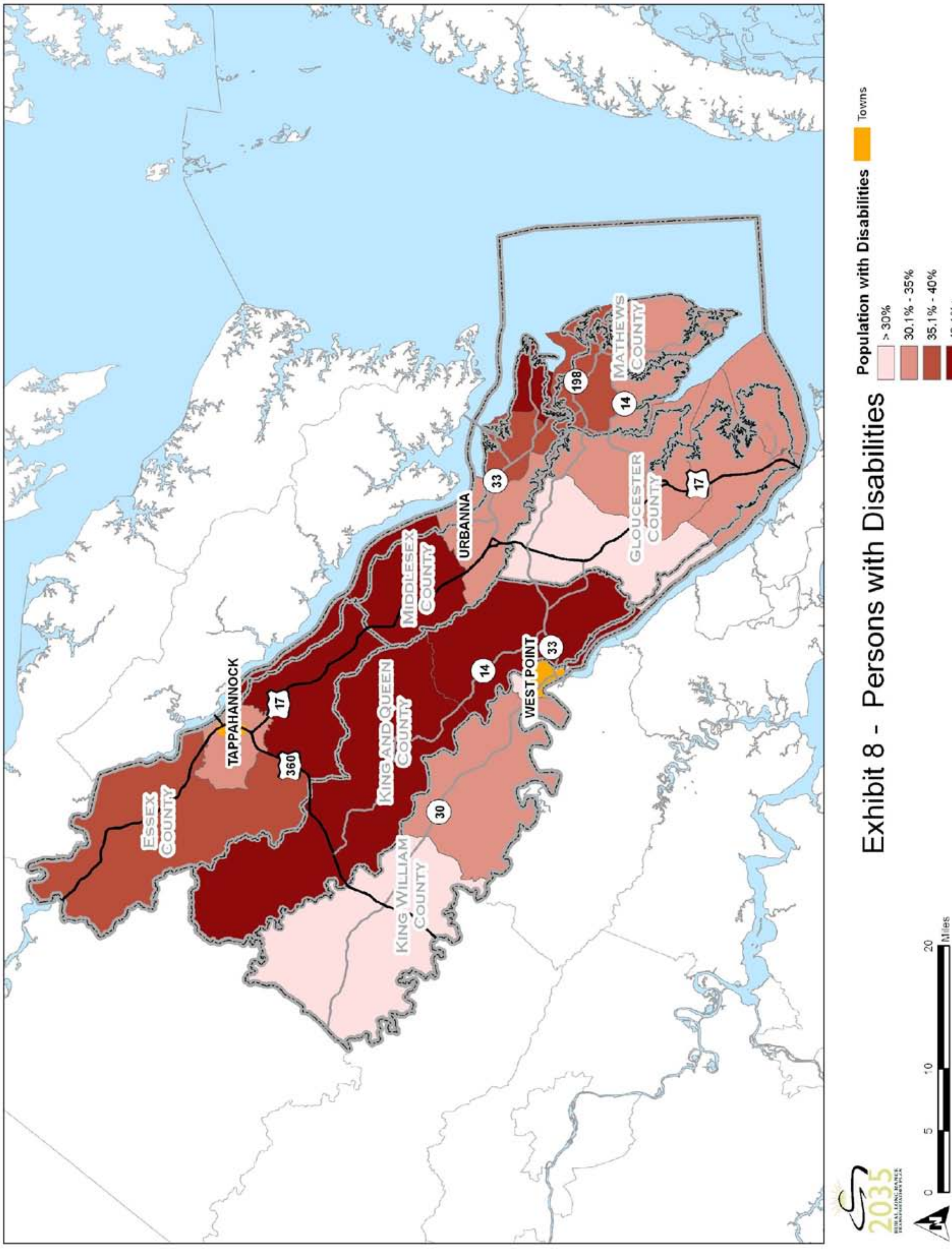


Exhibit 8 - Persons with Disabilities

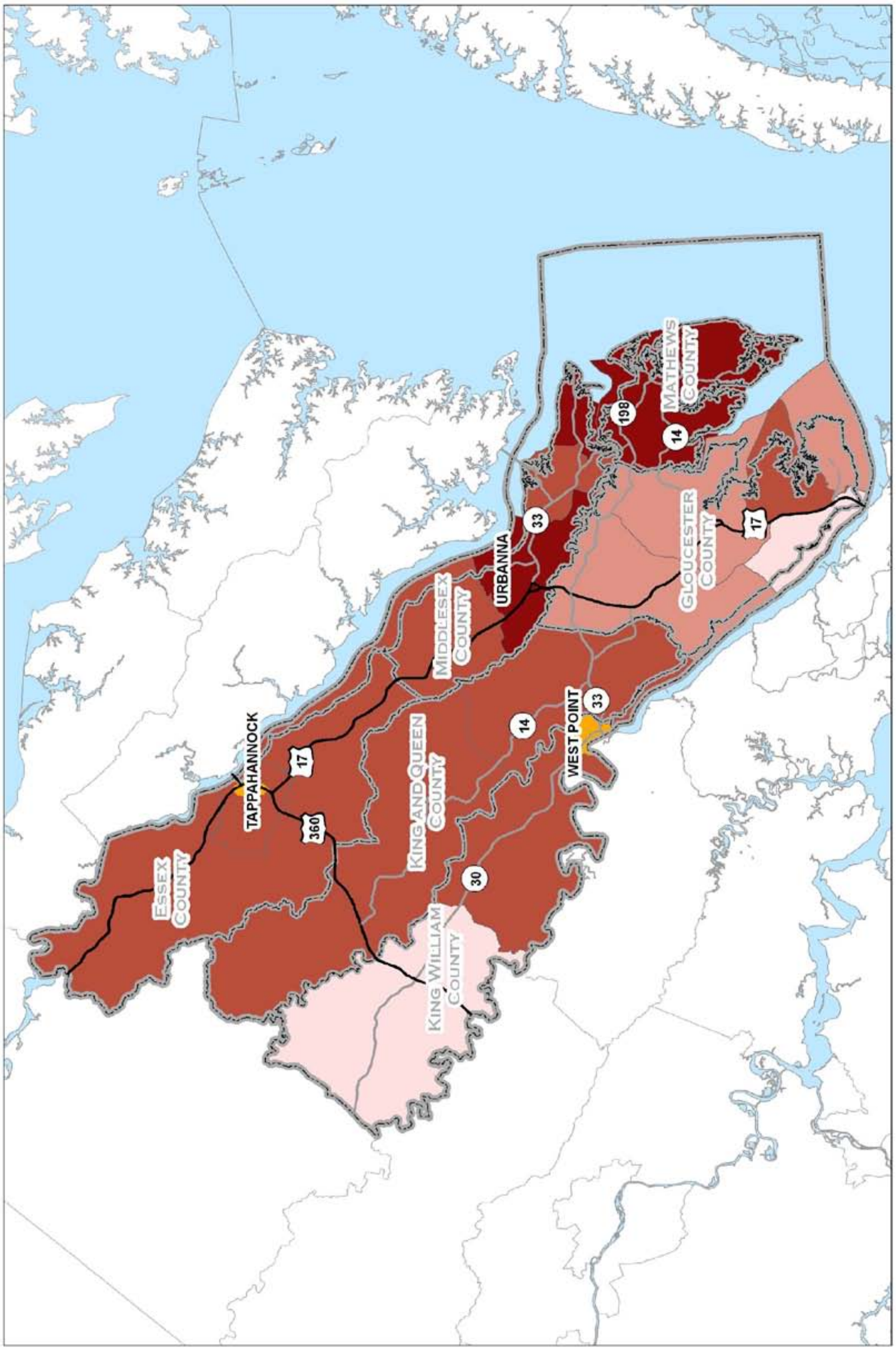


Exhibit 9 - Percent of Population Age 65 and Over

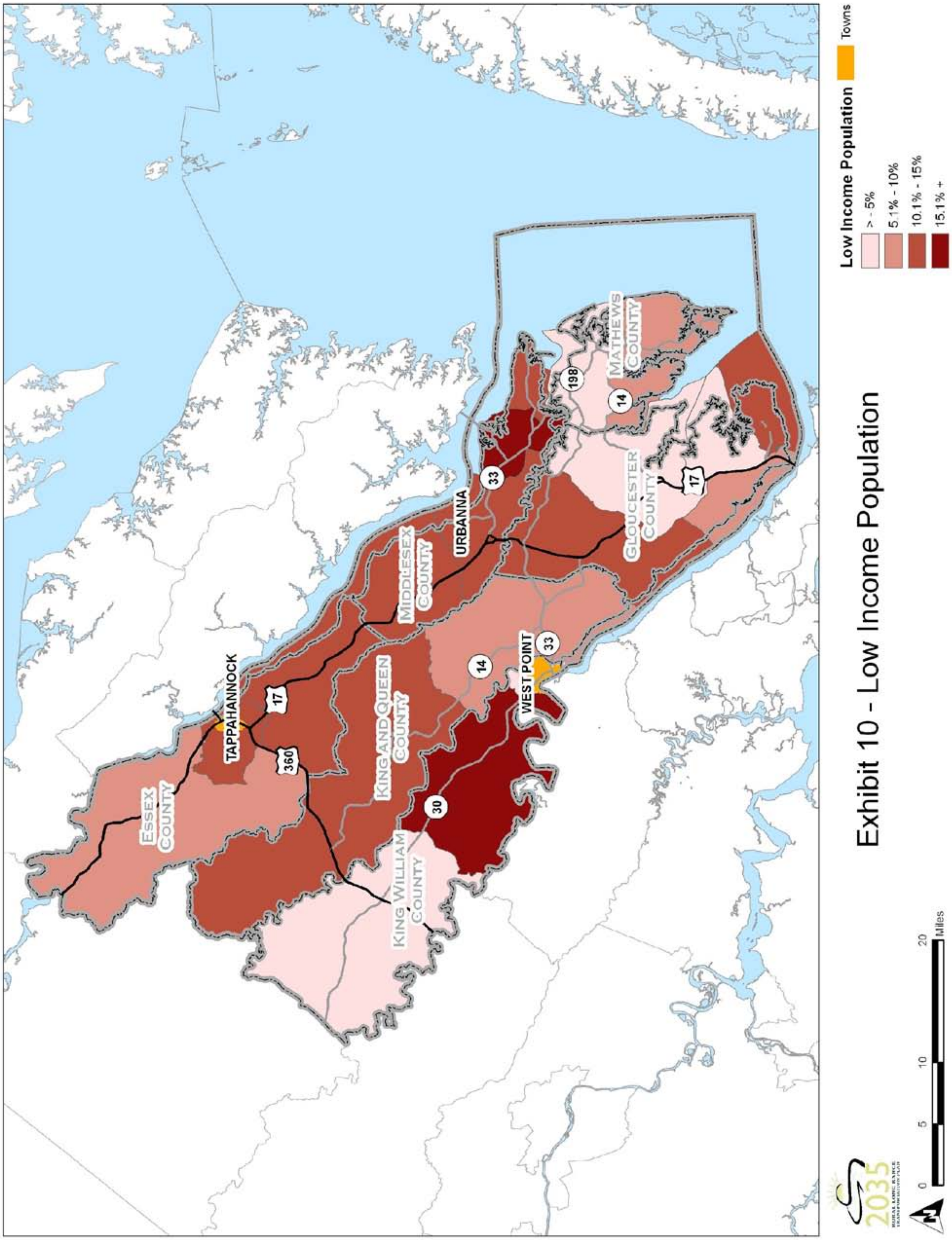


Exhibit 10 - Low Income Population

Airports

There are no commercial airports in the region. However, Richmond International is within 30 miles of the western portion of the PDC and Newport News/Williamsburg International is located south of the region, within 30 miles of the eastern part of the PDC. There are three general aviation airports: Middle Peninsula Regional Airport in Mattaponi; Tappahannock-Essex County Airport outside of the Town of Tappahannock on Aviation Road; and Hummel Field in Saluda (Exhibit 11). The Virginia Air Transportation System Plan Update includes data on changes in the number of based aircraft at airports. The average annual growth rate between 1990 and 2000 was 0.3% at Hummel Field, and 1.4% at Middle Peninsula Regional (DOAV, 2003). Because the report was written while Tappahannock/Essex was under construction, 1990-2000 data is for the Tappahannock Municipal Airport which had an average annual growth rate of 0.2% and has not been in service since the Tappahannock-Essex opened in 2007.

Goods Movement

The majority of goods movement in the region is by truck and utilizes most of the road network, particularly US 17, US 360, VA 3, VA 14, VA 30, and VA 33. The freight generators and shippers are more heavily clustered in southern Gloucester County and in western King William County, both of which are the closest locations to the interstate system and major metropolitan areas (Exhibit 12).

There is only one rail line in the area, a Norfolk Southern branch that crosses into King William County from New Kent County and terminates in the Town of West Point. The line is heavily used by the paper mill in town, Smurfit-Stone.

Land Use and Future Growth

The land use in the Middle Peninsula region is generally rural residential, agricultural, and forested with more dense residential and commercial uses centered around the existing towns and courthouse areas. The location and extent of land use and development throughout the region is reviewed as a part of traffic analysis. Changes in existing land use and geographic shifts of land use and development can have a long-term effect on traffic forecasts and demand on the transportation network. In Essex County, the Town of Tappahannock has the predominant residential and commercial development. Rural Residential and Countryside Districts are also along US 17 and US 360. In Gloucester County, land use is more intensified in the southern half of the county, within the HRTPO area. Development is more rural residential outside of the HRTPO area with large areas of forested land. In King and Queen County, the predominant land uses are agricultural and forested with residential and commercial development along US 360 and VA 33. King William County is also primarily agricultural and forested. Commercial and residential development is around the Town of West Point and along VA 30 west of West Point, and along US 360 in the western part of the county. Mathews County is also primarily rural in nature with commercial and residential development in the Mathews Village Center. Middlesex County has more residential and commercial development than some of the other counties, primarily in Saluda, Urbanna, and Deltaville.

Travel Demand Management

With diminishing resources of fossil fuels coupled with increasing travel demand, and a need to preserve and enhance environmental quality, every effort needs to be made to reduce the number of vehicle trips, especially single-occupant trips. In some rural areas, low population densities

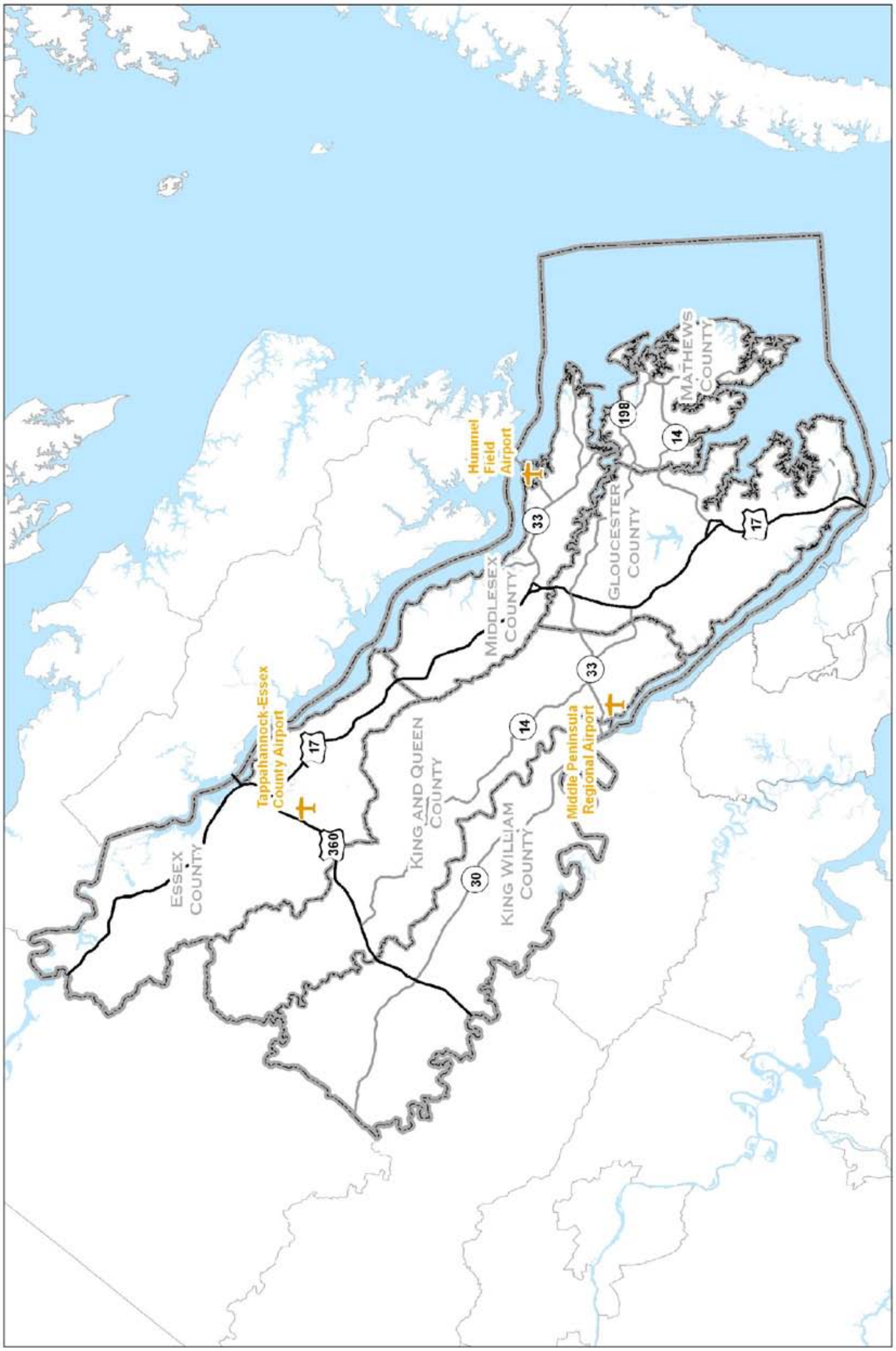


Exhibit 11 - Airports

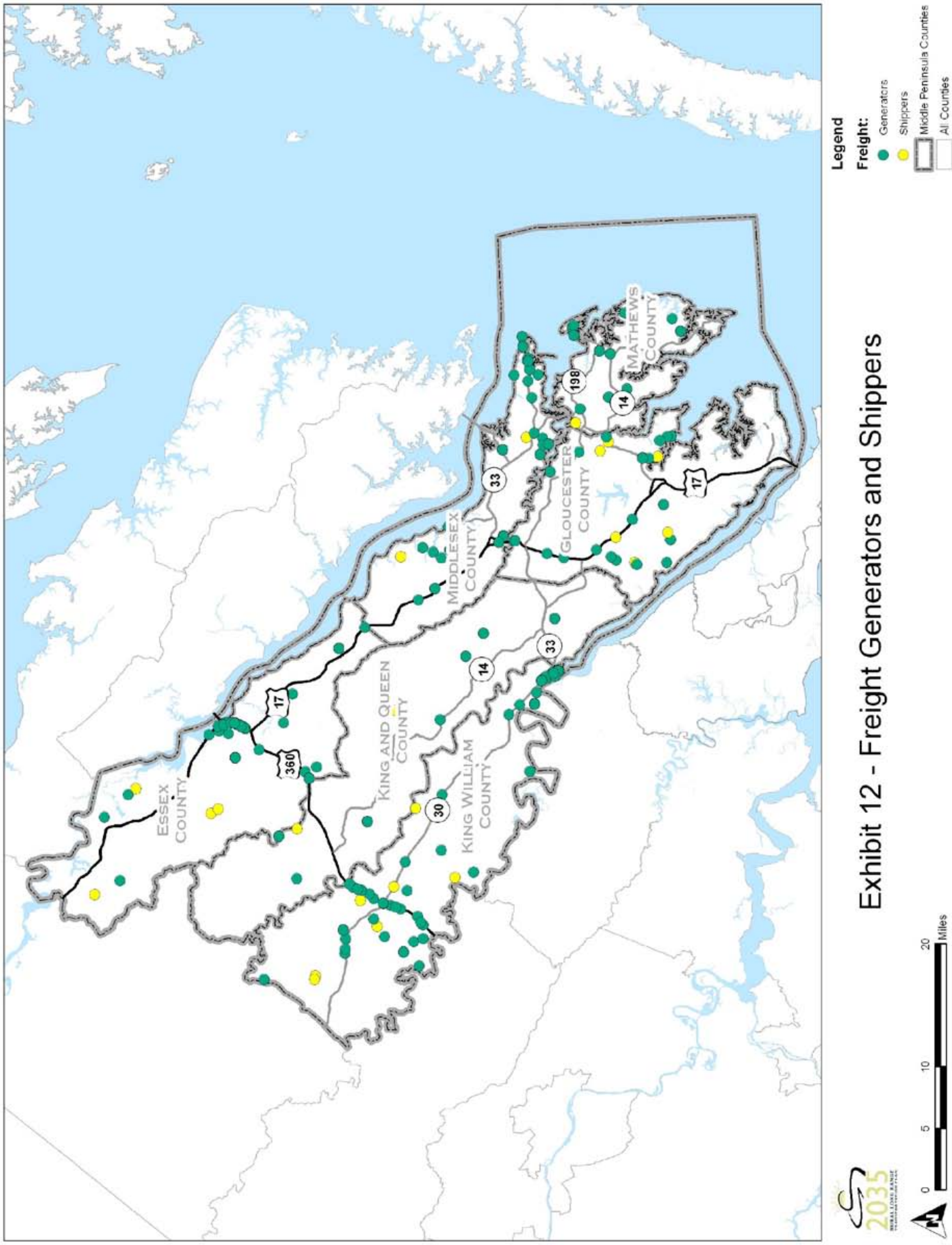


Exhibit 12 - Freight Generators and Shippers

and dispersed trip attractors may not be conducive to major shifts to mass transit. In the MPPDC, there is no single concentration of commuter destinations; commuters travel to Richmond, Fredericksburg, and Hampton Roads. Nevertheless, some gains in ridership could be realized. According to the 2000 US Census, numerous workers traveled outside of their county of residence, from a low of 47% in Essex County to a high of 75% in King and Queen County. Public transit, a key component of commuter transportation, is discussed above. Additional commuter-oriented pieces of the transportation network include ridesharing and park and ride lots.

The MPPDC operates a ridesharing program - MidPenRideShare - that offers alternative transportation information and assistance throughout the region. It provides commuter matching for traditional carpools and vanpools, as well as school pools for parents of school-age children to coordinate pick up and drop off at individual schools. There is a guaranteed ride home program, with some restrictions, for those registered in the system.

There are ten VDOT maintained park and ride lots in the region: two in Essex County, one each in King and Queen and King William Counties, three in Mathews County, and two in Middlesex County (Exhibit 13). There is one park and ride lot in the rural portion of Gloucester County; there are three additional lots within the HRTPO.

Passenger rail service is an additional link in travel demand management but is currently not available in the region. The Virginia Rail Express accesses northern Virginia and Washington, DC, but currently terminates in Fredericksburg, approximately 30 miles west of the region.

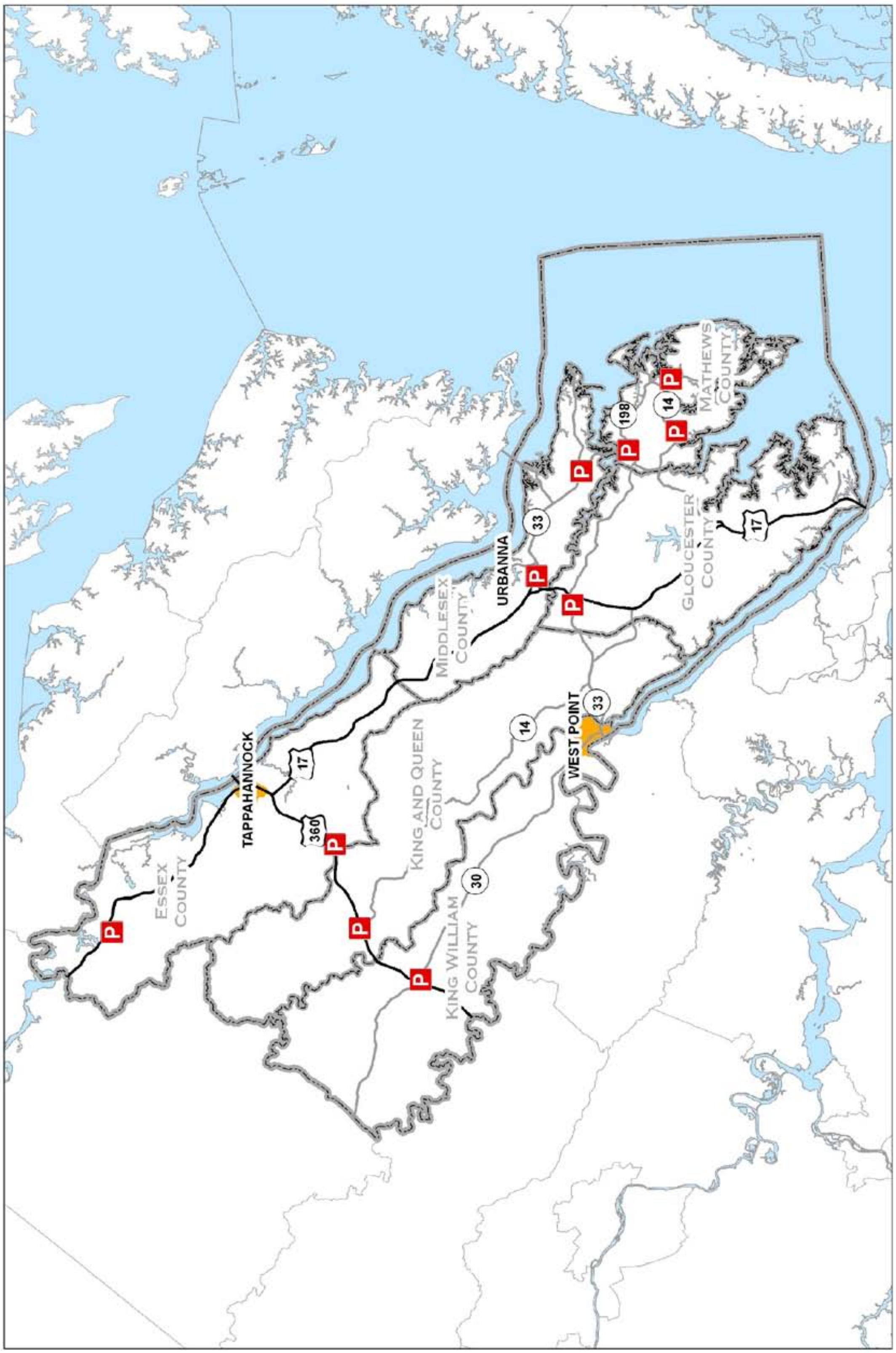


Exhibit 13 - Park and Ride Locations

CHAPTER 4 – TRANSPORTATION DEFICIENCIES AND RECOMMENDATIONS

The products of the transportation data compilation/collection and analysis resulted in a determination of deficiencies and recommendations for improvements. These are discussed by mode.

Roadways – Base Year

Deficiencies and recommendations were determined both for the base year and forecast year (2035) conditions. Deficiencies were identified based on mobility measures (LOS), safety concerns, a determination of structures requiring improvement or replacement, and a determination of geometric deficiencies. The road system analyzed included facilities functionally classified as arterials and collectors. For the purposes of this Plan, the portion of Gloucester County within the HRTPO was not analyzed. Short-term recommendations include recommendations from the Six Year Transportation Improvement Program (SYIP) FY 2010-2015 and projects identified in other studies as short-term. Mid-term recommendations have a horizon year between 2015 and 2025 and include projects in the SYIP that have a completion date after 2015. Long-term recommendations are to be completed after 2025 and are primarily financially unconstrained. When the short-, mid-, and long-term recommendations are combined, the totals of the recommendations include: 113 roadway segments to be improved; 38 structures to be upgraded or replaced; and 40 intersections to be improved.

Mobility

Within the MPPDC, roadway segments and intersections were combined from the following studies/projects: the detailed study locations, the Statewide Mobility System (SMS), private development Traffic Impact Analysis (TIA), the STARS component of this project, local recommendations, other separate studies, and projects currently programmed for funding in the SYIP. For some of the locations, recommendations have already been proposed, which were reviewed to determine if any updates needed to be made. The remaining locations were analyzed for a determination of current mobility LOS and degree of congestion encountered. Deficiencies based on these analyses or input provided are presented in Exhibit 14.

Possible recommendations for improvements included measures such as:

- Addition of a new, parallel facility;
- Grade separation (new interchange) of current at-grade intersection;
- Additional lanes to the existing facility;
- Widen existing lanes;
- Improved horizontal and/or vertical alignment;
- Improved shoulders;
- Addition of turn lanes;
- Crossover (addition or closing);
- Signalization (new or updated);
- Removal of parking;
- Roundabouts;

Exhibit 14. Roadway Base Year and Forecast Year Deficiencies and Recommendations

•	Jurisdiction	Location Information	Deficiencies	Recommendation
1	Essex	VA 659 (Desha Road) from VA 618 to South City Limit of Tappahannock	Safety: Segment has series of short horizontal curves that limit sight distance. Congestion: Turn lanes that could improve operations are missing along segment. (Source: 1, 3)	Long-Term: Safety/Congestion: Upgrade to current design standards and install turn lanes where appropriate. (Source: 1, 3)
2	Essex	US 17 at VA 631	Safety: Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 4)	Long-Term: Safety: Deficiency with low priority. Continue to monitor for potential improvements. (Source: 1)
3	Essex	US 360 (Richmond Road) from Begin Downing Bridge to End Downing Bridge / Richmond County Line	Congestion: Segment will operate at LOS E in 2035. (Source: 2, 3)	Long-Term: Congestion: Urban - 4 Lane With Median. (Source: 2, 3)
4	Essex	VA 606 (Fairfield Lane) from VA 607 to US 17	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
5	Essex	VA 607 (Muddy Gut Road) from US 17 to VA 606	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 1)
6	Essex	VA 609 (Essex Mill Road) from US 17 to VA 684	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
7	Essex	VA 617 (Island Farm Road) from End of Road to VA 697	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 20 Feet. (Source: 3)
8	Essex	VA 617 (Island Farm Road) from VA 697 to Eastern City Limit of Tappahannock	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
9	Essex	VA 618 (Scotts	Safety: Geometric	Long-Term: Safety: Rural - 2

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		Mill Road) from VA 619 to VA 659	Deficiency (2009). (Source: 3)	Lane 24 Feet. (Source: 1)
10	Essex	VA 619 (Sunnyside Road) from VA 620 East to King And Queen County Line	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
11	Essex	VA 620 (Dunbrooke Road) from US 360 to VA 619 East	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
12	Essex	VA 621 (Midway Road) from US 360 to VA 622	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
13	Essex	VA 624 (Essex Church Road) from VA 630 / VA 629 to US 17 North	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
14	Essex	VA 624 (Essex Church Road) from VA 631 to VA 630 / VA 629	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 1)
15	Essex	VA 627 (Mount Landing Road) from Caroline County Line to VA 665 West	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
16	Essex	VA 629 (Battery Road) from VA 627 to VA 624	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
17	Essex	VA 635 (Occupacia Road) from VA 639 East to VA 635 East	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
18	Essex	VA 637 (Occupacia Road) from VA 635	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		East to US 17		
19	Essex	VA 716 (Warings Mill Road) from VA 627 to US 17	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
20	Essex (Tappahannock)	VA 659 (Desha Road) from South City Limit of Tappahannock to VA 627 / VA706	Safety: Segment has series of short horizontal curves that limit sight distance. Congestion: Turn lanes that could improve operations are missing along segment. (Source: 1)	Long-Term: Safety/Congestion: Upgrade to current design standards and install turn lanes where appropriate. (Source: 1)
21	Essex (Tappahannock)	US 17 (Tidewater Trail) at US 360 (Richmond Highway)	Safety: Northbound left turners are permitted to turn right onto VA 708 (Hospital Road) across through lanes. Southbound through traffic allowed to turn right onto VA 715 across through lanes. Sight distance may be limited for northbound left turners at VA 715. Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 1, 4)	Mid-Term: Safety: Close access to VA 715 and provide new access south of residences. Close cross-over in the vicinity. Consider converting eastbound right turn to tighter free turn with yield control. Shift access to and realign Hospital Road west away from intersection to allow northbound left turners more time to merge. (Source: 1)
22	Essex (Tappahannock)	US 17 (Church Lane) at VA 657 (Marsh Street)	Safety: Stop bar missing on westbound approach. Congestion: Heavy truck traffic travelling to/from Northern Neck and Richmond county. (Source: 1)	Short-Term: Safety: Install stop bar on westbound approach. Mid-Term: Congestion: Consider providing additional capacity at the intersection by installing turn lanes as needed. (Source: 1)
23	Essex (Tappahannock)	US 17 at VA 1036	Safety: Intersection is located in dense commercial and high activity area with several adjacent signalized intersections. High potential for rear-end and left turn accidents. Crashes at this location exceed the planning	Mid-Term: Safety: Consider optimization of corridor as separate study and continue to monitor for accidents. (Source: 1)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			threshold (nine crashes over three-year period). (Source: 1, 4)	
24	Essex (Tappahannock)	US 17 (Church Lane) at US 360 (Queen Street)	Safety: Pavement markings faded. Truck traffic travelling between Northern Neck and Richmond county cannot be safely accommodated. Southbound left turning trucks cross westbound approach stop bar. Trucks cause curb and sidewalk damage in northeast corner. Electric and light poles located on sidewalks restrict full pedestrian access. Congestion: Heavy truck traffic travelling to/from Northern Neck and Richmond county. Left turn vehicle from the westbound experience high delay. (Source: 1)	Short-Term: Safety: Repaint pavement markings. Move westbound stop bar back to improve turn radius for southbound lefts. Mid-Term: Safety: Relocate electric and light poles from sidewalks or widen sidewalks to provide full pedestrian access. Congestion: Add an exclusive westbound to southbound left turn lane. (Source: 1)
25	Essex (Tappahannock)	US 17 at VA 1008 (Wright Street)	Safety: Diagonal parking on both sides of Wright Street cause vehicles to back out into street. Location of PARR'S Drive-in creates a less than desirable eastbound approach alignment. Eastbound left turners conflict with westbound left turners. Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 1, 4)	Short-Term: Safety: Restrict eastbound left turns out of PARR's Drive-in. Mid-Term: Safety: Consider access management to define access points to parking areas on both sides on Wright Street. On north side of Wright Street, offset eliminated parking spaces (due to reconfiguration of parking) by seeking additional parking in rear of building. (Source: 1)
26	Essex (Tappahannock)	US 17 at VA 1005	Safety: Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source:	Long-Term: Safety: Deficiency with low priority. Continue to monitor for potential improvements.

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			4)	(Source: 1)
27	Essex (Tappahannock)	US 17 at VA 1003	Safety: Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 4)	Long-Term: Safety: Deficiency with low priority. Continue to monitor for potential improvements. (Source: 1)
28	Essex (Tappahannock)	US 17 at VA 725	Safety: Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 4)	Long-Term: Safety: Deficiency with low priority. Continue to monitor for potential improvements. (Source: 1)
29	Essex (Tappahannock)	US 17 at VA 698	Safety: Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 4)	Long-Term: Safety: Deficiency with low priority. Continue to monitor for potential improvements. (Source: 1)
30	Essex (Tappahannock)	Proposed US 360 Connector from Proposed Tappahannock Bypass to US 17 / US 360	Congestion: Need for improvement was identified by SMS database. (Source: 2)	Long-Term: Congestion: Proposed US 360 Connector. (Source: 2)
31	Essex (Tappahannock)	Proposed Tappahannock Bypass from US 360 / VA 715 to US 17 North	Congestion: Need for improvement was identified by SMS database. (Source: 2)	Long-Term: Congestion: Proposed Tappahannock Bypass. (Source: 2)
32	Essex (Tappahannock)	US 360 (Richmond Highway) from US 17/US 360 to Richmond County Line	Congestion: Segment will operate at LOS E in 2035. (Source: 2, 3)	Long-Term: Congestion: Urban - 4 Lane. (Source: 2, 3)
33	Essex (Tappahannock)	US 17 (North Church Lane) from US 360 (Queen Street) to VA 627	Congestion: Project identified in CTB Six Year Improvement Program (UPC 86463).Segment will operate at LOS D in 2035. (Source: 5, 3)	Short-Term: Congestion: Reconstruct 0.23 miles of roadway from 0.23 mile to 0.46 mile north of US 360 North(no information available on specific improvements) Long-Term: Congestion: Continue to monitor for potential improvements.

•	Jurisdiction	Location Information	Deficiencies	Recommendation
				(Source: 4)
1	Gloucester	VA 606 (Farys Mill Road) from US 17 (George Washington Memorial Highway) to VA 198 (Dutton Road)	Safety: Stop bar missing on VA 605 (Indian Road). VA 605 (Indian Road) intersects VA 606/678 at a less than desirable angle. A sign north of VA 605 (Indian Road) directs southbound left turners to yield to through traffic which suggest driver confusion. Due to this intersection geometry, southbound VA 678 through traffic mistakenly veer left. Substandard roadway geometrics, pavement and edge of pavement conditions. (Source: 1)	Short-Term: Safety: Install stop bar on VA 605. Improve definition of VA 606/605 intersection with pavement markings. Mid-Term: Safety: Install southbound left turn lane on VA 678. Long-Term: Safety: Upgrade VA 606/678 to current design standards. Relocate VA 605 (Indian Road) to intersect VA 606 south of existing intersection. (Source: 1)
2	Gloucester	VA 610 (Pinetta Road) from VA 610 (Davenport Road) to VA 616 (Belroi Road)	Safety: Substandard roadway geometrics, pavement and edge of pavement conditions. Skid marks observed near VA 606 (Ark Road). Congestion: A proposed or recently completed residential subdivision along this segment may increase need for additional capacity. (Source: 1, 3)	Mid-Term: Safety: Consider installing northbound right turn lane and southbound left turn lane on VA 614/610 to reduce potential for accidents and to accommodate traffic travelling towards US 17. Long-Term: Safety: Upgrade VA 614/610 to current design standards. Congestion: Consider the need to increase capacity on VA 614/610 based on impact from new subdivision. (Source: 1, 3)
3	Gloucester	VA 198 (Glenns Road) from US 17 (George Washington Memorial Highway) to Mathews County Line	Safety: Pavement and shoulder widths and vertical and horizontal geometrics are substandard. VA 726 (Dogwood Trail) serves as main access to boat pier and subdivision; however no turn lanes provided. VA 678 (Harcum Road) provides	Short-Term: Safety: Consider reducing speed limit. Mid-Term: Safety: Consider installing eastbound left and westbound right turn lanes at VA 726 to accommodate vehicles with boat trailers. Install eastbound right and westbound left turn lanes at

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			access to Beaver Dam Park; however, no turn lanes provided. Based on roadway deficiencies, speed limit is too high. Congestion: Roadway experiences high traffic during weekends and summer months to access the river. Roadway is used as a main commuter route and is expected to experience traffic growth due to residential development. (Source: 1)	VA 678 (Harcum Road). Turn lanes at both location will provide storage, given speed limit of 55 mph, and reduce potential for accidents. Long-Term: Safety: Upgrade VA 198 to current design standards. Widen narrow bridge structure #1005 as part of the roadway upgrades under both safety and congestion long term recommendations. Congestion: Consider the need to increase capacity on VA 198 based on impact of residential development and increased weekend and summer months river-goers traffic. Widen narrow bridge structure #1005 as part of the roadway upgrades under both safety and congestion long term recommendations. (Source: 1)
4	Gloucester	VA 617 at VA 610	Safety: Northbound and southbound left turn lanes too short. Wide and undefined access to the USPO, convenience store and informal commuter lot in northwest quadrant. Too many access points in the southeast quadrant. (Source: 1)	Mid-Term: Safety: Lengthen northbound and southbound left turn lanes. Implement access management at intersection to define and reduce number of access points. (Source: 1)
5	Gloucester	US 17 at VA 198	Safety: Westbound through vehicles immediately merge into right-most lane downstream of the intersection making it difficult for southbound free right turners to find gaps. Both movements are heavy particularly during summer	Short-Term: Safety: Install puppy tracks for northbound left turns. Install plastic delineator post to prevent westbound through traffic from immediately merging to the right-most lane downstream of intersection in northwest corner.

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			months. Northbound left turners turn into eastbound left turn lane. Driver make unsafe left turn onto westbound VA 33 /198 from bank in southeast corner. Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 1, 4)	Mid-Term: Safety: Relocate entrance to 7-Eleven and bank to the east away from intersection or restrict left turns from bank to VA 33 /198. (Source: 1)
6	Gloucester	US 17 at VA 601	Safety: Northbound approach lack right turn storage lane. (Source: 1)	Mid-Term: Safety: Install northbound right turn lane. (Source: 1, 6)
7	Gloucester	US 17 at VA 610	Safety: Crashes at this location exceed the planning threshold (nine crashes over three-year period). HRR: High speed roadway and lack of advance warning signs means drivers are unaware of upcoming intersections. Stop bards are worn. Due to high speeds on mainline, side streets have excessive delays under stop controlled conditions. (Source: 4, 7)	Short-Term: Safety: Replace Stop bar on westbound approach. Add advance intersection warning advisor (45 MPH) on both approaches, both sides of the travel lanes. Mid-Term: Safety: Intersection meets Warrant 1B, 2 and 3 for signalization. (Source: 1)
8	Gloucester	US 17 at VA 606	Safety: Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 4)	Long-Term: Safety: Deficiency with low priority. Continue to monitor for potential improvements. (Source: 1)
9	Gloucester	US 17 (George Washington Memorial Highway) from VA 606 (Ark Road) to Hampton Road MPO boundary	Congestion: CSA: Need for improvement was identified by SMS database. (Source: 2)	Long-Term: Congestion: Urban - 6 Lane With Median. (Source: 2)
10	Gloucester	VA 616 (Belroi	Congestion: Segment will	Long-Term: Congestion:

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		Road) from VA 614 (Hickory Fork Road) to VA 615 (Burleigh Road)	operate at LOS D in 2035. (Source: 3)	Rural - 4 Lane With Median (Source: 1)
11	Gloucester	VA 602 (Burkes Pond Road) from VA 3 (John Clayton Memorial Highway) to VA 198 (Dutton Road)	Safety: Geometric Deficiency (2025). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
12	Gloucester	VA 605 (Indian Road) from VA 603 (Figg Shop Road) to VA 606 (Farys Mill Road)	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
13	Gloucester	VA 616 (Clay Bank Road) from VA 631 (Gum Fork Road) to VA 616 (Hickory Fork Road)	Safety: Geometric Deficiency (2030). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
14	Gloucester	VA 3 (John Clayton Memorial Hwy) at VA 623 (Ware Neck Road)	Safety: High speed roadway, short right turn bay on mainline and horizontal alignment makes it difficult for drivers on side street to estimate mainline travel speeds, resulting in collisions. (Source: 7)	Short-Term: Safety: Add advisory speed plate to "50 mph" to eastbound intersection ahead sign. Long-Term: Safety: Relocate eastbound right-turn lane approximately 12 feet south to improve sight distance for northbound approach. Add "Vehicles Entering When Flashing" sign (dual indicated) with detector on northbound approach. (Source: 6)
1	King & Queen	VA 635 (Bradley Farm Road) from Caroline County Line to VA 721	Safety: Substandard roadway geometric conditions. Poor intersection alignment at VA 721 and VA 627. Drivers on VA 627 have	Mid-Term: Safety: Realign VA 635 to intersect VA 721 at 90 degree angle. Realign VA 627 to intersect VA 635 at 90 degree angle. Realign VA 623

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			to look over shoulder to see on-coming traffic. (Source: 1, 3)	north with VA 623 south. Long-Term: Safety: Reconstruct to current design standards with adequate edge of pavement drainage. Additionally, upgrade side street approaches to VA 635. (Source: 1, 3)
2	King & Queen	VA 602 (Mount Olive Road) from VA 614 (Devils Three Jump Road) to Middlesex County Line	Safety: Substandard roadway geometric conditions. Pavement markings missing on all side streets. Lacks adequate way-finding signage. Congestion: Based on information from PDC, trucks use VA 602 as cut through. (Source: 1)	Short-Term: Safety: Install chevrons throughout the segment as necessary; particularly in areas where the speed limit reduces to 30 mph. Install pavement markings (stop bars) and way-finding signage. Long-Term: Safety: Upgrade to current design standards. Additionally, upgrade side street approaches to VA 602. Congestion: Upgrade roadway conditions to current design standards to accommodate truck traffic. Provide turn lanes for additional capacity where necessary. (Source: 1)
3	King & Queen	VA 634 (Canterbury Road) from VA 636 to VA 14	Safety: Substandard roadway geometric conditions. (Source: 1)	Short-Term: Safety: Install chevrons throughout the segment as necessary; particularly in areas where the speed limit reduces to 30 mph. Long-Term: Safety: Upgrade to current design standards. (Source: 1)
4	King & Queen	VA 33 (General Puller Highway) at VA 605 (York River Road)	Safety: DSL: East and westbound left turn lanes are too short. Due to speeds on VA 33 , right turn treatments are inadequate. Vertical curve on eastbound approach limits sight distance to side street. Static warning signage	Short-Term: Safety: Add Left-turn arrow for eastbound and westbound approaches. Move intersection ahead sign by 800' to 1,000' on both approaches. Add reflect on east side of median. Mid-Term: Safety: DSL:

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			already in place. HRR: High speed roadway and placement of advance warning signs can create safety issues. Shoulders are worn from turning traffic . Knoll in median creates sight distance issues for side street's view of mainline traffic. (Source: 1, 7)	Improve eastbound approach and overall intersection grade to improve sight distance. Lengthen east and westbound left turn lanes. Install westbound right turn lane and convert eastbound taper to full right turn lane. HRR: Improve sight distance by lowering the profile of the median (west of intersection). Improve westbound right turn taper to distinguish from shoulder. Long-Term: Safety: Add "Vehicle Entering when Flashing" sign (dual indicated) with detector on northbound approach to catch right-turn movement. Overlay northbound approach to repair damage caused from truck use. Lengthen eastbound right-turn lane. (Source: 1, 6)
5	King & Queen	VA 33 (General Puller Highway) at VA 14 (Buena Vista Road)	Safety: Too many median openings closely spaced. Westbound left turn lane is too short. Based on speeds, eastbound right turn taper may be inadequate. VA 14 intersects at less than desirable angle. (Source: 1)	Mid-Term: Safety: Install eastbound right turn lane. Lengthen westbound left turn lane. Close cross-overs immediately to the east and west of VA 14. Realign VA 14 to the east at Long Dirt Road and improve cross-over to include turn lanes. (Source: 1)
6	King & Queen	VA 14 at US 360	Safety: Pavement markings faded. Eastbound and westbound left turn lane is too short. Lack of westbound right turn lane increases potential for accidents. High number of crashes may be due to red light running. Crashes at this location	Short-Term: Safety: Repaint pavement markings. Check clearance intervals. Mid-Term: Safety: Lengthen eastbound and westbound left turn lanes. Install westbound right turn lane. (Source: 1)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			exceed the planning threshold (nine crashes over three-year period). (Source: 1, 4)	
7	King & Queen	VA 33 (General Puller Highway) at VA 14	Safety: Westbound right turn taper is inadequate to accommodate truck traffic going to land fill on VA 14. The approach also has slight vertical/ horizontal curve overlap. Trash truck queue on southbound approach spills-back to block entrances to USPO and Sears Realty. Sears Realty entrance is used as a cut-though to avoid queues at VA 33. (Source: 1)	Short-Term: Safety: Install stop bar and "Do not block the box" signage at Sear Realty entrance. Mid-Term: Safety: Covert westbound right turn taper to full right turn lane of appropriate length to accommodate truck traffic and reduce potential impacts of the horizontal/ vertical curve. Implement access management measure, such as channelization of Sears Realty entrance, to prevent truck cut through traffic. (Source: 1)
8	King & Queen	VA 601 (Stratton Major Road) from VA 605 North to VA 14 West	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
9	King & Queen	VA 603 (Dragon Bridge Road) from Middlesex County Line to VA 14	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
10	King & Queen	VA 608 (Clancie Road) from 1.25 miles North VA 678 to VA 609 West	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
11	King & Queen	VA 610 (Liberty Hall Road) from VA 614 East to VA 614 West	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 20 Feet. (Source: 3)
12	King & Queen	VA 614 (Devils Three Jump Road) from VA 602 to VA 610	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 20 Feet. (Source: 3)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		South		
13	King & Queen	VA 614 (Devils Three Jump Road) from VA 609 South to VA 602	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
14	King & Queen	VA 614 (Devils Three Jump Road) from VA 613 North to VA 609 South	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 1)
15	King & Queen	VA 614 (Devils Three Jump Road) from VA 14 to VA 613 North	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 1)
16	King & Queen	VA 620 (Owens Mill Road) from VA 660 to Essex County Line	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
17	King & Queen	VA 619 (Owens Mill Road) from VA 660 to VA 721	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
18	King & Queen	VA 620 (Poor House Lane) from VA 630 to VA 620 East	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
19	King & Queen	VA 631 (Poor House Lane) from VA 14 North to VA 630	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
20	King & Queen	VA 622 (Minor Road) from US 360 to Essex County Line	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
21	King & Queen	VA 623 (Indian Neck Road) from VA 721 to VA 635 South	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 20 Feet. (Source: 3)
22	King & Queen	VA 625 (Byrds Mill Road) from	Safety: Geometric Deficiency (2009). (Source:	Long-Term: Safety: Rural - 2 Lane 20 Feet. (Source: 3)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		VA 721 to VA 649	3)	
23	King & Queen	VA 631 (Smithfield Road) from US 360 West to VA 650	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
24	King & Queen	VA 631 (Stevensville Road) from VA 632 to VA 14 North	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
25	King & Queen	VA 632 (Hockley Neck Road) from VA 633 to VA 631	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
26	King & Queen	VA 633 (Mantua Road) from VA 634 to VA 632	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
27	King & Queen	VA 634 (Mount Elba Road) from VA 633 to VA 629 East	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
28	King & Queen	VA 633 over Garnett's Creek	Safety: Identified as needing bridge replacement (UPC 2239). (Source: 5)	Short-Term: Safety: Replace bridge with current design standards, upgrade approaches (Source: 4)
29	King & Queen	VA 14 from US 360 to VA 33 West	Safety: Project identified in CTB Six Year Improvement Program as needing centerline rumble strips. Deficiency likely vehicles drifting across centerline (UPC 86481). (Source: 5)	Short-Term: Safety: Add centerline rumble strips. (Source: 4)
1	King William	VA 30 (King William Road) from VA 617 East to VA 613	Safety: Substandard roadway geometrics. Horizontal and vertical curve overlap in vicinity of East Spring Forest Road north and south intersections. Many of the major side streets have no pavement markings. Congestion: Segment will	Short-Term: Safety: Install pavement marking on major side streets. Mid-Term: Safety: Upgrade VA 30 to current design standards. Long-Term: Congestion: Reconstruct to 4 Lane with median. (Source: 1)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			operate at LOS E in 2035. (Source: 1)	
2	King William	VA 618 (Acquinton Church Road) from US 360 to VA 30 East	Safety: Inconsistent pavement and shoulder widths throughout entire segment. (Source: 1, 3)	Long-Term: Safety: Upgrade VA 618/629 to current design standards. (Source: 1, 3)
3	King William	US 360 at VA 600	Safety: Eastbound US 360 approach has horizontal alignment issue and the right turn lane is too short. Westbound right turn lane is too short. (Source: 1)	Short-Term: Safety: Reduce speed limit on both approaches to the intersection. Install flashing warning signs along eastbound approach to limit impact of horizontal curve issue. Mid-Term: Safety: Lengthen eastbound and westbound right turn lanes. (Source: 1)
4	King William	US 360 at VA 611	Safety: Too many access points in northeast quadrant. Inadequate westbound right turn provision given speeds on US 360. (Source: 1)	Mid-Term: Safety: Install westbound right turn lane to provide storage and reduce potential for rear-end accidents due to slowing vehicles. Implement access management to reduce the number of access points in northeast quadrant. Consider closing first entrance on VA 611 and widening second to at least 30 feet. Eliminate both existing access points on US 360 to accommodate right turn lane. Provide new access point on US 360 in future when property is redeveloped. (Source: 1)
5	King William	VA 30 (King William Road) at US 360	Safety: Tight westbound right turn radius; trucks run over curb. Northbound right turn vehicles intending to turn right at US 360 become trapped in right-most right turn lane which provides	Short-Term: Safety: Move stop bar for southbound shared through/left lane back to provide additional turn radius for westbound right turning trucks. Mid-Term: Safety: Improve

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			access to 7-Eleven only. Additionally, northbound through vehicles at VA 662 (Sharon Lane) become trapped downstream as lane becomes right turn only lane; vehicles wishing to go straight have to shift to left-most lane . Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 1, 4)	westbound right turn radius to accommodate trucks. Reconstruct to realign northbound approach of VA 30 from south of VA 662 to US 360. Change lane configuration at US 360 to allow right turns from right-most lane. New channelization will be exclusive right, through and left. (Source: 1)
6	King William	VA 30 (King William Road) at VA 629 / VA 9466	Congestion: Segment experiences heavy truck traffic in both directions. Two schools are located within immediate vicinity of the Intersection. Adequate turn lane storage is not provide at entrances to both schools. Queue spill-back and slowing of school buses may be creating congested conditions. (Source: 1)	Mid-Term: Congestion: Convert southbound right turn lanes at Acquinton Church Road to full right turn lane and lengthen to minimum 150 feet. Lengthen right and left turn lanes at northern entrance to middle school. Convert northbound right turn taper lanes to full right turn lanes at Walkerton Road. (Source: 1)
7	King William	VA 604 (Dabneys Mill Road) from VA 614 to VA 30 East	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
8	King William	VA 604 (Herring Creek Road) from VA 30 West to VA 628	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
9	King William	VA 608 (Globe Road) from VA 607 West to VA 600	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
10	King William	VA 608 (Globe Road) from VA 30 to VA 609	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
11	King William	VA 609 (Smokey Road) from VA	Safety: Geometric Deficiency (2009). (Source:	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		604 to VA 608 East	3)	
12	King William	VA 611 (Venter Road) from VA 605 to VA 30	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
13	King William	VA 614 (Etna Mills Road) from VA 601 to VA 615	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
14	King William	VA 615 (Nelsons Bridge Road) from Hanover County Line to VA 604	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
15	King William	VA 625 (Indian Town Road) from VA 640 to End of Road	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
16	King William	VA 625 (Indian Town Road) from VA 626 to VA 640	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
17	King William	VA 628 (Dorrell Road) from VA 600 to King And Queen County Line	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 20 Feet. (Source: 1)
18	King William	VA 628 (Dorrell Road) from VA 604 to VA 600	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 20 Feet. (Source: 3)
19	King William	VA 673 (Pocahontas Trail) from VA 1400 (Pocket Road) to VA 633 (Powhatan Trail)	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 20 Feet. (Source: 3)
20	King William	US 360 from Hanover / King William County Line to VA 1214 (Choctaw Ridge)	Safety: Lack of paved shoulders (UPC 81466). (Source: 5)	Mid-Term: Safety: Widen and pave shoulders. (Source: 4)
21	King William	VA 600 over	Safety: Identified as needing	Short-Term: Safety: Replace

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		Herring Creek	bridge replacement (UPC 77328). (Source: 5)	bridge with current design standards, upgrade approaches (Source: 4)
22	King William	VA 30 (King William Road) at VA 1301 (Courthouse Lane)	Congestion: Current roadway configuration cannot accommodate for long term growth. (Source: 11)	Long-Term: Congestion: Extend Courthouse driveway from Courthouse lane to VA 30, include right and left turn bays on VA 30. Eliminate existing eastern VA 30 and Courthouse lane intersection. Construct park & ride lot on Courthouse lane. (Source: 10)
23	King William (West Point)	VA 30 (King William Road) from VA 1002 (Magnolia Ave) to VA 33	Congestion: Series of closely spaced intersections along the corridor. At bulk delivery entrance (24th St), trucks making northbound left form queues that propagate to impact through lane. The capacity of VA 30 & VA 33 is not enough. (Source: 1)	Mid-Term: Congestion: Implement access management. Lengthen northbound left turn lane at bulk delivery entrance (24th Street). Add turn lanes to the east bound approach of the intersection of VA 30 & VA 33 . (Source: 1)
24	King William (West Point)	VA 30 (King William Road) at VA 1122 (15th Street)	Safety: Stop bar and centerline markings are missing on both approaches of 15th Street. Westbound lefts turn into TWLTL and conflict with northbound lefts. Eastbound right turn cars are crushed as they attempt to slip by on the right side of heavy vehicles as they make wide right turns. Entrance to Valero gas station on 15th Street is too close the intersection. TWLTL on north leg allows drivers to turn left into Valero at closest entrance to intersection. (Source: 1, 4)	Short-Term: Safety: Install stop bar and centerline marking on both approaches of 15th Street. Repaint northbound and southbound approaches to delineate left turn bays; paint left arrow on pavement. Install signage on eastbound approach to warn cars that heavy vehicles make wide right turns. Mid-Term: Safety: Implement access management to move entrance to Valero west away from intersection. (Source: 1)
25	King William (West Point)	VA 30 (King William Road) at	Safety: Crashes at this location exceed the planning	Mid-Term: Congestion: Add a through lane and an exclusive

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		VA 33	threshold (nine crashes over three-year period). Congestion: The capacity of the eastbound approach is not enough. (Source: 1, 4)	left lane for the eastbound approach. Long-Term: Safety: Deficiency with low priority. Continue to monitor for potential improvements. (Source: 1)
26	King William (West Point)	Off VA 33 (Eltham Road) Adjacent to new bridge.	Congestion: Commuter Lot Improvement identified by SMS database. (Source: 2)	Long-Term: Congestion: Construct commuter lot adjacent to new bridge. Estimate 25 spaces. (Source: 2)
27	King William (West Point)	VA 701 (Euclid Boulevard) from VA 1026 to VA 30	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
1	Mathews	VA 3 (Twiggs Ferry Road) at VA 198 (Buckley Hall Road)	Congestion: Vehicles from the southbound approaches have difficulty finding gaps in mainline traffic flow. (Source: 1)	Mid-Term: Congestion: Consider signalization to provide gaps for Twiggs Ferry Road traffic based on preliminary warrant analysis. Installation of the signal would depend on full warrant analysis. (Source: 1)
2	Mathews	VA 626 (Hallieford Road) from VA 198 North to VA 666	Safety: Stop bar missing on southbound VA 626 at VA 198. Tide water floods drainage ditches on side of the roadway. Substandard horizontal curve alignment. Congestion: VA 626 experiences high summer time traffic. (Source: 1)	Short-Term: Safety: Install stop bar on VA 626 at VA 198. Long-Term: Safety: Reconstruct to current design standards with adequate edge of pavement drainage facilities. Congestion: Based on future summer traffic volume, consider widening VA 626 where feasible. (Source: 1)
3	Mathews	VA 660 (East River Road) from VA 617 North to VA 618	Safety: Both north and south VA 617 intersections are not well-defined and intersect VA 660 at a less than desirable angle. Stop bars missing on both approaches of VA 619. Several minor	Short-Term: Safety: Install pavement markings including stop bars on both VA 617 intersections, lane markings and edge of pavement marking to improve definition and visibility. Install stop bar on

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			roads and private entrances intersect VA 660. (Source: 1)	both approaches of VA 619. Mid-Term: Safety: Install appropriate turn lanes on VA 660 at VA 619 and VA 660 (East River Road). Long-Term: Safety: Reconfigure both VA 617 intersections to intersect VA 660 at 90 degree angle and install appropriate turn lanes on VA 660. Investigate opportunities to implement access management to consolidate minor roads and relocate private entrances. (Source: 1)
4	Mathews	VA 3 (Windsor Road) at VA 198 (Buckley Hall Road)	Safety: Slight horizontal curve on VA 3 approach. (Source: 1)	Long-Term: Safety: Straighten VA 3 approach to eliminate horizontal curve. (Source: 1)
5	Mathews	VA 14 at VA 660	Safety: Intersection is under construction. (Source: 1)	Long-Term: Safety: Continue to monitor for safety improvements. (Source: 1)
6	Mathews	VA 3 (Windsor Road) from VA 14 to Middlesex County Line	Congestion: Segment will operate at LOS D in 2035. (Source: 2)	Long-Term: Congestion: Rural - 4 Lane With Median. (Source: 2)
7	Mathews	VA 14 (Buckley Hall Road) from VA 198 West to VA 9246	Congestion: Segment will operate at LOS D in 2035. (Source: 3)	Long-Term: Congestion: Urban - 4 Lane With Median. (Source: 3)
8	Mathews	VA 14 (Old Bayside Drive) from VA 600 (Circle Drive) to Bayside Wharf	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
9	Mathews	VA 600 (Circle Drive) from VA 14 North to VA 14 South	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
10	Mathews	VA 609 (Bethel Beach Road)	Safety: Geometric Deficiency (2009). (Source:	Long-Term: Safety: Rural - 2 Lane 22 Feet . (Source: 1)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		from VA 608 to VA 611	3)	
11	Mathews	VA 611 (Garden Creek Road) from VA 613 West to VA 609	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
12	Mathews	VA 613 (Beaverdam Road) from VA 14 to VA 611 West	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet . (Source: 1)
13	Mathews	VA 617 (North River Road) from VA 618 (Cardinal Road) to VA 654	Safety: Project identified in CTB Six Year Improvement Program as needing realignment. (UPC 67091). Geometric Deficiency (2030). (Source: 5, 3)	Short-Term: Safety: Reconstruct 0.75 miles of roadway from 0.105 mile North of VA 618 to 0.073 mile South of VA 645 to realign and widen roadway (no information available on specific improvements) Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 4, 3)
14	Mathews	VA 617 (North River Road) from VA 654 to VA 14	Safety: Geometric Deficiency (2025). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
15	Mathews	VA 618 (Cardinal Road) from VA 617 to VA 660	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
16	Mathews	VA 628 (Cobbs Creek Lane) from VA 198 to VA 725	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
17	Mathews	VA 636 (Bay Haven Drive) from VA 672 to VA 633	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
18	Mathews	VA 637 (Gwynnsville Road) from VA 680 to VA 633	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
19	Mathews	VA 639 (Crab Neck Road) from VA 223 East to	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		VA 648		
20	Mathews	VA 641 (Pine Hall Road) from VA 14 to End of Road	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
21	Mathews	VA 642 (Fitchetts Wharf Road) from VA 643 to Fitchett Wharf	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
22	Mathews	VA 643 (Haven Beach Road) from VA 642 to VA 645	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
23	Mathews	VA 14 at VA 198	Safety: Project identified in CTB Six Year Improvement Program. (UPC 56940). (Source: 5)	Short-Term: Safety: Construct turn lanes to improve intersection safety. (Source: 4)
24	Mathews	VA 3 at VA 14	Safety: Short turn bays causes safety concerns. (Source: 11)	Mid-Term: Safety: Extend existing turn bays to current standards (Source: 10)
1	Middlesex	VA 33 (General Puller Highway) at VA 3 (Twiggs Ferry Road)	Safety: Yield sign on eastbound to southbound right turn is on left hand side only. Several commercial and private access points closely spaced. Congestion: Vehicles on the northbound approach have difficulty finding sufficient gaps in the mainline traffic. (Source: 1)	Short-Term: Safety: Augment existing yield sign for eastbound right turns to southbound Twiggs Ferry Road with additional yield sign on right hand side. Mid-Term: Safety: Consider access management to consolidate access points along the segment from VA 626 to VA 3 (Twiggs Ferry Road). Long-Term: Congestion: Reconstruct intersection since VA 3 will be widen to four lanes according to SMS recommendations. Keep monitor the intersection for further improvements. (Source: 1)
2	Middlesex	VA 603 (Farley Park Road) from King & Queen	Safety: Vegetation along portions of the roadway restrict sight distance.	Short-Term: Safety: Trim vegetation to improve sight distance.

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		County Line to VA 612	Roadway is constructed to secondary (low volume) road design standards. (Source: 1, 3)	Long-Term: Safety: Upgrade roadway to current design standards. (Source: 1)
3	Middlesex	VA 3 (Twiggs Ferry Road) from Mathews County Line to VA 630	Congestion: Segment will operate at LOS D in 2035. (Source: 2, 1)	Long-Term: Congestion: Rural - 4 Lane With Median. (Source: 2, 1)
4	Middlesex	VA 33 at VA 227	Safety: DSL: Pavement markings are faded. Westbound right turn radius is too tight. Permitted/Protected left turn phasing on both east/west approaches causes accidents. Too many commercial entrance located within functional area of the intersection. Southbound right turn acceleration lane creates an unnecessary merge point. HRR: Location has high rate of left turn crashes due to permitted phases and high speeds of opposing traffic. Tight geometry and lack of guidance (puppy tracks) contributes to crashes between left turning vehicles. Stop bar is worn. Poor drainage in median. Congestion: DSL: Heavy westbound right turn volume. (Source: 1, 7)	Short-Term: Safety: DSL: Repaint pavement markings. HRR: eastbound & westbound protected left-turn phasing. Restripe westbound stop bar. Strip puppy feet for eastbound left-turn. Mid-Term: Safety: DSL: Eliminate southbound right turn acceleration lane and allow turns at the signal. HRR: Improve drainage in median. Congestion: DSL: Convert VA 33 westbound right turn taper to full right turn lane and improve turn radius. Right turn lane should be long enough to accommodate heavy right turn traffic. Long-Term: Safety: DSL: Consider access management to consolidate or relocate commercial entrances, particularly entrance that tie into turn lane. Continue to monitor intersection for accidents and consider changing east/west left phasing to protected only. (Source: 1, 6)
5	Middlesex	US 17 at VA 616 / VA 665	Safety: Southbound US 17 left turn lane is too short. Northbound US 17 right turn	Mid-Term: Safety: Lengthen southbound left turn lane to accommodate trailer traffic.

•	Jurisdiction	Location Information	Deficiencies	Recommendation
			taper does not accommodate summer time boat-trailer traffic. Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 1, 4)	Convert northbound right turn taper to full right turn lane that can accommodate trailer traffic. (Source: 1)
6	Middlesex	VA 33 at VA 3	Safety: Crashes at this location exceed the planning threshold (nine crashes over three-year period). (Source: 4)	Long-Term: Safety: Deficiency with low priority. Continue to monitor for potential improvements. (Source: 1)
7	Middlesex	US 17 BUS (Gloucester Road) from US 17 South to VA 33 / VA 618	Congestion: Need for improvement was identified by SMS database. (Source: 2)	Long-Term: Congestion: Urban - 3 Lane. (Source: 2)
8	Middlesex	VA 3 (General Puller Highway) from VA 3 / VA 33 North to VA 3 / VA 33 North	Congestion: Need for improvement was identified by SMS database. Study identified that the roadway will not accommodate long term growth on corridor. (Source: 2, 11)	Long-Term: Congestion: Rural - 4 Lane With Median. (Source: 2, 10)
9	Middlesex	VA 3 (Greys Point Road) from Lancaster County Line / Robert Opie Norris Bridge End to VA 3 / VA 33 North	Safety: Bridge is functionally obsolete, shoulders are insufficient. . Congestion: Segment will operate at LOS E in 2035. Existing LOS for bridge is LOS D in AM, and LOS E in PM. (Source: 2, 11)	Long-Term: Safety: Replace existing 2-lane bridge with a 4-lane bridge, include 10 foot shoulders. Congestion: Urban - 4 Lane With Median. (Source: 2, 10)
10	Middlesex	VA 3 (Twiggs Ferry Road) from VA 3 / VA 33 North to VA 630	Congestion: Segment will operate at LOS D in 2035. (Source: 2, 3)	Long-Term: Congestion: Rural - 4 Lane With Median. (Source: 2, 3)
11	Middlesex	VA 33 (General Puller Highway) from US 17 / VA 33/ VA 618 to VA 703	Congestion: Segment will operate at LOS E in 2035. (Source: 2, 3)	Long-Term: Congestion: Urban - 4 Lane With Median. (Source: 2, 3)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
12	Middlesex	VA 33 (General Puller Highway) from VA 636 to Stingray Point	Safety: Project identified in CTB Six Year Improvement Program because of insufficient facilities for pedestrians and cyclist. (UPC 67640) (Source: 5, 3)	Mid-Term: Safety: Construct bicycle/pedestrian path between VA 636 to VA 688. Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 4, 1)
13	Middlesex	VA 1101 (Lovers Lane) from End of Road to VA 33	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
14	Middlesex	VA 1104 (Deagles Road) from End of Road to VA 1102	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
15	Middlesex	VA 602 (Wares Bridge Road) from King And Queen County Line to US 17 North	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
16	Middlesex	VA 603 (Farley Park Road) from VA 612 to US 17	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)
17	Middlesex	VA 615 (Town Bridge Road) from VA 616 to VA 602 West	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
18	Middlesex	VA 616 (Zion Branch Road) from VA 615 to US 17	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
19	Middlesex	VA 622 (Dirt Bridge Road) from VA 623 to VA 3	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
20	Middlesex	VA 623 (Regent Road) from VA 624 to VA 622	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
21	Middlesex	VA 624 (Syringa Road) from VA 626 to VA 623	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 3)
22	Middlesex	VA 625 (Barricks Mill Road) from	Safety: Geometric Deficiency (2009). (Source:	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)

•	Jurisdiction	Location Information	Deficiencies	Recommendation
		VA 624 to VA 628	3)	
23	Middlesex	VA 628 (Mill Creek Road) from VA 33 to VA 625	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 22 Feet. (Source: 3)
24	Middlesex	VA 629 (Stormont Road) from VA 690 to VA 619	Safety: Project identified in CTB Six Year Improvement Program. (UPC 59071) (Source: 5, 3)	Mid-Term: Safety: Reconstruct 0.23 miles of roadway from 0.50 mile East of VA 619 to 0.085 mile West of VA 690 (no information available on specific improvements). Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 4, 3)
25	Middlesex	VA 3 in vicinity of VA 621	Safety: Tight horizontal curves in "darkness - not lighted" conditions compounded with high speeds are cause of collisions (Source: 11)	Short-Term: Safety: Add advisory speed reduction signage at horizontal curve. (Source: 10)
26	Middlesex	VA 3 at VA 622 (Dirt Bridge Road)	Congestion: Lack of turn lanes causes congestion as through vehicles are blocked by turning vehicle. (Source: 11)	Mid-Term: Congestion: Add eastbound right turn lane and northbound right turn lane. (Source: 10)
27	Middlesex (Urbanna)	VA 227 (Urbanna Road) at VA 1001(Rappahannock Avenue)	Safety: Stop bar missing on VA T-1001 and stop sign is obscured by tree limbs. No pedestrian facilities available; however, pedestrians observed walking in street along VA T-1001. No drainage facilities. (Source: 1)	Short-Term: Safety: Install stop bar on VA 1001. Trim tree limbs away from stop sign. Long-Term: Safety: Upgrade intersection with urban characteristics. Consider installing curb & gutter, side-walk on either side of VA 1001, cross-walks with ADA requirement. (Source: 1)
28	Middlesex (Urbanna)	VA 1001 (Rappahannock Avenue) from VA 1014 to VA 1007	Safety: Geometric Deficiency (2009). (Source: 3)	Long-Term: Safety: Rural - 2 Lane 24 Feet. (Source: 1)

- Replacing shoulders with curb-and-gutter sections;
- Possible reduction in traffic levels to improve LOS; and
- Conversion of two parallel roadways with two-way traffic to a one-way pair.

Safety

Roadway segments and intersections with high levels of incidents were supplied by VDOT and supplemented with additional information obtained from the MPPDC. Within the MPPDC, road segments and intersections were reviewed for causes of high incident rates and recommendations were developed to reduce or eliminate the concerns. Possible remedial measures included many of those noted for LOS deficiencies, and supplemented by others, for example:

- Improved sight distance;
- Reduced speed limit;
- Advance signage with safety-related messages; and
- Removal of objects within the roadway right-of-way.

The safety analysis is limited to the base year condition (Exhibit 14).

Structures

Information on structures and their current degree of adequacy was obtained from inventory information provided by VDOT. Current bridge sufficiency ratings were reviewed and those structures with a rating of less than 50 were considered deficient. Within the MPPDC, 15 structures were considered deficient or obsolete and in need of replacement, with an additional 23 recommended to be upgraded or repaired (Exhibit 15).

Exhibit 15. Bridge Deficiencies

	Functionally Obsolete			Structural Deficiency		
	Replace	Upgrade/Repair		Replace	Upgrade/Repair	
• **Bridge Sufficiency Rating**	**0-50**	**51-80**	**80+**	**0-50**	**51-80**	**80+**
• Essex County	0	3	0	4	0	0
• Gloucester County*	1	4	0	1	0	0
• King and Queen County	1	2	0	2	3	0
• King William County	1	4	0	1	2	0
• Mathews County	2	1	0	1	0	0
• Middlesex County	0	4	0	1	0	0
• Middle Peninsula PDC	5	18	0	10	5	0

Note: * Outside of HRTPO.

Roadway Geometrics

Data related to roadway geometrics provided by VDOT was compared to adequacy criteria, also made available by VDOT, to determine road segments and spot locations considered deficient. Recommendations for improvements included many of the remedial actions noted for mobility and safety improvements.

Deficiencies, Recommendations and Cost Estimates

Base year deficiencies (mobility, safety, structures, geometrics) and recommendations to alleviate the deficiencies are listed in Exhibit 14 and mapped by jurisdiction in Exhibits 16 through 21.

Roadways - Forecast Year (2035)

Deficiencies were based on mobility analysis (LOS) only. The same roadway segments and intersections analyzed for the base year condition, together with any new roadways (arterials or collectors) expected to be constructed in the MPPDC. were analyzed again using year 2035 traffic projections. If some segments and intersections are determined to be deficient for both the base year and forecast year, the recommendation for 2035 will override the recommendation for the base year (Exhibit 14).

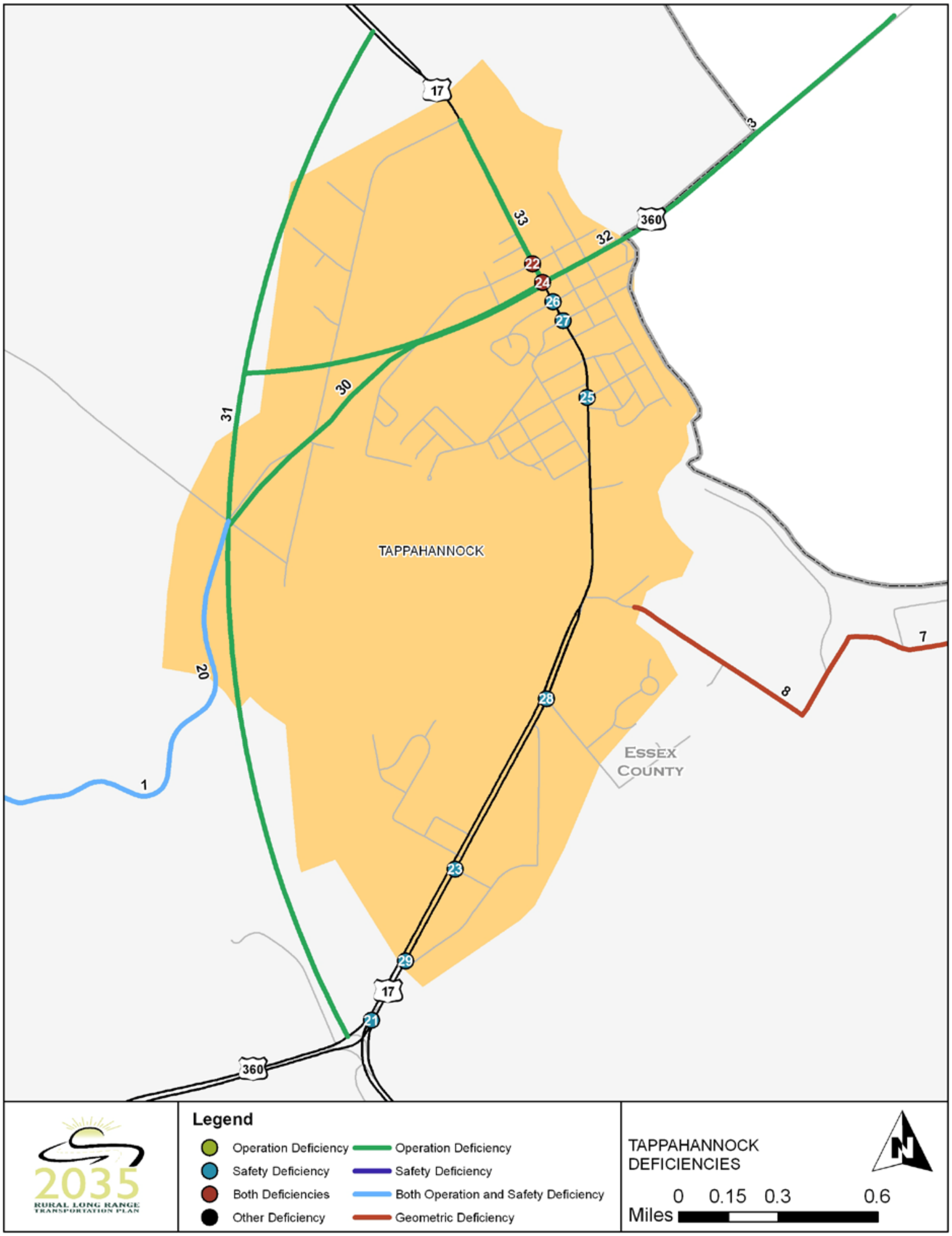
Public Transportation

One set of deficiencies and recommendations (base year and forecast year) was developed for the public transportation component of the Plan. Bay Transit, in partnership with other regional organizations, is exploring the possibility of providing additional fixed-route services in the future to meet the high transit demands of the Middle Peninsula region.

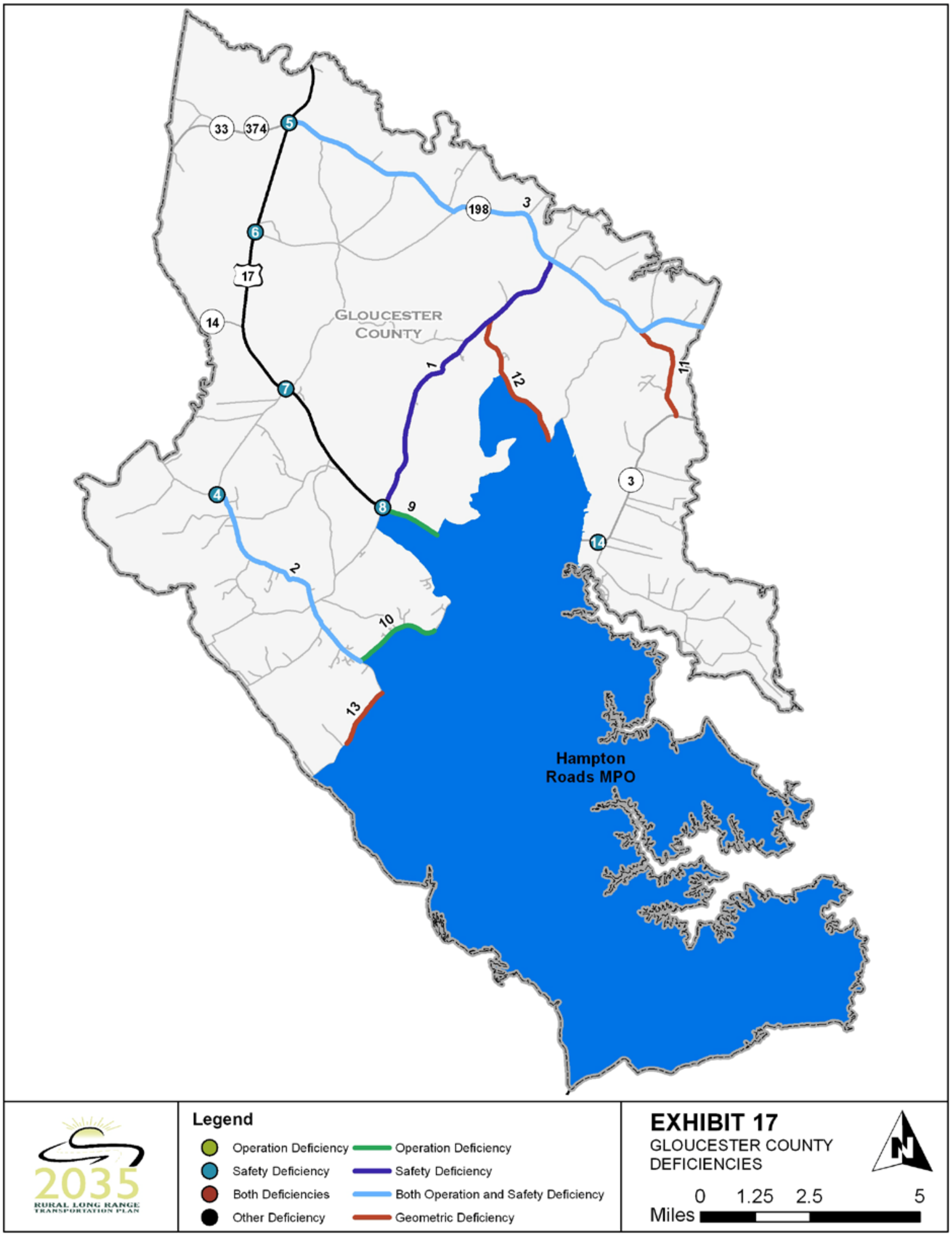
Demand-responsive transit is a vital service offered in many rural areas throughout the state because the providers offer transportation services to those with no other means of travel to necessary trip destinations. The Coordinated Human Service Mobility plan identified the needs and deficiencies of the region and also formulated strategies to address these needs (DRPT, *Middle Peninsula*, 2008):

- Continue to support and maintain capital needs of coordinated human service transportation providers;
- Expand availability of demand-response and specialized transportation services to provide additional trips for older adults, people with disabilities, and people with lower incomes;
- Expand outreach and information on available transportation options in the region, including establishment of a centralized point of access;
- Build coordination between Bay Transit and other demand-responsive transit providers;
- Bring new funding partners to public transit/human service transportation;
- Implement new public transportation services or operate existing public transit services on more frequent basis;
- Provide flexible transportation options and more specialized one-to-one services through expanded use of volunteers; and
- Provide targeted shuttle services to access employment opportunities.

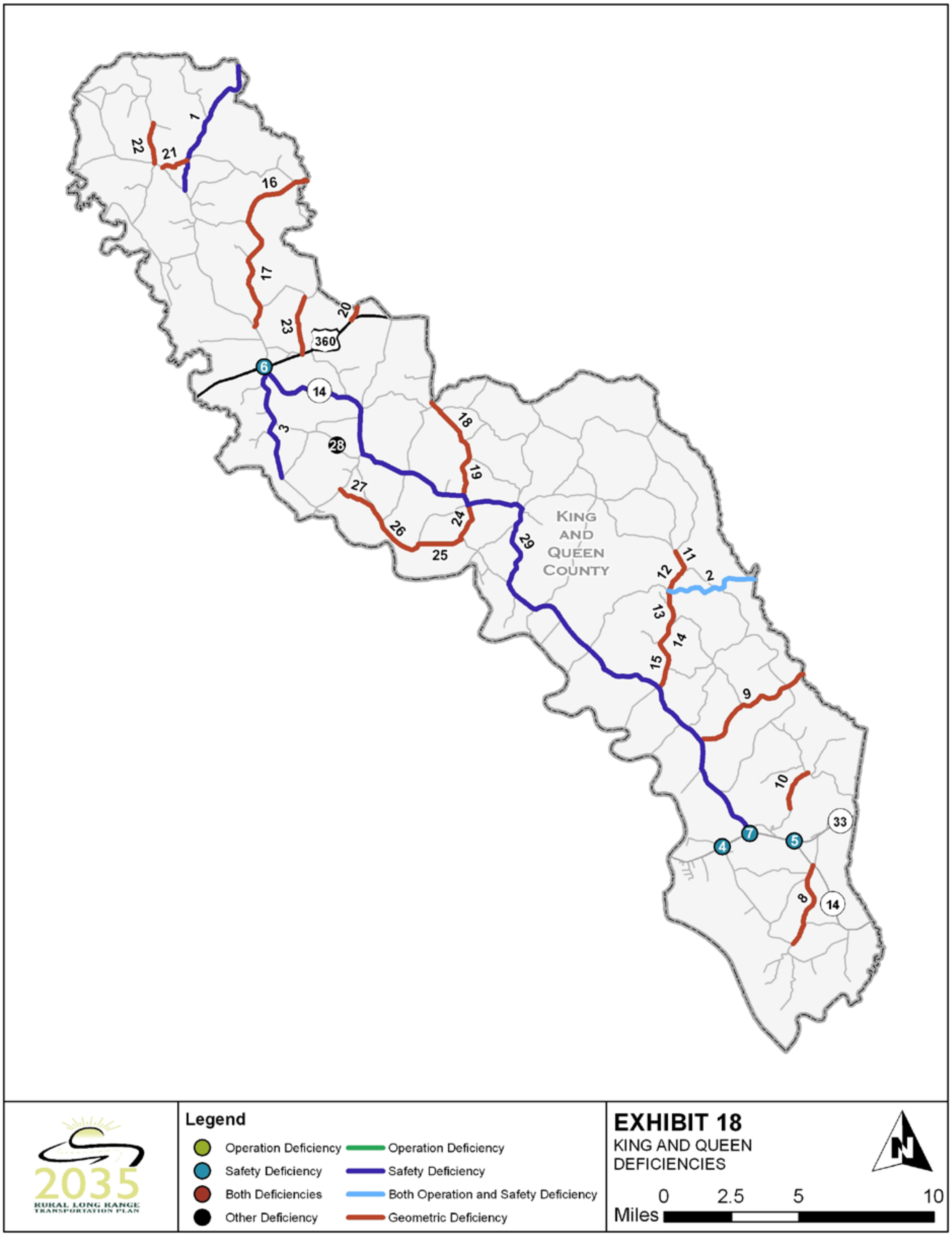

SEE
TAPPAHANNOCK
MAP
ESSEX
COUNTY
Legend
Operation Deficiency
Safety Deficiency
Both Deficiencies
Other Deficiency
Operation Deficiency
Safety Deficiency
Both Operation and Safety Deficiency
Geometric Deficiency
EXHIBIT 16
ESSEX COUNTY
DEFICIENCIES
0 1.25 2.5 5
Miles
2035
RURAL LONG RANGE TRANSPORTATION PLAN



17
33
32
360
3
22
24
26
27
25
30
31
TAPPAHANNOCK
20
1
28
23
29
17
21
360
8
7
ESSEX COUNTY
2035 RURAL LONG RANGE TRANSPORTATION PLAN
Legend
Operation Deficiency
Safety Deficiency
Both Deficiencies
Other Deficiency
Operation Deficiency
Safety Deficiency
Both Operation and Safety Deficiency
Geometric Deficiency
TAPPAHANNOCK DEFICIENCIES
0 0.15 0.3 0.6
Miles
N



33
374
5
198
3
6
17
14
Gloucester County
1
12
11
7
3
4
8
9
14
2
10
13
Hampton Roads MPO
2035
Rural Long Range Transportation Plan
Legend
Operation Deficiency
Safety Deficiency
Both Deficiencies
Other Deficiency
Operation Deficiency
Safety Deficiency
Both Operation and Safety Deficiency
Geometric Deficiency
EXHIBIT 17
GLOUCESTER COUNTY DEFICIENCIES
N
0 1.25 2.5 5
Miles


KING AND QUEEN COUNTY
360
14
33
Legend
Operation Deficiency
Safety Deficiency
Both Deficiencies
Other Deficiency
Operation Deficiency
Safety Deficiency
Both Operation and Safety Deficiency
Geometric Deficiency
EXHIBIT 18
KING AND QUEEN DEFICIENCIES
0 2.5 5 10
Miles
2035
RURAL LONG RANGE TRANSPORTATION PLAN

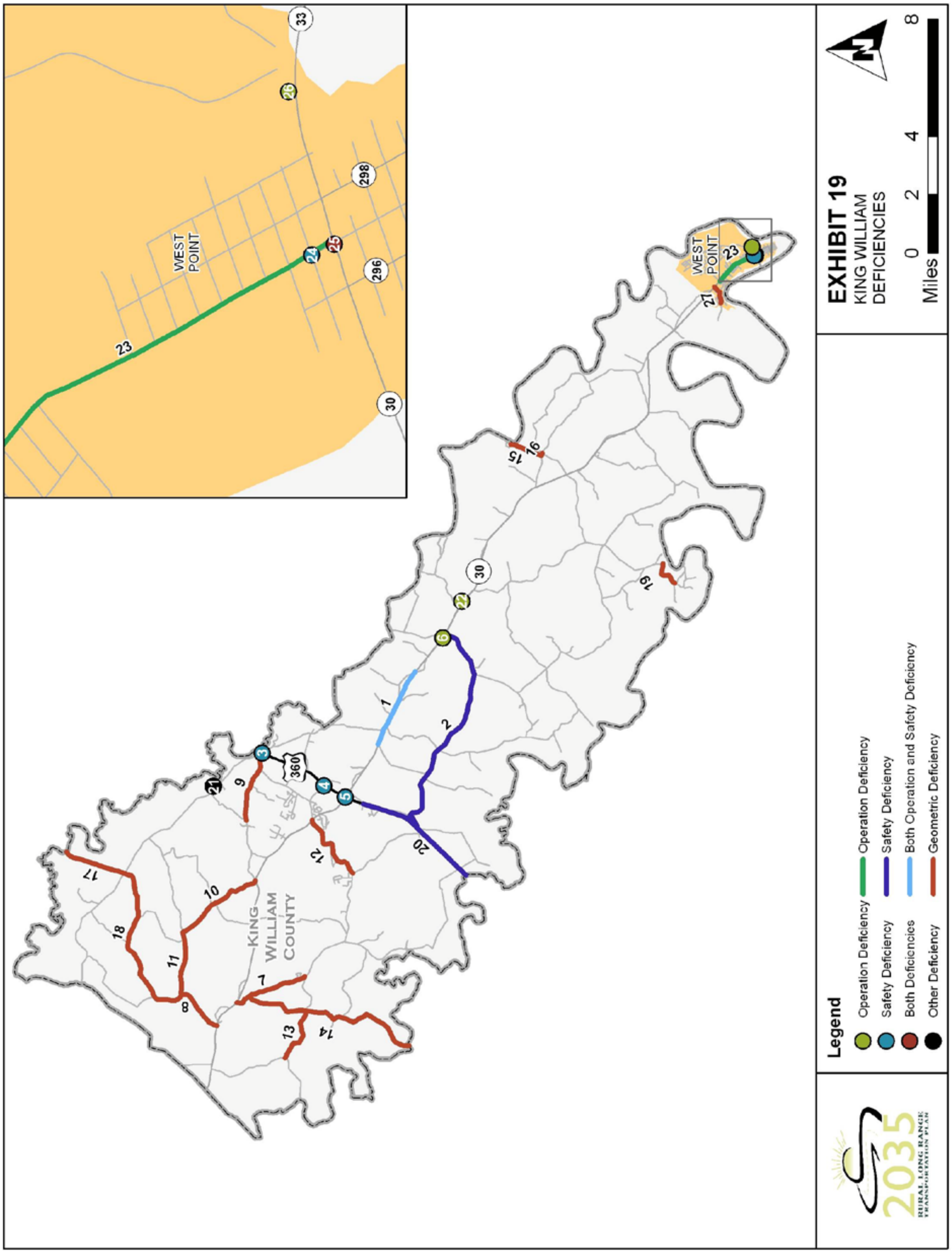
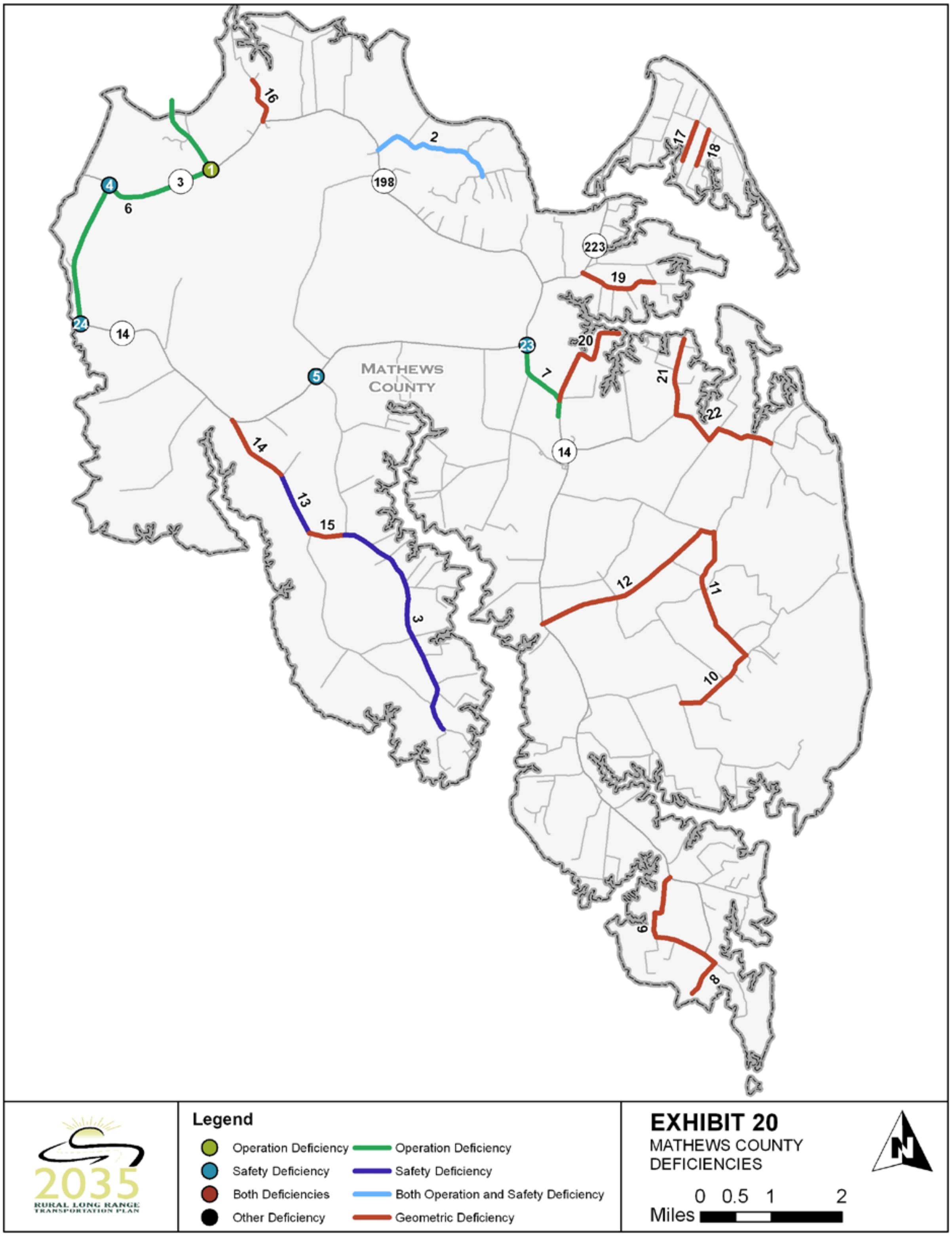


EXHIBIT 19
KING WILLIAM
DEFICIENCIES
Legend
Operation Deficiency
Safety Deficiency
Both Deficiencies
Other Deficiency
Operation Deficiency
Safety Deficiency
Both Operation and Safety Deficiency
Geometric Deficiency
KING WILLIAM COUNTY
WEST POINT
0 2 4 8
Miles



Mathews County
Legend
Operation Deficiency
Safety Deficiency
Both Deficiencies
Other Deficiency
Operation Deficiency
Safety Deficiency
Both Operation and Safety Deficiency
Geometric Deficiency
EXHIBIT 20
MATHEWS COUNTY
DEFICIENCIES
0 0.5 1 2
Miles
2035
RURAL LONG RANGE TRANSPORTATION PLAN

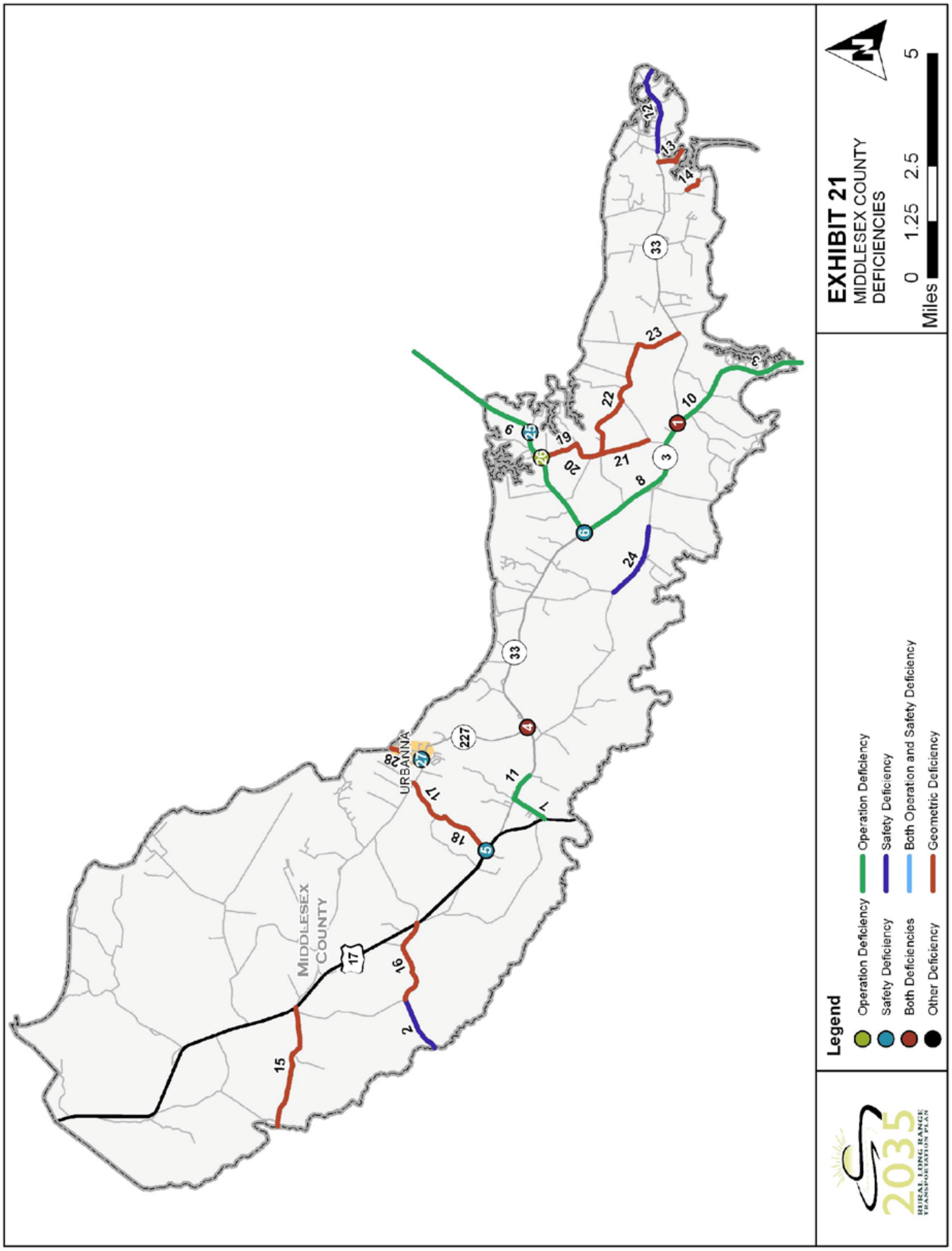


EXHIBIT 21
MIDDLESEX COUNTY
DEFICIENCIES
0 1.25 2.5 5
Miles
Legend
Operation Deficiency
Safety Deficiency
Both Deficiencies
Other Deficiency
Operation Deficiency
Safety Deficiency
Both Operation and Safety Deficiency
Geometric Deficiency
MIDDLESEX COUNTY
URBANNA
2035
RURAL LONG RANGE TRANSPORTATION PLAN

The review of disadvantaged population groups determined that there is limited access to public transportation by these populations, other than by demand-responsive service.

The Virginia Disability Survey of 1999, identified transportation as a significant impediment for disabled persons seeking additional or improved employment, including disabled individuals currently employed 35 or more hours per week. This is a particularly urgent problem for persons who have serious loss of vision or other severe physical impairments that cannot be overcome by purchasing a properly outfitted, privately-owned vehicle. Although each of the localities provides emergency vehicles to people with disabilities, these services are, in general, expensive and not equipped to meet the day-to-day transportation needs of disabled people living on the Middle Peninsula.

The largest provider of transportation services in the region, Bay Transit, Inc., offers transportation and para-transit style services to residents of each locality in region as stated previously. Although most Bay Transit vehicles are equipped with wheelchair lifts, Bay Transit has indicated that additional vehicles and the construction of bus shelters would reduce the number of individuals whose requested pick up times could not be accommodated and enhance service delivery. Recently, Bay Transit has decided to expand its services to include transportation from the Middle Peninsula to surrounding areas, such as the Richmond Metropolitan Area. There, the transportation system connects with Richmond transportation hubs, increasing the ability of disabled individuals to access additional services.

There are several census tract block group areas that had a high portion of one or more transportation disadvantaged groups. The MPPDC identified those areas that have the highest concentrations of low-income, elderly, and persons with disabilities (Exhibits 22 and 23). Bay Transit, in their "Transit Development Plan: Fiscal Years 2010-2015", projected that the population of elderly persons age 65 or older will increase from years 2010-2015 in all of the Middle Peninsula counties they serve. Addition of fixed-route or flexible fixed-route transit service along the principal arterials within the PDC would provide better mobility and access to and from these areas and populations. In addition, extended hours of demand-responsive service and new fixed-route service could provide access to the other transportation disadvantaged groups throughout the region.

Exhibit 22. Census Tracts with Higher than PDC-wide Transportation Disadvantaged Populations

• **Location**	**Minorities**	**Low-Income**	**Age 65 and Over**	**Persons with Disabilities**
• **MPPDC**	22.5%	8.4%	14.6%	18.5%
• **Essex County**				
• Tract 9506	53.1%	9.8%	15.3%	24.5%
• Block Group 1	74.0%	12.6%	15.4%	30.2%
• Block Group 2	41.8%		18.1%	25.4%
• Tract 9507	44.2%	13.6%	19.5%	20.0%
• Block Group 1	28.8%	10.5%	23.0%	18.6%
• Block Group 2	57.1%	17.0%		20.1%
• Block Group 3	42.1%	11.9%	24.1%	

• **Location**	**Minorities**	**Low-Income**	**Age 65 and Over**	**Persons with Disabilities**
• Tract 9508	27.7%	10.3%	17.2%	22.4%
• Block Group 1	23.9%	12.3%	18.8%	20.9%
• Block Group 2	34.0%		15.4%	23.7%
• Block Group 3	24.6%	13.8%	17.3%	
• Gloucester County				
• Tract 1105		10.6%	14.9%	19.3%
• Block Group 2		9.6%	20.5%	23.0%
• King and Queen County				
• Tract 9504	43.8%	11.6%	16.4%	25.1%
• Block Group 1	42.6%	12.8%	16.3%	24.0%
• Block Group 2	46.2%	9.2%	16.7%	23.1%
• Tract 9505	31.8%	9.8%	17.5%	24.0%
• Block Group 2	36.5%	16.7%	19.5%	32.4%
• Block Group 3	48.5%	11.4%	21.3%	19.5%
• King William County				
• Tract 9502	48.7%	16.0%	17.7%	19.2%
• Block Group 1	61.8%	18.8%	15.8%	21.8%
• Block Group 2	40.6%	14.2%	18.9%	
• Middlesex County				
• Tract 9509	32.4%	14.8%	20.6%	29.1%
• Block Group 1	33.6%	15.2%	20.6%	30.5%
• Block Group 2	31.1%	14.3%	20.6%	24.8%
• Tract 9510	27.3%	12.3%	21.8%	20.8%
• Block Group 1	43.6%	15.4%	20.9%	
• Block Group 3		14.2%	17.7%	23.1%
• Tract 9511		15.2%	17.3%	20.5%
• Block Group 1	24.3%	15.3%	19.3%	21.1%
• Block Group 2		16.2%	21.1%	19.3%
• Tract 9512		10.6%	29.9%	25.0%
• Block Group 2		14.9%	38.9%	31.4%

Source: US Census 2000.

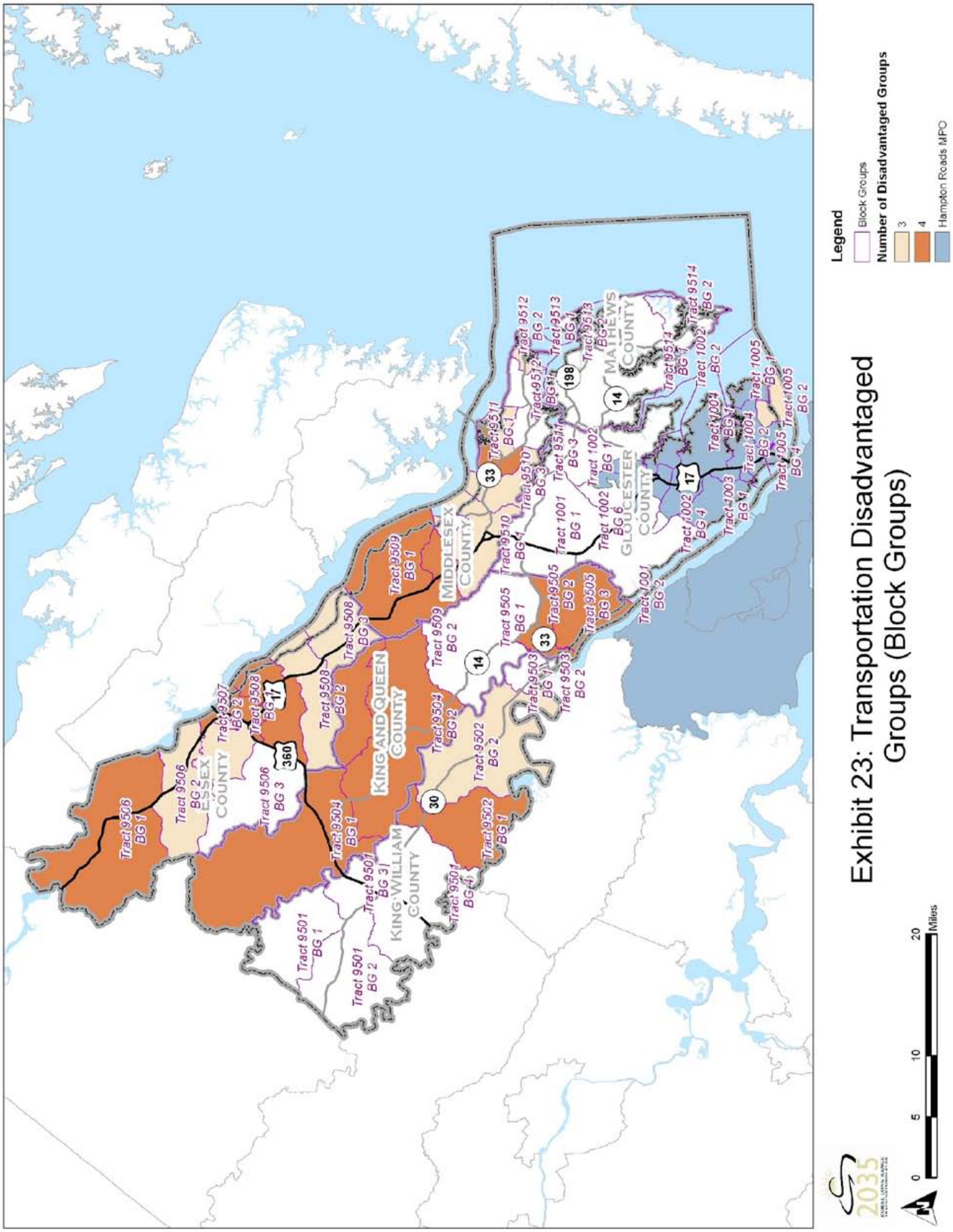


Exhibit 23: Transportation Disadvantaged Groups (Block Groups)

The staff of Bay Transit and several stakeholders, through the Transit Development Plan (TDP) process, have identified the potential need in the region for the initiation of additional fixed-route services. They identified one proposed fixed route in the Middle Peninsula Region. "Proposed Fixed Route 1" would provide service from Gloucester Point to the Town of Urbanna to the Town of Tappahannock starting from Gloucester and following US 17 to access Urbanna and Tappahannock. The one-way distance of the route is about 62 miles with a one-way trip estimated to take one and a half hours. However, funding for new fixed-route services is unlikely during at least the next 5 years considering anticipated funding levels in the near-term future and other considerations.

Bay Transit and other stakeholders included additional suggestions for expanded service in their TDP, including the extension of existing demand-response service to include later evening hours (after 6 PM) and/or weekend service (Saturday primarily). Other improvements that Bay Transit has proposed include the planned acquisition of a computerized scheduling and dispatching system. The manual method they are using presently is not an efficient way to operate the system, and with the improvement, Bay Transit suggests that their annual ridership may experience an increase of about ten percent per year following the implementation of a computerized system.

Based on the way the demand for transit has grown in the Bay Transit service area, an administrative and maintenance center has been proposed to be built in the Middle Peninsula. Funding for the facility, according to Bay Transit's current TDP, had been previously identified as a Federal earmark and would require zero local funds to build.

Bicycle and Pedestrian Facilities

As with human services transportation, one set of deficiencies and recommendations (base year and forecast year combined) was developed for this component of the Plan. Analysis is more qualitative than quantitative in nature with recommendations closely aligned with local desires. Because system development desires addressed present day or near-term needs, consolidation of recommendations was appropriate.

Determination for bikeways and pedestrian facilities is dependent on several factors. One is to define areas for development that have numerous trip generators and attractors, such as neighborhoods, parks, schools, and shopping areas. Another factor in development is the determination of areas appropriate for extensions of existing routes and paths to provide better links between facilities.

The primary source of recommendations was the Middle Peninsula Regional Bicycle Facility Plan. In the Middle Peninsula, the relatively flat terrain and current use of roads by bicyclists allowed the bike plan focus group to recommend facilities that will be successfully accepted and utilized. The recommendations from the regional plan are for shared road designations and primarily require routing and signage (Exhibits 24 and 25).

Exhibit 24. Recommended Bicycle Facilities in the MPPDC

• Jurisdiction	Roadway	Termini
• Essex County	US 17	Caroline County line to Middlesex County line
•	US 360	Rappahannock River to King and Queen County line

• **Jurisdiction**	**Roadway**	**Termini**
•	VA 659, VA 618, and VA 619	Tappahannock to King and Queen County line
•	VA 622 and VA 621	VA 618/VA 619 to US 360
•	VA 684	US 17 to US 360
• Town of Tappahannock	Diversion around US 17 through town using South Water Lane (T-1004) and Wright Street (T-1008)	
• Gloucester County	VA 198 and VA 33	Mathews County line to King and Queen County line
•	US 17	Middlesex County line to HRTPO boundary
•	VA 14	King and Queen County line to US 17
•	VA 602 (Burkes Pond Road)	VA 198 to VA 14
•	VA 3/VA 14	Mathews County line to HRTPO boundary
• King and Queen County	VA 721 and VA 14	Caroline County line to Gloucester County line
•	VA 623, VA 625, and VA 628	Essex County line to King William County line
•	US 360	Essex County line to King William County line
•	VA 621 and VA 629	Essex County line to King William County line
•	VA 620, VA 617, VA 614, VA 610, and VA 609	Essex County line to Gloucester County line
• King William County	VA 600	Caroline County line to VA 30
•	VA 628	King and Queen County line to VA 600
•	VA 30	Caroline County line to King and Queen County line
•	VA 601	Caroline County line to VA 30
•	VA 614	Hanover County line to VA 615
•	VA 615	Hanover County line to VA 30
•	VA 604	VA 600 to VA 30
•	VA 609, VA 608, and VA 610	VA 600 to VA 30
•	VA 605	VA 615 to US 360
•	US 360	King and Queen County line to Hanover County line
•	VA 618	US 360 to VA 629
•	VA 629/VA 632	King and Queen County line over VA 30 and back to VA 30

• **Jurisdiction**	**Roadway**	**Termini**
•	VA 640	VA 30 to VA 30
•	VA 33/VA 30	King and Queen County line to New Kent County line
• Mathews County	VA 3	Middlesex County line to VA 14
•	VA 198, VA 642, VA 643	Gloucester County line to Chesapeake Bay
•	VA 14	Gloucester County line to Chesapeake Bay
•	VA 223	VA 198 to Chesapeake Bay
•	VA 611	VA 14 south of Mathews to VA 14 west of Mathews
• Middlesex County	US 17	Essex County line to Gloucester County line
•	VA 602, VA 227	King and Queen County line across US 17 to VA 33
•	VA 33	Saluda/US 17 to Chesapeake Bay
•	VA 3	Rappahannock River to Piankatank River/Mathews County line

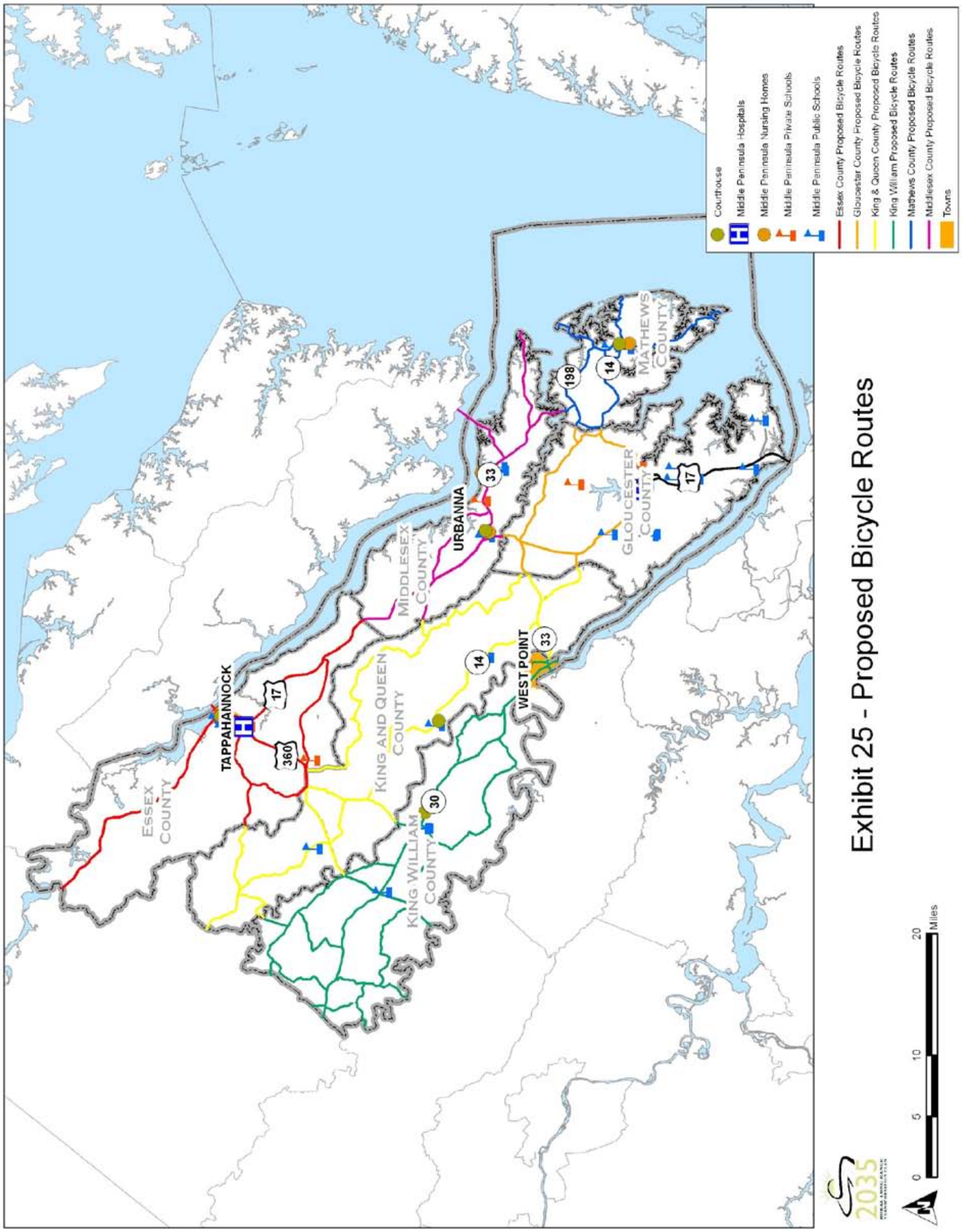


Exhibit 25 - Proposed Bicycle Routes

Airports

The Virginia Air Transportation System Plan Update forecasted average annual growth rates of based aircraft through 2020 for the three general aviation airports (DOAV, 2003). Aircraft based at Hummel Field are expected to continue to grow at 0.3% annually, at Middle Peninsula Regional Airport, 1.4%, and at Tappahannock/Essex County Airport, 1.0%. The forecasts assumed that the replacement of Tappahannock Municipal with Tappahannock/Essex would bring some initial gains followed by the projected growth (DOAV, 2003). Future growth at these airports is not expected to have long-term effects on the existing transportation network.

Goods Movement

The transfer of some goods shipments from roadway to rail has the potential to strengthen rail freight services offered, while also reducing the number of long-haul tractor-trailers trips and preserving or possibly enhancing roadway Level-of-Service (LOS). Due to the limited rail network in the Middle Peninsula, this is not as likely a possibility as in other PDCs with more extensive rail networks. Key truck freight corridors will continue to include the major arterials and collectors in the region, US 17, US 360, VA 3, VA 14, VA 30, and VA 33 due to their access to I-64. The counties and towns wish to direct most new industrial and commercial development towards the existing development in order to maintain the predominantly rural land uses throughout the counties as well as to utilize the current infrastructure such as water and sewer service and the transportation network.

The Middle Peninsula PDC received a planning grant from VDOT to conduct a Multimodal Freight Operations Study in the Region to analyze the existing intermodal and port infrastructure assets on the Middle Peninsula and how those assets can be better incorporated to establish a more efficient and reliable transportation system. The final report was completed in November 2009, identifying the most feasible opportunities for improving transportation integration of freight traffic in the Region. Three different industries were analyzed in the study: seafood, agriculture, and timber.

The seafood industry's transportation model uses inter-transportation and intra-transportation segments to complete the product distribution or supply chain. Inter-transportation combines multiple modes, whereas intra-transportation involves the use of a singular transportation mode. The initial segment of the seafood transportation model is "inter" in nature because the product is trans-loaded from boat to truck. The subsequent segment is "intra" in nature because the product is trans-loaded from truck to truck. It is difficult to incorporate new inter-transportation models for the seafood industry because of the products' brief shelf life. Seafood businesses in the Middle Peninsula generally receive and distribute products in less than a day to ensure freshness. That practice virtually eliminates the possibility of shipping seafood in refrigerated containers via ship, barge, or rail because each of those alternative modes of inter-transportation incorporates additional freight handling charges and, more importantly, increases transit times because of indirect routes. For this reason, an intra-transportation model versus an inter-transportation model produces the most feasible concept for improvement to seafood transport in the Region. Intra-transportation efficiencies could be made by establishing a centralized trans-loading refrigerated warehouse where seafood can be stored, consolidated, and distributed. The warehouse should have a fleet of trucks for local, regional, and over-the-road transport, able to service any of the local seafood businesses' transportation needs. The ideal location of the trans-loading refrigerated warehouse is recommended for three generalized areas in the Region, each having a concentrated amount of seafood business within a 10-15 mile radius: Guinea in Gloucester County, New Point in Mathews County, and Lower Deltaville in Middlesex County. The ability to establish this service would benefit the local seafood businesses because more resources would be placed on operational aspects (i.e., harvesting, processing, etc.) and fewer resources allocated towards locating and securing reliable transportation. This service could create a more efficient transportation network by consolidating shipments and thereby reducing truck traffic in the Region. One of the challenges facing the Middle Peninsula seafood industry is waterside access. Waterside access in this case means maintaining ample water depths to allow for the safe navigation of commercial fishing vessels. Regular maintenance dredging is required to maintain adequate navigation conditions. With no regular maintenance dredging, local waterways in the Middle Peninsula will continue to result in silting of navigational channels and loss of safe boating depths. Lack of available financing for regular maintenance dredging will continue to challenge the local navigation conditions of the Middle Peninsula's creeks and rivers.

The study identified a potential location for a public intermodal facility in the Region that would serve as a trans-loading site, able to accommodate agriculture and timber industries' commodities such as grains, round log, and wood chips. A public intermodal facility established on the Middle Peninsula could be a more effective link between transportation modes by providing a centralized point for cargo transfer and allowing shippers access to alternative markets. The facility would need access to two or more transportation modes and be positioned adjacent to the water, with ingress and egress provided by a primary or secondary road able to accommodate truck traffic carrying heavy loads. There are many locations throughout the Region that satisfy these requirements, and further evaluation is recommended to distinguish the most suitable site, but the study identified a location in King William County, in or near the Town of West Point. Preliminary evaluation conducted for the study supports that location because it currently accommodates all three modes of transportation, has proximity to major highways, is in a centralized location, is surrounded by water and is adjacent to the only railway access in the Region. The sole rail line is a critical component to the success of any potential intermodal facility because it offers the region the ability to reach out-of-state markets more economically by an alternative mode of transportation. The Middle Peninsula has a robust agriculture and timber market, making an intermodal facility sustainable just by accommodating a small percentage of those commodities produced in the Region.

The study also found that truck traffic and emissions could be reduced by transporting containerized grain products via barge from the Middle Peninsula to the Virginia Port Authority (VPA) marine terminal. Grain products are now transported from farms by truck to the VPA terminal and are transferred to a barge once there. By transporting the containers by barge from the Middle Peninsula to a VPA marine terminal, those truck trips could be eliminated from the primary highways connecting the Middle Peninsula to southeastern Virginia. The advantages of shipping cargo by barge compared to truck and rail has been well documented and includes increased energy efficiency, reduced emissions, and reduced traffic on roadways.

Funding available for the multimodal freight infrastructure recommendations discussed in the study includes the Aid to Local Ports Program administered by the VPA and the Maritime Administration's America's Marine Highway Program. The Marine Highway Program has at least two current projects that may provide opportunities for the Middle Peninsula movement of goods to market. The James River Expansion Project will expand an existing container-on-barge service between Hampton Roads and Richmond, Virginia by increasing the frequency of service. It will also initiate a container shuttle service between four terminals in the Hampton Roads area, shifting the freight from local urban roads to the waterborne alternative. The James River service began in 2008 and exceeded the initial container transport estimates by more than 50 percent and moved more than 6,000 containers in the first year of service. The I-64 corridor has been identified by the U.S. Department of Transportation as a major freight bottleneck, causing up to 500,000 hours of vehicle delays annually, making the area a good candidate for alternative freight movement. The M-95 Marine Highway Corridor is a waterside alternative to transporting goods via I-95, the 1,925 mile-long corridor that is the major North-South landside freight corridor on the East Coast. The U.S. Department of Transportation identified more than a dozen major freight bottlenecks along this route, along with significant critical rail congestion along the upper portions. Projections of future freight volumes indicate increasing freight congestion challenges, with limited opportunities to increase landside capacity. Along the corridor are found 15 of the largest 50 marine ports in the United States, and those ports handle about 26 percent of the national total of short tons of cargo. The East Coast possesses a host of waterways, bays, rivers and the Atlantic coast itself. The Middle Peninsula is perfectly positioned to take advantage of this marine highway for transporting goods to market.

Land Use and Future Growth

Because the existing land use in the Middle Peninsula region is generally rural and agricultural in nature, future development is expected to focus in existing towns, along major roadway corridors, and/or where water and sewer service is currently available or to become available (Exhibit 26). These growth areas were developed by the MPPDC in conjunction with the individual jurisdictions. These areas were used in the analysis of the roadway network to review existing traffic forecasts for the individual roadways and to produce new forecasts. The analysis was then used to prepare the recommendations. Some of these residential growth areas are designated as Rural Service Centers, Rural Village Centers, or Crossroad Communities. Commercial and industrial land uses are expected to continue where they currently occur and to expand along existing roadways, US 17, US 360, VA 30 and VA 33.

Travel Demand Management

In rural areas, low residential densities and dispersed work destinations are generally not conducive to high public transportation use. This is particularly true in the Middle Peninsula. Some decreases in single-occupant vehicle trips are possible through the continued use of the MidPen RideShare program. Further reductions would be possible if additional fixed-route service is established in the region. In addition, a commuter bus that would link to existing transit in Richmond, Fredericksburg, or Hampton Roads could reduce reliance on single-occupant vehicle travel. The Hampton Roads area is developing a Regional Transit Vision Plan that will look into the future, 2025 and beyond, to imagine what may be possible for the region’s transit services. As part of the plan, there will be a proposed express and enhanced bus service that connects major transit centers and activity nodes in the Hampton Roads region. One such recommendation for the Peninsula Network includes an express bus service from Gloucester County (Courthouse area) to Oyster Point in Newport News with a vision horizon of 2035. The express bus service would use coach bus vehicles and would serve regional commuter trips. If this service becomes available it would provide Middle Peninsula commuters with another option besides ridesharing. Finally, park and ride lots in the region are expected to maintain their

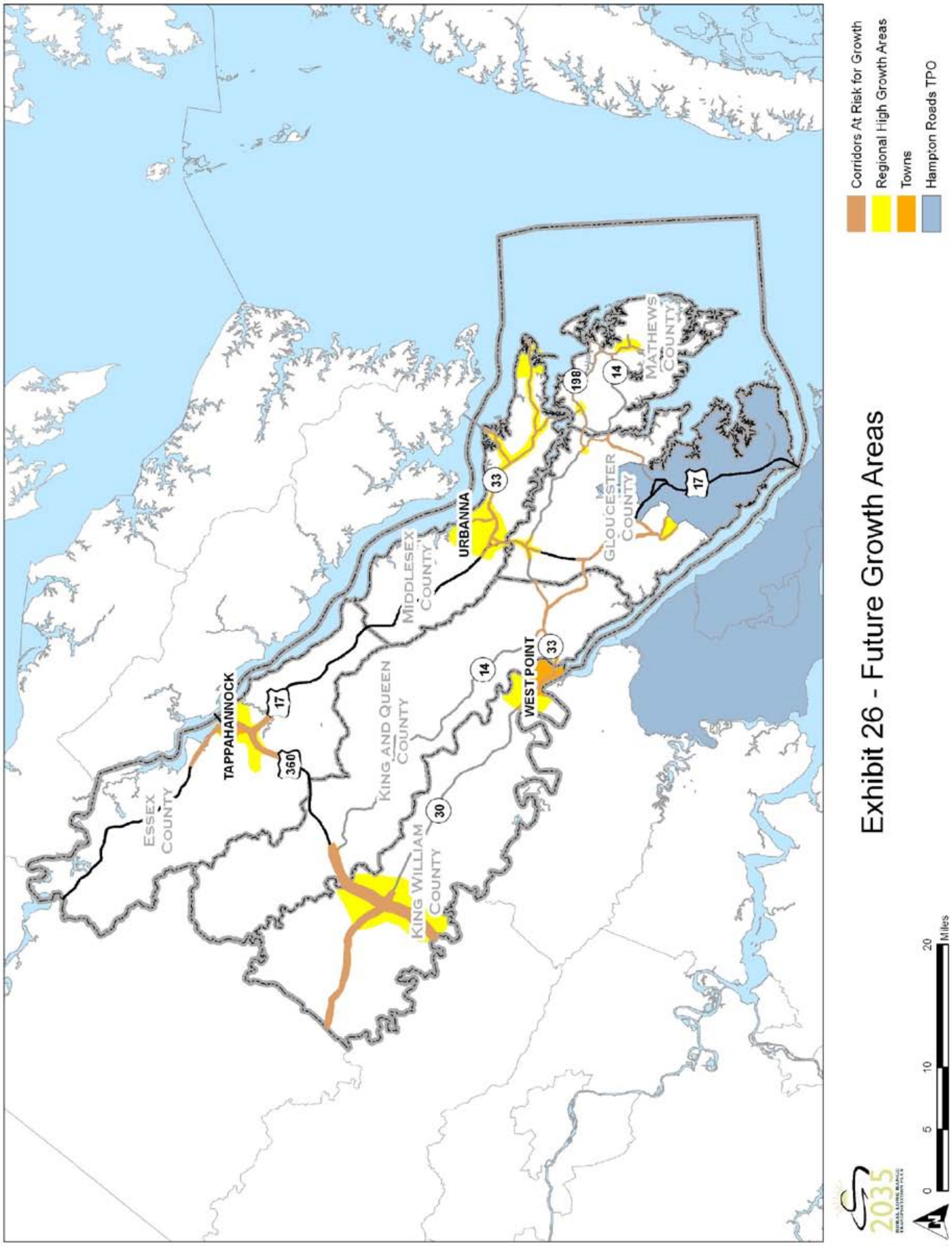


Exhibit 26 - Future Growth Areas

importance to the commuting population. In some lots, more space is needed and the feasibility of a lot in or near the Town of West Point, a major gateway to the Middle Peninsula Region, needs to be investigated. A survey of existing lots and their amenities and usage would be useful to assess any changes that may be needed to better serve commuters. A key intermodal connection to Bay Transit should also be addressed. Assessment of the use of the transit system in conjunction with park and ride lot usage can also prove useful in meeting the access and mobility needs of commuters.

CHAPTER 5 – CURRENT TRANSPORTATION PROJECTS & CONCERNS

The Middle Peninsula's Regional Transportation Committee expressed a need for any current transportation projects that are underway, or determined to be needed, to be recorded in this Plan along with any local government or public comments regarding those projects. These projects fall into all categories including, but not limited to, maintenance, construction, safety improvements and enhancements. Projects and comments are recorded here by county if they were submitted to the Middle Peninsula Regional Transportation Committee or MPPDC staff. All projects ongoing or needed in the Region are not included in this section and a more comprehensive list may be provided in a future update of the Plan.

Essex County provided a complete list of the roads that need to be paved below. Only those roads with 50 or more vehicles per day are eligible for paving per VDOT guidelines.

Essex Unpaved Roads-2010:

- Route 685, River Landing Road, from Route 606 to the dead end.
- Route 666, Shellfield Road, from Route 646 to the dead end.
- Route 727, Laurel Level Road, from route 611 to the dead end.
- Route 640, Ullaincee Road, from Route 637 to Route 639 West.
- Route 676 Lewis Level Road, from Route 620 to the dead end.
- Route 653, Tuscarora Road, from Route 694 to the dead end.
- Route 648, Old Howerton Road, from Route 684 to the dead end.
- Route 661, Kendalis Road, from Route 637 to the dead end.
- Route 680, River Place, from R0.3 miles east of Route 616 to the dead end.
- Route 683, Fountain Run Road, from Route 620 to the dead end.
- Route 623, Beulah Church Road, from Route 622 to Route 650 East.
- Route 608, Barefords Mill Road, from Route 607 to the dead end.
- Route 605, White Marsh Road, from Route 684 West to Route 684 East.
- Route 688, Fortune Lane, from Route 637 to the dead end.
- Route 654, Rectory Road, from route 17 to the dead end.
- Route 638, Wheatland Road, from route 17 to the dead end.
- Route 659, Desha Road, from Route 618 to the dead end.
- Route 606, Wares Mill Road, from Route 17 to the dead end.
- Route 655, Vineyard Road, from Route 611 to the dead end.
- Route 672, Cloverdale Road, from Route 600 to the dead end.
- Route 675, Carpenters Rest Road, from Route 639 to the dead end.
- Route 600, Sadlers Hill Road, from Route 17 to the dead end.
- Route 602, Colnbrook Road, from Route 17 to Route 719.

- Route 654, Belle Mead Road, from Route 17 to the dead end.
- Route 663, Ferry Landing Road, from Route 17 to the dead end.
- Route 669, Foggs Loop Road, from Route 627 West to Route 627 East.
- Route 674, Marl Bank Road, from Route 17 to the dead end.
- Route 679, Belmont Road, from Route 624 to the dead end.
- Route 686, Old Wagon Road, from Route 662 to the dead end.
- Route 690, Box Factory Lane, from Route 603 to the dead end.
- Route 701, Oak Hill Road, from Route 620 to the dead end.
- Route 718, Forest Grove Road, from Route 17 North to Route 17 South.
- Route 720, Montague Road, from Route 601 to Route 17.
- Route 1103, Ben Lomond Road, from Route 17 to .11 miles South of Route 17.
- Route 626, Bloomsberry Lane, from Route 620 to the dead end.
- Route 673, Polar Grove Road, from Route 605 to the dead end.
- Route 678, Clydeside Road, from Route 662 to the dead end.
- Route 709, Clover Lane, from Route 17 to Route 720.

Essex County's Secondary Six-Year Plan for fiscal years 2012-2017 and Construction Priority List for fiscal year 2012 included Routes 659, 608, 666 and 685.

Gloucester County provided the Commonwealth Transportation Board (CTB) with the following comments on the fiscal year 2012-2017 Six-Year Improvement Program:

1) Page 213, UPC No: 100624, Route 1216 Bicycle-Pedestrian Improvement.

Comment #1: There appears to be a minor typing error in the Scope of Work which reads "Minor Construction – City." Gloucester County is not a City and if possible this typo should be corrected on future documents.

Comment #2: The project is lacking a description. Our records indicate the description of the project as: "Entire length of Hayes Road from its northern intersection with Route 17 to the southern intersection with Route 17 and along Hook Road."

Comment #3: This project is very important for our Urban Development Area (UDA) project which is located in the Gloucester Point area, the highest populated area of the County. Route 1216 serves this area of the County, locally known as "Old 17" or Hayes Road. This is a mixed use area various density residential types, and a variety of commercial and industrial establishments. This road also provides an alternative to Route 17 for commuters and those looking to avoid traffic congestion on Route 17. A large number of pedestrians walk or ride bikes along Route 1216. Creating a more bicycle and pedestrian friendly environment would encourage and enable more residents of this area to take alternative, non-motorized routes to the nearby churches, retail, restaurants and other commercial establishments. Providing a bike lane and/or pedestrian friendly option to this road it would make a considerable difference in the safety of citizens who utilize the road as well as reduce the number of local motorized vehicle trips in this area of the County. In addition, sidewalks are required in new commercial site plans and since this area is designated a compact area under the State's Subdivision Street Acceptance Requirements (SSAR), sidewalks will be required on any new subdivision streets.

2) Page 217, UPC No: 100625, Bicycle-Pedestrian Improvement to Route 216, Guinea Road.

Comment #1: The project is lacking a description. Our records indicate the description of the project as: "From intersection of Guinea Road (Route 216) with US Route 17 to Achilles Elementary School/ Maryus Road (SR 649)."

Comment #2: This project is very important for our Urban Development Area (UDA) project which is located in the Gloucester Point area, the highest populated area of the County. Route 216 acts as a main arterial to connect this highly populated area of the County, locally known as Guinea Neck, to Route 17. Route 216 has public sewer and water running along much of its length and is zoned for high to moderate density housing. Providing a bike lane or pedestrian friendly option to this road would make a considerable difference in the safety of citizens who utilize the road as well as encourage alternative modes of transportation to the citizens living on this "peninsula" such as safe streets to schools and convenient access to retail centers and the newly relocated

Gloucester Point library at the intersection of Route 17 and Route 216. In addition, sidewalks are required in new commercial site plans and since this area is designated a compact area under the State's Subdivision Street Acceptance Requirements (SSAR), sidewalks will be required on any new subdivision streets.

3) Page 214, UPC No: 100626, Route 17 Bicycle Pedestrian Improvements.

Comment #1: This project is very important for our Urban Development Area (UDA) project which is located in the Gloucester Point area, the highest populated area of the County. Route 17 acts as a gateway from the peninsula to Hampton Roads. The area of the proposed project is a mixed use area with various density residential types, and a variety of commercial and industrial establishments as well as one of the County's major employers and a prominent educational institution - the Virginia Institute of Marine Sciences (VIMS). Route 17 is currently under construction as part of a long term widening project, however, sidewalks were not including during the original planning phases for the project. A large number of pedestrians walk or ride bikes along Route 17 using the existing shoulders or in the turn lanes. The project includes handicap ramps at the corners but does not provide the connecting sidewalks. Providing a bike lane and/or pedestrian friendly option to this portion of this road it would make a considerable difference in the safety of citizens who utilize the road as well as reduce the number of local motorized vehicle trips in this area of the County. Future widening projects in the UDA designated areas along Route 17 will include sidewalks in the project planning phases. In addition, sidewalks are required in new commercial site plans and since this area is designated a compact area under the State's Subdivision Street Acceptance Requirements (SSAR), sidewalks will be required on any new subdivision streets.

4) Page 213, UPC No: 98806, Signal Coordination Along Route 17.

Comment #1: The need for this project was identified as a priority during a recent 527 traffic impact analysis related to a local rezoning project. In certain intersections the northbound turning movements are overflowing in the PM hours due to the need to adjust the signal timings to reflect the traffic volume differences during different times of the day. The better movement of traffic would reduce congestion at these intersections and reduce the amount of idling vehicles. In addition, coordination of the signals to provide for pedestrian movements within the designated UDA's is critical to both areas' future functionality under traditional neighborhood design concepts.

5) Page 212, UPC No: 84478, Access Management – Crossover Improvements.

Comment #1: The Gloucester Board of Supervisors presented a list of 34 specific recommendations primarily focusing on the need for left turn lanes, additional signing and closing of crossovers. Additionally, several other crossovers were identified to have deficiencies to be addressed. The study was approved by the Board and the recent ARRA funding has allowed this important project to move forward more quickly than previously anticipated.

6) Page 251, UPC No: 98805, Business Route 17 Corridor Planning Study.

Comment #1: A large number of commuters from the northern portion of the County and other localities on the Middle Peninsula use Rte 3/14 as the main corridor to access Route 17 to the Peninsula. During peak hours, traffic at the intersection of Route 3/14 meets Main Street (Business 17) creates bottlenecks which compromise the system's efficiency. Various remedies have been put into effect to minimize the congestion, such as signalization coordination, a left turn on green, right turn on red, to help traffic flow better. While the problem has gotten slightly better with these solutions there is still a large amount of bottleneck traffic at this intersection. The intersection is also adjacent to two historic properties and serves at one of the gateways to the County's Historic Courthouse Downtown area. The Village along with the surrounding area is the County's second designated Urban Development Area (UDA). The County has used Enhancements grants to create a pedestrian friendly environment in the retail village however this intersection poses a mobility challenge for pedestrians and motor vehicles alike.

Along with this intersection, the cross-over at the Main Street Center has become a concern from a safety aspect as the use of this access has increased due to the location of the library, post office, and Health Department along with other retail establishments in this shopping center. Improvements to this section of Business 17 to relieve congestion, improve safety and access to the Main Street Center and provide a better pedestrian environment at either end of the Courthouse Village are much needed. Such improvements may encourage non motorized local traffic in and around this more densely developed portion of the County.

By studying this corridor in depth we are hopeful that a solution may be found that works to dramatically reduce or eliminate the bottle necking at this intersection while remaining cognizant of the surrounding historic properties and downtown retail area consistent with the traditional neighborhood design principles established for this UDA.

Gloucester County's Secondary Six-Year Plan for fiscal years 2012-2017 and Construction Priority List for fiscal year 2012 included:

- Reconstruction of Route 614, Hickory Fork Road, from .027 miles west of intersection with Route 633 and .149 miles west of intersection with Route 17.
- Reconstruction and minor widening of Route 615, Burleigh Road, from Route 616 to Route 17.
- Surface treatment of non-hard surfaced road on Route 615, Willis Road, from Route 613 to Route 606.
- Surface treatment of Route 610, Salem Church Road, from .56 miles north of Route 637 to Route 198.
- Surface treatment of Route 655, Zack Road, to Route 714.
- Surface treatment of Route 663, George Lane, to Route 629.
- Surface treatment of Route 709, Schley Lane, to Route 623.
- Surface treatment of Route 1105, Cross Road, to Route 646.

Mathews County has several projects that needed attention according to a report from May 2010 outlining comments that were approved by the Mathews County Board of Supervisors on April 27, 2010 for inclusion in the record of the FY 2011-2016 Six-Year Improvement Program (SYIP) public hearing.

Projects that are in the 2011-2016 SYIP:

- Reconstruction of Intersection at Routes 14/198-Ward's Corner: Substantial funding has already been programmed for the reconstruction of this dangerous intersection and a representative of Mathews County expressed that the additional funding that is necessary to begin construction of this improvement be included in the FY 2011-2016 SYIP.
- Reconstruction of Route 14-Main Street in Mathews Court House: $500,000.00 has been

budgeted in previous SYIPs to provide for engineering design to develop plans to minimize flooding of the roadway in the business district. Mathews asked the Commonwealth Transportation Board (CTB) to provide the necessary right-of-way acquisition and actual construction for this project. This project is of the utmost importance to the economic viability of the community, as regular flooding on Main Street has made business ownership and expansion extremely difficult.

Safety Improvements: projects that are not large in terms of cost, but they will greatly enhance the safety of the traveling public:

- Intersection Improvements at Routes 14/3 (Fort Nonsense): VDOT has begun some safety improvements at this dangerous intersection. The construction of a turn lane from Rt. 3 (Windsor Road) onto Rt. 14 West would greatly improve vehicular safety at this intersection.
- Construction of turn lanes on Rt. 198 at intersection with Rt. 626 (Hallieford Road): Hallieford Road (Rt. 626) serves one of the most densely-populated sections of Mathews County. Turn lanes at this location would allow traffic to move more freely along Rt. 198 and would greatly enhance safety.
- Construction of left turn lane on Route 14/198 at the Park & Ride facility adjacent to Mathews High School: This parking lot includes 63 spaces set aside for commuters; it also provides an additional 61 spaces for park user and overflow from Mathews High School. It is located along the busiest section of roadway in Mathews County (Rt. 14/198).
- Construction of left turn lane on Rt. 14 at entrance to the Mathews County Waste Convenience/Transfer Station: This public facility attracts an average of 500 vehicles per day, along with numerous trucks used to haul waste from the site. This is a primary public service location where traffic on Rt. 14 is slowed on a regular basis. Construction of a left turn on Rt. 14 would greatly enhance safety for the traveling public.
- Intersection of Routes 3/198 (Dixie): The Mathews Board of Supervisors has asked VDOT several times to install a traffic signal at this intersection. VDOT engineers originally approved this improvement and later withdrew approval. This intersection is dangerous, growing in traffic, and has been the site of numerous accidents in the past few years. The Board requests that VDOT reconsider this request for a traffic signal.

Enhancement Projects:

- New Point Comfort Lighthouse: Mathews County has been fortunate to receive partial funding through the enhancement grant program for Phase 1 of the New Point Comfort Lighthouse Preservation Project. The Mathews Board of Supervisors requested in 2010 that the CTB support of the current application for this project which will put the county closer to their goal of preserving the 1805 historic landmark.
- Mathews Court House Historic Gateway: VDOT has awarded several enhancement grants to Mathews County for this important project which will provide for pedestrian and vehicular safety improvements on Main Street in the Court House business district. The Mathews Board of Supervisors requested support for continued funding from the CTB of the enhancement grant applications for this purpose.

Mathews County has several projects that needed attention according to a report from May 2011 outlining comments that were approved by the Mathews County Board of Supervisors on April 26, 2011 for inclusion in the record of the FY 2012-2017 Six-Year Improvement Program (SYIP) public hearing.

Projects that are in the 2012-2017 SYIP:

- Reconstruction of Rt. 14 –Main Street in Mathews Court House: $500,000 has been budgeted previously to provide for engineering design to develop plans to minimize flooding of the roadway in our business district. Please consider including additional funding to provide for necessary right-of-way acquisition and actual construction for this project. This project is of utmost importance to the economic viability of our community, as regular flooding on Main Street has made business ownership and expansion extremely difficult. It is critical that this work be coordinated with streetscape work being done as part of the Mathews Court House Historic Gateway Enhancement Program project.

Safety Improvements: These projects are not large in terms of cost, but they will greatly enhance the safety of the traveling public:

- Intersection Improvements at Routes 14/3 (Fort Nonsense): VDOT has begun some safety improvements at this dangerous intersection. The construction of a turn lane from Rt. 3 (Windsor Road) onto Rt. 14 West would greatly improve vehicular safety at this intersection.
- Construction of turn lanes on Rt. 198 at intersection with Rt. 626 (Hallieford Road): Hallieford Road (Rt. 626) serves one of the most densely-populated sections of Mathews County. Turn lanes at this location would allow traffic to move more freely along Rt. 198 and would greatly enhance safety.
- Construction of left turn lane on Route 14/198 at the Park & Ride facility adjacent to Mathews High School: This parking lot includes 63 spaces set aside for commuters; it also provides an additional 61 spaces for park user and overflow from Mathews High School. It is located along the busiest section of roadway in Mathews County (Rt. 14/198).
- Construction of left turn lane on Rt. 14 at entrance to the Mathews County Waste Convenience/Transfer Station: This public facility attracts an average of 500 vehicles per day, along with numerous trucks used to haul waste from the site. This is a primary public service location where traffic on Rt. 14 is slowed on a regular basis. Construction of a left turn on Rt. 14 would greatly enhance safety for the traveling public.
- Intersection of Routes 3/198 (Dixie): The Board of Supervisors has asked VDOT several times to install a traffic signal at this intersection. VDOT engineers originally approved this improvement and later withdrew approval. This intersection is dangerous, growing in traffic, and has been the site of numerous accidents in the past few years. The Board requests that VDOT reconsider this request for a traffic signal.

Enhancement Projects:

- Mathews Court House Historic Gateway: VDOT has awarded several enhancement grants to Mathews County for this important project which will provide for pedestrian and vehicular safety improvements on Main Street in the Court House business district. Preliminary design is complete and engineering work is currently being completed. We look forward to construction in the near future, with your support. The Board of Supervisors thanks you for past support and respectfully requests that the $776,000 in additional funding included in the FY 12 Tentative Enhancement Allocations for this project be approved.
- Fort Nonsense Historical Park***:*** The CTB has awarded two previous enhancement grants to Mathews County for this important historic/cultural wayside at the entrance to the county on Route 14. The additional enhancement program funding that has been requested will provide adequate funds to complete this project and we are anxious to get started. The Board of Supervisors respectfully requests that the $393,000 in additional funding included in the FY 12 Tentative Enhancement Allocations for this project be approved.
- New Point Comfort Lighthouse Preservation Project: We expect to begin construction of Phase 1, the protective rock revetment, in 2011 or early 2012. An application for additional funding to assist with restoration of the lighthouse structure itself (Phase 2) will be submitted later this year.

King and Queen County’s Secondary Six-Year Plan for fiscal years 2012-2017 and Construction Priority List for fiscal year 2012 included Routes 636, 659, 601, and 664 and most, if not all, of those Routes are in the County’s unpaved road plan.

CHAPTER 6 – FUTURE CONCERNS IN REGIONAL TRANSPORTATION PLANNING

It is not possible to plan for all challenges that will come in the future, but below are some subjects that may be of concern in the next 25 years. Additional subjects will be added in future plan revisions.

Climate Change

According to information presented in the U.S. Department of Transportation and the Federal Highway Administration's 2011 Climate Change and Transportation Planning webinar on Virginia, there is evidence to suggest that the sea level will rise by 2 feet or more over the next 80 years. That increase in sea level may significantly impact the counties and towns of the Middle Peninsula.

With well over 1,000 miles of linear shoreline, the Middle Peninsula is under direct threat from accelerated climate change. Specifically, sea level rise will impact coastal communities and infrastructure, including roadways. In 2008, with funding from the Virginia Department of Environmental Quality's Virginia Coastal Zone Management Program, the Middle Peninsula PDC began a three year endeavor working with member localities and a variety of stakeholder groups to assess and discuss climate change impacts. As part of the study, an assessment was conducted of the economic and ecological impacts of a one foot sea level rise by the year 2050 for select vulnerable locations within the Middle Peninsula Region. The total long term costs of selected areas in the region were calculated to be approximately $187,005,132.10-$249,451,074.50, including the costs to raise select roadways ten inches and acquire the additional right-of-way to do so. Estimates of what it costs to raise a roadway 10 inches were provided by the Virginia Department of Transportation at $149-$745/square foot depending on short and long term time periods. Road access to coastal developments may become more limited as roadways are impacted by higher storm surge and sea level rise.

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King and Queen County, Virginia

2030 Comprehensive Plan

Appendix C:
VDOT 6 Year Road Plan

District: Fredericksburg

SECONDARY SYSTEM CONSTRUCTION PROGRAM (in dollars)

County: King & Queen County

Board Approval Date: 2017-18 through 2021-22

Route / PPMS ID / Accomplishment / Type of Funds / Type of Project / Priority #	Road Name / Project # / Description / FROM / TO / Length		Estimated Cost / Ad Date	Previous Funding / *SSYP Funding* / *Other Funding* / *Total*	Additional Funding Required	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Balance to complete	Traffic Count / Scope of Work / FHWA # / Comments
Rt.0630	Deshazo Road	*PE*	$3,000										
104908	0630049P75	*RW*	$0	**$221,981**		**$0**	**$0**	**$59,055**	**$56,757**	**$0**	**$0**		Reconstruction w/o Added Capacity
STATE FORCES/HIRED	RTE 630 - RECONSTRUCT &	*CON*	$218,981	**$0**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		16004
	RTE 631	*Total*	**$221,981**	**$221,981**	**$0**	**$0**	**$0**	**$59,055**	**$56,757**	**$0**	**$0**		
No Plan	RTE 612												
0001.00	2.5		7/15/2018										
Rt.0652	Vessels Road	*PE*	$3,000										80
102907	0652049567	*RW*	$0	**$50,449**		**$44,008**	**$51,808**	**$0**	**$0**	**$0**	**$0**		Reconstruction w/o Added Capacity
STATE FORCES/HIRED	Route 652 - Reconstruct/Surface	*CON*	$148,698	**$0**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		16004
	Route 721	*Total*	**$151,698**	**$50,449**	**$101,249**	**$44,008**	**$51,808**	**$0**	**$0**	**$0**	**$0**		
No Plan	route 641												
0002.00	1.4		7/3/2017										
Rt.0634	Canterbury Road	*PE*	$5,000										
106214	0634049576	*RW*	$0	**$389,690**		**$21,805**	**$21,805**	**$21,805**	**$21,805**	**$21,805**	**$0**		Resurfacing
STATE FORCES/HIRED	RTE 634 - SPOT IMPROVEMENTS	*CON*	$384,690	**$0**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		04005
	Various locations	*Total*	**$389,690**	**$389,690**	**$0**	**$21,805**	**$21,805**	**$21,805**	**$21,805**	**$21,805**	**$0**		
No Plan	Various Locations												
0003.00	1.2		7/10/2018										
Rt.0721	Newtown Rd.	*PE*	$926,545										
100828	0721049566	*RW*	$69,967	**$173,190**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		Bridge Replacement w/o Added
RAAP CONTRACT	Newtown Road Over Beverly	*CON*	$1,790,844	**$1,639,276**		**$62,011**	**$912,879**	**$0**	**$0**	**$0**	**$0**		14011
BR	1.060 Miles South of Rt. 646	*Total*	**$2,787,356**	**$1,812,466**	**$974,890**	**$62,011**	**$912,879**	**$0**	**$0**	**$0**	**$0**		Revised schedule required
Single Hearing	1.040 Miles North of Rt. 652												
0004.00	0.1		6/14/2016										
Rt.4005		*PE*	$0										0
99949	1204005	*RW*	$0	**$42,146**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		Preliminary Engineering
	COUNTYWIDE ENGINEERING &	*CON*	$250,000	**$0**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		16015
S	VARIOUS LOCATIONS IN	*Total*	**$250,000**	**$42,146**	**$207,854**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		MINOR SURVEY & PRELIMINARY ENGINEERING FOR BUDGET ITEMS AND INCIDENTAL TYPE WORK.
	VARIOUS LOCATION IN COUNTY												
0006.00			3/1/2011										
Rt.4003		*PE*	$0										0
99953	1204003	*RW*	$0	**$38,718**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		Reconstruction w/o Added Capacity
	COUNTYWIDE RURAL	*CON*	$250,000	**$0**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		16004
S	VARIOUS LOCATIONS IN	*Total*	**$250,000**	**$38,718**	**$211,282**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		RURAL ADDITIONS - SECTION 33.1-72.1. ROLLOVER OF FUNDS CAN BE FOR FIVE YEARS.
	VARIOUS LOCATIONS IN COUNTY												
0007.00			3/1/2011										
Rt.4007		*PE*	$0										0
99735	1204007	*RW*	$0	**$29,749**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		Safety
	COUNTYWIDE TRAFFIC	*CON*	$250,000	**$0**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		16021
S	VARIOUS LOCATIONS IN	*Total*	**$250,000**	**$29,749**	**$220,251**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		TRAFFIC SERVICES INCLUDE SECONDARY SPEED ZONES, SPEED STUDIES, OTHER NEW SECONDARY SIGNS
	VARIOUS LOCATIONS IN COUNTY												
0008.00			3/1/2011										
Rt.4008		*PE*	$0										

Route PPMS ID Accomplishment Type of Funds Type of Project Priority #	Road Name Project # Description FROM TO Length	Estimated Cost		Previous Funding *SSYP Funding* *Other Funding* *Total*	Additional Funding Required	PROJECTED FISCAL YEAR ALLOCATIONS 2016-17	 2017-18	 2018-19	 2019-20	 2020-21	 2021-22	Balance to complete	Traffic Count Scope of Work FHWA # Comments
			Ad Date										
Rt.4008		*PE*	$0										0
99834	1204008	*RW*	$0	**$18,715**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		Right of Way
	COUNTYWIDE RIGHT OF WAY	*CON*	$250,000	**$0**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		16016
S	VARIOUS LOCATIONS IN	*Total*	**$250,000**	**$18,715**	**$231,285**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		USE WHEN IMPARTICAL TO OPEN A PROJECT: ATTORNEY FEES and ACQUISITION COST.
	VARIOUS LOCATIONS IN COUNTY												
0009.00			1/30/2011										

KING & QUEEN COUNTY UNPAVED ROADS - 2016

ROUTE	STREET NAME	FROM TERMINI	TO TERMINI	LENGTH	AADT	SYIP	DISTRICT	ESTMATE
637	CHATHAM HILL ROAD	0.9 M W RTE. 634	DEAD END	0.50	188		ST. STEPHENS	$ 54,624.45
612	LILY POND ROAD	RTE. 14	RTE. 630	0.30	179		STEVENSVILLE	$ 32,774.67
658	TRAVELLERS ROAD	RTE. 601	RTE. 605	3.14	166		BUENA VISTA	$ 343,041.52
673	MARTIN TOWN ROAD	RTE. 619	DEAD END	0.79	97		NEWTOWN	$ 86,306.52
652	VESSELS ROAD	RTE. 721	RTE. 641	1.40	81	**on plan**	NEWTOWN	$ 152,948.48
630	DESHAZO ROAD	RTE. 631	RTE. 612	2.50	66	**on plan**	STEVENSVILLE	$ 273,122.23
607	CROUCHES ROAD	RTE. 631	RTE. 617	1.10	63		STEVENSVILLE	$ 120,173.78
645	PAGE LANE	RTE. 605	DEAD END	0.60	62		BUENA VISTA	$ 65,499.33
662	GREENBRIAR ROAD	RTE. 634	DEAD END	0.46	62		ST. STEPHENS	$ 50,254.49
642	GREEN CHAMBERS ROAD	RTE. 628	RTE. 360	0.30	56		ST. STEPHENS	$ 32,774.67
651	DEWSVILLE ROAD	RTE. 625	DEAD END	1.00	56		NEWTOWN	$ 107,528.00
612	LILY POND ROAD	RTE. 630	RTE. 617	2.77	55		STEVENSVILLE	$ 302,619.43
672	HOLMESTOWN ROAD	RTE. 631	DEAD END	0.84	51		ST. STEPHENS	$ 91,769.07
							Totals	**$ 1,287,365.93**

Amount for Unpaved Roads **$178,929**

2
1

Work Order Log Details from April 29, 2015 through April 29, 2016

Row Labels	Numbers of Calls for Service
SC-617E (King and Queen County)	6
SC-651E (King and Queen County)	3
SC-614N (King and Queen County)	3
SC-652E (King and Queen County)	3
SC-685N (King and Queen County)	2
SC-673N (King and Queen County)	2
SC-602E (King and Queen County)	2
SC-610N (King and Queen County)	1
SC-671N (King and Queen County)	1
SC-633E (King and Queen County)	1
SC-672E (King and Queen County)	1
SC-612N (King and Queen County)	1
SC-675E (King and Queen County)	1
Rt. 617W (King & Queen County)	1
SC-658E (King and Queen County)	1
SC-661N (King and Queen County)	1
(blank)	
Grand Total	**30**

King and Queen County, Virginia

2030 Comprehensive Plan

Appendix D:
VDOT AADT 2010 Report

2010
Virginia Department of Transportation
Daily Traffic Volume Estimates
Including Vehicle Classification Estimates

where available

Jurisdiction Report
49

King & Queen County

Prepared By

Virginia Department of Transportation
Traffic Engineering Division

In Cooperation With

U.S. Department of Transportation
Federal Highway Administration

Virginia Department of Transportation
Traffic Engineering Division
Traffic Monitoring Section

The Virginia Department of Transportation (VDOT) conducts a program where traffic count data are gathered from sensors in or along streets and highways and other sources. From these data, estimates of the average number of vehicles that traveled each segment of road are calculated. VDOT periodically publishes booklets listing these estimates.

One of these booklets, titled “Average Daily Traffic Volumes with Vehicle Classification Data, on Interstate, Arterial and Primary Routes” includes a list of each Interstate and Primary highway segment with the estimated Annual Average Daily Traffic (AADT) for that segment. AADT is the total annual traffic estimate divided by the number of days in the year. This booklet also includes information such as estimates of the percentage of the AADT made up by 6 different vehicle types, ranging from cars to double trailer trucks; estimated Annual Average Weekday Traffic (AAWDT), which is the number of vehicles estimated to have traveled the segment of highway during a 24 hour weekday averaged over the year; as well as Peak Hour and Peak Direction factors used by planners to formulate design criteria.

In addition to the Primary and Interstate publication, one hundred books are published periodically, one for each of 100 areas across the state defined by VDOT for record-keeping purposes. These books include traffic volume estimates for roads within the county, cities, and towns within the area. These books are titled “Daily Traffic Volumes Including Vehicle Classification Estimates, where available; Jurisdiction Report numbers 00 through 99”.

Also available are a number of reports summarizing the average Vehicle Miles Traveled (VMT) in selected jurisdictions and other categories of highways. There are many different ways to present traffic volume summary information. Because the user determines the value of each presentation, the reports have been redesigned based on user requests and feedback. The people of the VDOT Traffic Engineering Division Traffic Monitoring Section who produce these books welcome requests for other helpful ways of presenting the summary information.

A compact disc (CD) is available that includes files in the Adobe® Portable Document Format (PDF) that can be displayed, searched, and printed using common desktop computer equipment. The CD includes the publications described above as well as a number of other reports, including specialized VMT summaries and smaller AADT reports for each city and town separately.

Publication Notes

Parallel Roads

For road inventory and management purposes, some roadways are counted separately by direction and have separately published traffic estimates for each direction of travel. Examples of such roadways are the interstate system and routes with separated facilities and (usually) one-way traffic facilities in urban areas. In these publications, they are referred to as parallel roads. As a convenience for the users of the publication, the listing for segments of roads with parallel segments are published with both the traffic estimates for their own direction of travel (e.g. I-95 Northbound) as well as the estimate of the total of all traffic on the same route including parallel roadways (all directions of I-95). The publication will have a "Combined Traffic Estimates for Parallel Roadways on this Route" or "Combined Traffic" identifiers for the combined direction of travel estimates.

Roadways such as I-395 with a North segment, a South segment and a separate Reversible lane segment will have the estimate for more than two parallel roadways included in the entire combined traffic estimate.

Some routes have very complicated paths through cities and towns. These parallel paths may be too complex to allow a relationship between nearby sections of the opposite direction on the same route. In this case, to indicate that the traffic estimates for such a road segment may not include all directions of traffic on that route, the line that would list the combined values will indicate "NA" for not available.

VDOT's traffic monitoring program includes more than 100,000 segments of roads and highways ranging from several mile sections of Interstate highways to very short sections of city streets. Due to problems experienced obtaining some traffic count data, and the level of quality necessary to maintain confidence in the data, no estimate is currently available for some segments of roadway. These segments are included in the publications indicating "NA" for not available. It is the intention of the VDOT Traffic Engineering Division Traffic Monitoring group to obtain the data necessary and to report traffic volume estimates on all road segments included in these publications.

Many of the road segments in this program are local secondary roads. The amount and detail of data collected on these roads are not as great as the data collected on higher volume roads. The vehicle classification, average weekday traffic volumes, and the theoretical design hour traffic volumes are not calculated for these roads. The publications indicate "NA" for the information that is not available.

This publication is based on a traffic monitoring program initiated in 1997. Because the data collection techniques and statistical evaluation processes are different than those used in previous years, comparison with previous publications may be misleading.

Glossary of Terms:

Route: The Route Number assigned to this segment of roadway with the master inventory route number if this is an overlapping route, with official street or highway name if available.

Length: Length of the traffic segment in miles.

AADT: Annual Average Daily Traffic. The estimate of typical daily traffic on a road segment for all days of the week, Sunday through Saturday, over the period of one year.

QA: Quality of AADT:

- A Average of Complete Continuous Count Data
- B Average of Selected Continuous Count Data
- F Factored Short Term Traffic Count Data
- G Factored Short Term Traffic Count Data with Growth Element
- H Historical Estimate
- M Manual Uncounted Estimate
- N AADT of Similar Neighboring Traffic Link
- O Provided By External Source
- R Raw Traffic Count, Unfactored

4Tire: Percentage of the traffic volume made up of motorcycles, passenger cars, vans and pickup trucks.

Bus: Percentage of the traffic volume made up of busses.

2Axle Truck: Percentage of the traffic volume made up of 2 axle single unit trucks (not including pickups and vans).

3+Axle Truck: Percentage of the traffic volume made up of single unit trucks with three or more axles.

1Trail Truck: Percentage of the traffic volume made up of units with a single trailer.

2Trail Truck: Percentage of the traffic volume made up of units with more than one trailer.

QC: Quality of Classification Data:

- A Average of Complete Continuous Count Data
- B Average of Selected Continuous Count Data
- C Short Term Classified Traffic Count Data
- F Factored Short Term Traffic Count Data
- H Historical Estimate
- M Mass Collective Average
- N Classification Estimates of Similar Neighboring Traffic Link

K Factor: The estimate of the portion of the traffic volume traveling during the peak hour or design hour.

QK: Quality of the K Factor estimate:

- A Factor based on 30th Highest Hour Observed During at least 250 days of Continuous Traffic Data
- B Factor based on other Hour Observed During Less than 250 days of Continuous Traffic Data
- F Factor based on Highest Hour Collected at in a 48 Hour Weekday Period
- M Factor based on Manual Estimate of design hour
- N Design Hour Factor (K Factor) of Similar Neighboring Traffic Link
- O Provided by External Source

Dir Factor: The estimate of the portion of the traffic volume traveling in the peak direction during the peak hour..

AAWDT: Average Annual Weekday Traffic. The estimate of typical traffic over the period of one year for the days between Monday through Thursday inclusive.

QW: Quality of AAWDT:

- A Average of Complete Continuous Count Data
- B Average of Selected Continuous Count Data
- F Factored Short Term Traffic Count Data
- G Factored Short Term Traffic Count Data with Growth Element
- M Manual Uncounted Estimate
- N AAWDT of Similar Neighboring Traffic Link
- O Provided by External Source

Year: Year for which the published values are appropriate. If the Quality of AADT (QA) is “R”, the year is the year that the raw traffic count was collected, and if available,

Route Shield Legend

Route Systems

North 81	Interstate Route	Traffic volume data for Interstate Routes and some other routes are reported separately by direction, as well as combined.
29	US Route	
7	Virginia State Route	
F241	Frontage Road (F precedes frontage route number)	
600	Secondary Route	

Special Routes

Bus 29 ALT 220	Bus - Business Route Bypas - Bypass Route Truck - Truck Route ALT - Alternate Route Wye - Wye Route connector
11 P	P - Parallel Route; Southbound or Westbound direction lanes of a numbered route where they are on a different road facility than the other direction.
600 154	The VDOT Maintainenance Jurisdiction number is displayed below the Secondary Route Number if the Maintenance Jurisdiction is different than the jurisdiction in the title of the report.

Route	Jurisdiction	From / To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW
14 The Trail	King & Queen County	From: US 360; St Stephens Church To: 49-629 Walkerton Rd	6.14	**460**	**G**	89%	0%	3%	2%	6%	0%	F	0.119	F	0.518	470	G
14 The Trail	King & Queen County	From: 49-629 Walkerton Rd To: 49-620 W, Duck Pond Rd	1.81	**570**	**G**	89%	0%	3%	2%	6%	0%	F	0.112	F	0.599	580	G
14 The Trail	King & Queen County	From: 49-620 W, Duck Pond Rd To: 49-617 Carletons Corner Rd	9.74	**310**	**G**	89%	0%	3%	2%	6%	0%	C	0.107	F	0.556	310	G
14 The Trail	King & Queen County	From: 49-617 Carletons Corner Rd To: 49-614 Clifton Lane	5.63	**850**	**G**	89%	0%	3%	2%	6%	0%	F	0.103	F	0.531	870	G
14 The Trail	King & Queen County	From: 49-614 Clifton Lane To: SR 33 Shacklefords	6.81	**2200**	**G**	89%	0%	3%	2%	6%	0%	F	0.099	F	0.562	2300	G
14 33 Lewis Puller Mem. Hwy	King & Queen County	From: SR 33 Shacklefords To: SR 33 Shacklefords Fork	1.66	**9700**	**G**	92%	1%	1%	1%	5%	0%	C	0.088	F	0.639	10000	G
14 Buena Vista Rd	King & Queen County	From: SR 33 Lewis Puller Mem Hwy To: Gloucester County Line	4.95	**3600**	**G**	93%	1%	1%	1%	4%	0%	C	0.091	F	0.613	3600	G
33 Lewis Puller Mem Hwy	King & Queen County	From: King William County Line To: 49-678 Riverview Ave	3.30	**13000**	**G**	92%	0%	1%	2%	5%	0%	C	0.089	F	0.646	14000	G
33 Lewis Puller Mem Hwy	King & Queen County	From: 49-678 Riverview Ave To: SR 14 Buena Vista Rd, Shacklefords Fork	0.14	**12000**	**G**	92%	0%	1%	2%	5%	0%	F	0.086	F	0.656	13000	G
33 14 Lewis Puller Mem. Hwy	King & Queen County	From: SR 14 Shackelfords To: SR 14 Shackelfords Fork	1.66	**9700**	**G**	92%	1%	1%	1%	5%	0%	C	0.088	F	0.639	10000	G
33 Lewis Puller Mem Hwy	King & Queen County	From: SR 14 Buena Vista Rd, Shacklefords Fork To: Gloucester County Line	2.61	**6200**	**G**	92%	0%	1%	2%	5%	0%	F	0.088	F	0.596	6500	G
360 Richmond Hwy	King & Queen County	From: King William County Line To: SR 14 The Trail	2.91	**10000**	**G**	95%	0%	1%	1%	3%	0%	F	0.090	F	0.627	10000	G
360 Richmond Hwy	King & Queen County	From: SR 14 The Trail To: Essex County Line	6.29	**7900**	**G**	91%	1%	1%	2%	5%	0%	C	0.093	F	0.567	8300	G

Virginia Department of Transportation
Traffic Engineering Division
2010
Annual Average Daily Traffic Volume Estimates By Section of Route
King Queen Maintenance Area

King & Queen County

Route No.	Route	Length	AADT	QA	4Tire	Bus	2Axle	3+Axle	1Trail	2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year	From	To
F600	Pine Tree Rd	0.19	**20**	G	98%	0%	2%	0%	0%	0%	C	NA			20	G	2010	Dead End	SR 33 Lewis Puller Mem Hwy
600	Pine Tree Rd	1.48	**30**	R								NA			NA		07/15/2009	49-616 Mt Zion Rd	49-617 Exol Rd
601	Cherry Row Lane	1.39	**80**	R								NA			NA		06/18/2009	Dead End	1.39 MN Dead End
601	Cherry Row Lane	0.91	**210**	R								NA			NA		06/18/2009	1.39 MN Dead End	49-605 S, Plain View Lane
601	Stratton Major Rd	3.40	**160**	G	94%	3%	2%	1%	0%	0%	C	0.121	F	0.524	170	G	2010	49-605 N, York River Rd	SR 14 W, Buena Vista Rd
601	Pear Tree Ave	1.25	**200**	R								NA			NA		06/18/2009	SR 14 E, Buena Vista Rd	SR 33 Lewis Puller Mem Hwy
601	Farmville Rd	0.08	**90**	R								NA			NA		06/18/2009	SR 33 Lewis Puller Mem Hwy	Liberty St
601	Liberty St	0.05	**80**	R								NA			NA		06/18/2009	Pear Tree Ave	Southwest End State Mainteancne
601	Liberty St	0.03	**10**	R								NA			NA		06/26/2006	Northeast End State Maintenance	Pear Tree Ave
602	Melrose Landing Rd	1.20	**40**	R								NA			NA		06/29/2009	Dead End	SR 14 The Trail
602	Truhart Rd	1.00	**45**	R								NA			NA		06/29/2009	SR 14 The Trail	1.00 MN SR 14
602	Truhart Rd	3.60	**5**	R								NA			NA		06/29/2009	1.00 MN SR 14	49-614 Devils 3 Jump Rd
602	Mt Olive Rd	1.90	**60**	G	81%	9%	3%	7%	1%	0%	C	NA			70	G	2010	49-614 Devils 3 Jump Rd	49-610 Timber Branch Rd
602	True Hart Rd	0.20	**60**	N	81%	9%	3%	7%	1%	0%	N	NA			70	N	2010	49-610 Timber Branch Rd	49-610 Piedmont Rd
602	Wares Church Rd	1.57	**160**	G	81%	9%	3%	7%	1%	0%	F	0.145	F	0.563	160	G	2010	49-610 Piedmont Rd	Middlesex County Line
603	Lombardy Rd	4.39	**210**	G	96%	0%	2%	2%	1%	0%	F	0.12	F	0.686	220	G	2010	SR 14 The Trail	49-610 Coldwater Rd; Elsom Mascot Rd
603	Dragon Bridge Rd	0.86	**380**	G	96%	0%	2%	2%	1%	0%	C	0.098	F	0.6	390	G	2010	49-610 Coldwater Rd; Elsom Mascot Rd	Middlesex County Line
604	Byrds Bridge Rd	0.70	**300**	R								NA			NA		06/30/2009	49-614 Poplar Grove Rd; Rock Spring Rd	Essex County Line
605	Chain Ferry Rd	0.03	**20**	R								NA			NA		06/28/2006	Dead End	49-674 Shepards Warehouse Rd
605	Chain Ferry Rd	1.31	**140**	R								NA			NA		06/28/2006	49-674 Shepards Warehouse Rd	SR 33 Lewis Puller Mem Hwy
605	York River Rd	3.46	**870**	G	97%	1%	1%	1%	1%	0%	C	0.104	F	0.586	900	G	2010	SR 33 Lewis Puller Mem Hwy	49-606 Taylorsville Rd
605	York River Rd	1.39	**520**	G	97%	1%	1%	1%	1%	0%	F	0.119	F	0.682	540	G	2010	49-606 Taylorsville Rd	49-601 N, Cherry Row Lane

King & Queen County

	Route	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
	From: 49-601 N, Cherry Row Lane																
605	Plain View Lane	0.61	**520**	N	97%	1%	1%	1%	1%	0%	N	0.119	N	0.682	540	N	2010
	To: 49-601 S, Cherry Row Lane																
	From: 49-601 S, Cherry Row Lane																
605	Plain View Lane	2.68	**320**	R								NA			NA		06/26/2006
	To: SR 14 Buena Vista Rd																
	From: 49-605 York River Rd																
606	Taylorsville Rd	2.40	**150**	R								NA			NA		06/26/2006
	To: 49-601 Stratton Major Rd																
	From: 49-631 Poor House Lane																
607	Crouches Rd	1.10	**60**	R								NA			NA		07/15/2009
	To: 49-617 E, Providence Rd																
	From: 49-617 W, Providence Rd																
607	Princess Rd	1.40	**20**	R								NA			NA		07/06/2009
	To: Essex County Line																
	From: 49-678 Riverview Ave																
608	Clancie Rd	0.17	**810**	G	96%	0%	1%	1%	2%	0%	C	0.107	F	0.688	840	G	2010
	To: 49-700 Airville Rd																
	From: 49-700 Airville Rd																
608	Clancie Rd	2.73	**430**	G	96%	0%	1%	1%	2%	0%	F	0.121	F	0.816	450	G	2010
	To: 49-609 W, New Hope Rd																
	From: 49-609 E, New Hope Rd																
608	Royal Oak School Rd	1.89	**140**	R								NA			NA		06/26/2006
	To: 1.89 MN 49-609 New Hope Rd																
	From: 1.89 MN 49-609 New Hope Rd																
608	Royal Oak School Rd	0.29	**30**	R								NA			NA		06/26/2006
	To: Cul-de-Sac																
	From: Dead End																
609	Mt Olive Bottom Rd	0.60	**20**	R								NA			NA		07/15/2009
	To: 49-614 N, Devils 3 Jump Rd																
	From: 49-614 S, Devils 3 Jump Rd																
609	Iris Rd	0.64	**120**	R								NA			NA		06/29/2009
	To: 0.64 ME 49-614																
	From: 0.64 ME 49-614																
609	Iris Rd	2.31	**20**	R								NA			NA		06/22/2006
	To: 49-613 Dabney Rd																
	From: 49-613 Dabney Rd																
609	Iris Rd	0.30	**20**	R								NA			NA		06/22/2006
	To: 49-611 Tastine Rd																
	From: 49-611 Tastine Rd																
609	Iris Rd	1.80	**4**	R								NA			NA		06/22/2006
	To: 49-603 Lombardy Rd; Gap																
	From: 49-610 Elsom Mascot Rd; Gap																
609	New Hope Rd	5.80	**170**	R								NA			NA		06/29/2009
	To: SR 33 Lewis Puller Mem Hwy																
	From: SR 14 The Trail																
610	Elsom Mascot Rd	3.65	**450**	G	97%	0%	1%	0%	1%	0%	C	0.104	F	0.642	470	G	2010
	To: 49-609 New Hope Rd																
	From: 49-609 New Hope Rd																
610	Elsom Mascot Rd	1.89	**410**	G	97%	0%	1%	0%	1%	0%	F	0.109	F	0.602	420	G	2010
	To: 49-603 Dragon Bridge Rd; Lombardy Rd																
	From: 49-603 Dragon Bridge Rd; Lombardy Rd																
610	Coldwater Rd	1.19	**160**	R								NA			NA		06/26/2006
	To: 49-656 Barn Gate Rd																
	From: 49-656 Barn Gate Rd																
610	Coldwater Rd	2.14	**100**	R								NA			NA		06/26/2006
	To: 49-613 Dabney Rd																
	From: 49-613 Dabney Rd																
610	Piedmont Rd	2.30	**60**	R								NA			NA		06/26/2006
	To: 49-602 S, True Hart Rd																
	From: 49-602 N, True Hart Rd; Mt Olive Rd																
610	Timber Branch Rd	1.40	**80**	R								NA			NA		06/26/2006
	To: 49-614 S, Devils 3 Jump Rd																
	From: 49-614 S, Devils 3 Jump Rd																
610	Dragonville Rd	0.70	**190**	G	73%	3%	3%	2%	19%	0%	C	0.106	F	0.64	200	G	2010
	To: 49-614 N, Rock Spring Rd																

King & Queen County

Route		From	To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
610	Hickory Hill Rd	49-614 N, Rock Spring Rd	49-616 E, Liberty Hall Rd	0.20	**150**	R								NA			NA		06/26/2006
610	Hickory Hill Rd	49-616 E, Liberty Hall Rd	0.85 MN 49-616	0.85	**20**	R								NA			NA		06/19/2006
610	Liberty Hall Rd	0.85 MN 49-616	49-615 Union Hope Church Rd	0.75	**6**	R								NA			NA		06/19/2006
610	Spring Garden Rd	49-615 Union Hope Church Rd	49-616 W, Liberty Hall Rd; Mt Zion Rd	1.70	**10**	R								NA			NA		06/19/2006
611	Tastine Rd	49-609 Iris Rd	2.00 MS 49-609 Iris Rd	2.00	**30**	R								NA			NA		06/22/2006
611	Tastine Rd	2.00 MS 49-609 Iris Rd	SR 14 E, The Trail	1.00	**80**	R								NA			NA		06/22/2006
611	Water Lane	SR 14 W, The Trail	Dead End	1.60	**180**	R								NA			NA		06/29/2009
612	Lily Pond Rd	SR 14 The Trail	49-630 Deshazo Rd	0.30	**110**	R								NA			NA		06/19/2006
612	Lily Pond Rd	49-630 Deshazo Rd	49-617 S, Providence Rd	2.77	**40**	R								NA			NA		06/19/2006
612	Lily Pond Rd	49-617 S, Providence Rd	Essex County Line	1.53	**90**	R								NA			NA		07/06/2009
613	Allens Mill Pond Rd	Dead End	49-614 N, Devils 3 Jump Rd	1.10	**9**	R								NA			NA		07/15/2009
613	Dabney Rd	49-614 S, Devils 3 Jump Rd	49-610 Peidmont Rd; Coldwater Rd	4.10	**110**	R								NA			NA		06/29/2009
614	Clifton Lane	Dead End	SR 14 The Trail	1.90	**40**	R								NA			NA		07/15/2009
614	Devils 3 Jump Rd	SR 14 The Trail	49-613 S, Dabney Rd	0.90	**990**	G	47%	1%	1%	19%	32%	0%	C	0.092	F	0.525	1000	G	2010
614	Devils 3 Jump Rd	49-613 S, Dabney Rd	49-613 N, Allens Mill Pond Rd	1.00	**980**	G	47%	1%	1%	19%	32%	0%	F	0.106	F	0.594	1000	G	2010
614	Devils 3 Jump Rd	49-613 N, Allens Mill Pond Rd	49-609 S, Iris Rd	0.80	**820**	G	47%	1%	1%	19%	32%	0%	F	0.108	F	0.596	880	G	2010
614	Devils 3 Jump Rd	49-609 S, Iris Rd	49-602 Truhart Rd; Wares Church Rd	1.30	**180**	G	47%	1%	1%	19%	32%	0%	F	0.098	F	0.783	190	G	2010
614	Devils 3 Jump Rd	49-602 Truhart Rd; Wares Church Rd	49-610 E, Dragonville Rd	1.00	**190**	G	73%	2%	1%	6%	18%	0%	C	0.135	F	0.68	200	G	2010
614	Rock Spring Rd	49-610 W, Liberty Hall Rd; Dragonville Rd	49-615 Union Hope Church Rd	4.65	**240**	R								NA			NA		06/19/2006
614	Rock Spring Rd	49-615 Union Hope Church Rd	49-604 Byrds Bridge Rd	0.70	**190**	G	70%	1%	3%	6%	21%	0%	C	0.099	F	0.5	190	G	2010
614	Poplar Grove Rd	49-604 Byrds Bridge Rd	49-617 Exol Rd; White House Lane	3.30	**46**	R								NA			NA		06/30/2009
615	Union Hope Church Rd	49-610 Liberty Hall Rd	49-614 Rock Spring Rd	1.40	**30**	R								NA			NA		06/19/2006

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Route	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
616 Mt Zion Rd (From: SR 14 The Trail; To: 49-610 E, Spring Garden Rd)	3.20	100	R								NA			NA		06/30/2009
616 Liberty Hall Rd (From: 49-610 E, Spring Garden Rd; To: 49-610 W, Hickory Hill Rd)	3.70	120	R								NA			NA		06/26/2006
617 Providence Rd (From: 49-631 Poor House Lane; To: 49-607 E, Princess Rd)	2.20	80	R								NA			NA		06/30/2009
617 Providence Rd (From: 49-607 E, Princess Rd; To: 49-612 S, Lily Pond Rd)	2.00	50	R								NA			NA		06/30/2009
617 White House Lane (From: 49-612 N, Lily Pond Rd; To: 49-614 Popular Grove Rd)	1.80	70	R								NA			NA		06/30/2009
617 Exol Rd (From: 49-614 Popular Grove Rd; To: 49-616 Mt Zion Rd)	2.60	40	R								NA			NA		06/30/2009
617 Carletons Corner Rd (From: 49-616 Mt Zion Rd; To: SR 14 The Trail)	4.90	60	R								NA			NA		06/29/2009
618 Shilo Rd (From: SR 14 The Trail; To: Dead End)	1.00	40	R								NA			NA		06/30/2009
619 Owens Mill Rd (From: 49-721 Newtown Rd; To: 49-673 Martin Town Rd)	2.80	410	G	96%	2%	1%	0%	1%	0%	F	0.106	F	0.624	430	G	2010
619 Owens Mill Rd (From: 49-673 Martin Town Rd; To: 49-660 Sorghum Rd)	1.80	300	G	96%	2%	1%	0%	1%	0%	C	0.119	F	0.629	300	G	2010
619 Owens Mill Rd (From: 49-660 Sorghum Rd; To: Essex County Line)	3.00	260	G	96%	2%	1%	0%	1%	0%	F	0.117	F	0.585	270	G	2010
620 Duck Pond Rd (From: 49-633 Stones Rd; To: SR 14 W, The Trail)	2.20	20	R								NA			NA		06/30/2009
620 Powcan Rd (From: SR 14 E, The Trail; To: 49-631 E, Poor House Lane)	2.89	170	G	95%	1%	1%	1%	2%	0%	F	0.14	F	0.528	170	G	2010
620 Powcan Rd (From: 49-631 E, Poor House Lane; To: Essex County Line)	1.00	500	G	95%	1%	1%	1%	2%	0%	C	0.095	F	0.647	510	G	2010
621 Bruinton Rd (From: SR 14 The Trail; To: US 360; Essex County Line)	3.80	550	G	88%	1%	1%	1%	9%	0%	C	0.112	F	0.507	560	G	2010
622 Minor Rd (From: US 360 Richmond Hwy; To: Essex County Line)	0.49	410	G	97%	0%	1%	0%	2%	0%	C	0.118	F	0.941	410	G	2010
623 Indian Neck Rd (From: 49-721 Newtown Rd; To: 49-635 S, Bradley Farm Rd)	1.05	190	G	94%	2%	1%	0%	3%	0%	C	0.123	F	0.625	190	G	2010
623 Indian Neck Rd (From: 49-635 N, Bradley Farm Rd; To: 49-619 Owens Mill Rd)	4.60	290	R								NA			NA		06/13/2006
623 Indian Neck Rd (From: 49-619 Owens Mill Rd; To: Essex County Line)	1.80	20	R								NA			NA		06/13/2006
624 Root Swamp Rd (From: 49-635 Bradley Farm Rd; To: 49-689 Frog Pond Rd)	1.13	60	R								NA			NA		07/08/2009
624 Root Swamp Rd (From: 49-689 Frog Pond Rd; To: Caroline County Line)	1.97	45	R								NA			NA		07/08/2009

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	Route	From	To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
625	Poplar Hill Rd	49-628 Spring Cottage Rd; Poplar Hill Rd	49-651 Dewsville Rd	1.60	**190**	G	92%	3%	3%	0%	2%	0%	F	0.124	F	0.519	190	G	2010
625	Poplar Hill Rd	49-651 Dewsville Rd	49-721 Newtown Rd	1.00	**210**	G	92%	3%	3%	0%	2%	0%	F	0.130	F	0.55	220	G	2010
625	Byrds Mill Rd	49-721 Newtown Rd	49-649 Kays Lane	1.50	**200**	G	92%	3%	3%	0%	2%	0%	C	0.138	F	0.655	210	G	2010
625	Byrds Mill Rd	49-649 Kays Lane	49-641 Salvia Rd	1.10	**120**	R								NA			NA		06/15/2006
625	Byrds Mill Rd	49-641 Salvia Rd	Caroline County Line	2.00	**48**	R								NA			NA		06/15/2006
626	Roseville Rd	49-623 Indians Neck Rd	0.46 MN 49-623	0.46	**4**	R								NA			NA		07/13/2009
626	Roseville Rd	0.46 MN 49-623	Dead End	0.04	**4**	R								NA			NA		07/15/2009
627	Roundabout Route Rd	Caroline County Line	49-721 Newtown Rd	2.04	**90**	R								NA			NA		06/15/2006
628	Green Chambers Rd	US 360 Richmond Hwy	49-642; Pattie Swamp Rd	0.50	**50**	R								NA			NA		07/06/2009
628	Pattie Swamp Rd	49-642 Green Chambers Rd	49-721 S, Newtown Rd	1.00	**60**	R								NA			NA		06/05/2006
628	Todds Bridge Rd	49-721 N, Newtown Rd	1.20 MW 49-721	1.20	**200**	R								NA			NA		06/05/2006
628	Todds Bridge Rd	1.20 MW 49-721	2.60 MW 49-721 GAP	1.40	**10**	R								NA			NA		06/05/2006
628	Spring Cottage Rd	Dead End; Gap	49-639 Eastern View Rd	1.80	**10**	R								NA			NA		06/05/2006
628	Spring Cottage Rd	49-639 Eastern View Rd	49-625 Byrds Mill Rd	1.80	**45**	R								NA			NA		07/08/2009
628	Spring Cottage Rd	49-625 Byrds Mill Rd	King William County Line	1.90	**230**	G	97%	0%	2%	0%	1%	0%	C	0.113	F	0.731	230	G	2010
629	Walkerton Rd	King William County Line; 50-629	SR 14 The Trail	3.11	**790**	G	90%	1%	2%	1%	7%	0%	C	0.097	F	0.578	810	G	2010
630	Deshazo Rd	49-631 Poor House Lane	49-612 Lily Pond Rd	2.50	**70**	R								NA			NA		07/15/2009
631	Frazier Ferry Rd	Dead End	SR 14 E, The Trail	1.45	**150**	R								NA			NA		06/29/2009
631	Bunker Hill Rd	SR 14 W, The Trail	49-632 Hockley Neck Rd	2.60	**620**	G	97%	2%	1%	0%	0%	0%	C	0.12	F	0.709	660	G	2010
631	Stevensville Rd	49-632 Hockley Neck Rd	SR 14 SOUTH; 49-633 Stones Rd	1.45	**330**	G	97%	2%	1%	0%	0%	0%	F	0.134	F	0.681	340	G	2010
631	Poor House Lane	SR 14 N, The Trail	49-630 Deshazo Rd	1.58	**220**	G	97%	2%	1%	0%	0%	0%	F	0.108	F	0.6	220	G	2010
631	Poor House Lane	49-630 Deshazo Rd	49-620 E, Powcan Rd	2.54	**270**	G	97%	2%	1%	0%	0%	0%	F	0.116	F	0.530	270	G	2010

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Route No.	Route	From / To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
631	Norwood Rd	From: 49-620 W, Powcan Rd To: SR 14 E, The Trail	3.03	60	R								NA			NA		07/06/2009
631	Fleets Mill Rd	From: SR 14 W, The Trail To: 49-672 Holmestown Rd	0.98	100	R								NA			NA		07/06/2009
631	Fleets Mill Rd	From: 49-672 Holmestown Rd To: 1.44 MW 49-672	1.44	190	R								NA			NA		07/06/2009
631	Fleets Mill Rd	From: 1.44 MW 49-672 To: US 360 E, Richmond Hwy	0.06	190	R								NA			NA		07/06/2009
631	Smithfield Rd	From: US 360 W, Richmond Hwy To: 49-650 Smithfield School Rd	2.20	360	G	97%	1%	1%	0%	1%	0%	C	0.137	F	0.789	370	G	2010
631	Smithfield Rd	From: 49-650 Smithfield School Rd To: 49-619 Owens Manor Rd	2.15	70	R								NA			NA		07/08/2009
632	Hockley Neck Rd	From: 49-633 Stones Rd To: 49-631 Poor House Lane; Bunker Hill Rd	1.79	390	G	98%	1%	1%	0%	0%	0%	C	0.099	F	0.537	390	G	2010
633	Bendley Lane	From: Dead End To: 49-675, N Blank Rd	0.27	2	R								NA			NA		07/15/2009
633	Bendley Lane	From: 49-675, N Blank Rd To: 49-634 S, Cantebury Rd	0.65	50	R								NA			NA		06/15/2006
633	Rose Mount Rd	From: 49-634 N, Cantebury Rd To: 49-636 W, Minter Lane	1.41	260	R								NA			NA		06/15/2006
633	Rose Mount Rd	From: 49-636 W, Minter Lane To: 49-636 E, Pea Ridge Rd	0.30	220	R								NA			NA		06/15/2006
633	Rose Mount Rd	From: 49-636 E, Pea Ridge Rd To: 0.69 ME 49-636	0.69	180	R								NA			NA		07/06/2009
633	Rose Mount Rd	From: 0.69 ME 49-636 To: 49-629 N, Walkerton Rd	1.31	170	R								NA			NA		07/06/2009
633	Stones Rd	From: 49-629 S, Walkerton Rd To: 49-634 Mt Elba Rd	1.70	140	R								NA			NA		06/15/2006
633	Mantau Rd	From: 49-634 Mt Elba Rd To: 49-632 Hockley Neck Rd	2.60	480	G	97%	0%	2%	0%	0%	0%	C	0.105	F	0.63	490	G	2010
633	Stones Rd	From: 49-632 Hockley Neck Rd To: SR 14 The Trail; 49-631 Poor House Lane	2.60	80	R								NA			NA		06/19/2006
634	Mt Elba Rd	From: 49-633 Stones Rd To: 49-629 E, Walkerton Rd	1.35	470	G	91%	1%	2%	1%	6%	0%	F	0.11	F	0.656	490	G	2010
634	Cantebury Rd	From: 49-629 W, Walkerton Rd To: 49-636 Miner Lane	1.72	420	G	91%	1%	2%	1%	6%	0%	F	0.101	F	0.660	440	G	2010
634	Cantebury Rd	From: 49-636 Miner Lane To: 49-633 S, Bendley Lane	1.78	320	G	91%	1%	2%	1%	6%	0%	F	0.121	F	0.708	350	G	2010
634	Cantebury Rd	From: 49-633 S, Bendley Lane To: 49-633 N, Rose Mount Rd	0.47	370	G	91%	1%	2%	1%	6%	0%	F	0.107	F	0.692	380	G	2010
634	Cantebury Rd	From: 49-633 N, Rose Mount Rd To: SR 14 The Trail	2.07	660	G	91%	1%	2%	1%	6%	0%	C	0.106	F	0.526	690	G	2010
635	Bradley Farm Rd	From: 49-721 Newtown Rd To: 49-623 S, Indians Neck Rd	1.19	310	G	92%	1%	0%	1%	6%	0%	C	0.116	F	0.757	320	G	2010
635	Bradley Farm Rd	From: 49-623 S, Indians Neck Rd To: Essex County Line	4.43	190	G	92%	1%	0%	1%	6%	0%	F	0.097	F	0.625	200	G	2010

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	Route	From	To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
636	Minter Lane	49-634 Cantebury Rd	49-633 W, Rose Mount Rd	2.00	**160**	R								NA			NA		06/15/2006
636	Pea Ridge Rd	49-633 E, Rose Mount Rd	SR 14 The Trail	2.00	**210**	R								NA			NA		07/06/2009
637	Chatham Hill Rd	Dead End	49-634 Cantebury Rd	1.40	**190**	R								NA			NA		07/15/2009
638	Aspen Hill Rd	49-620 S, Powcan Rd	49-620 N, Powcan Rd	0.20	**20**	R								NA			NA		07/15/2009
639	Eastern View Rd	49-628 Spring Cottage Rd	49-684 The Forge Rd	0.45	**120**	R								NA			NA		07/08/2009
639	Eastern View Rd	49-684 The Forge Rd	49-721 Newtown Rd	1.15	**400**	R								NA			NA		07/08/2009
640	Lyneville Rd	49-721 Newtown Rd	1.00 MN 49-721	1.00	**230**	R								NA			NA		06/13/2006
640	Lyneville Rd	1.00 MN 49-721	49-623 Indians Neck Rd	1.30	**120**	R								NA			NA		06/13/2006
641	Salvia Rd	49-652 Vessels Rd	49-625 Byrds Mill Rd	2.00	**70**	R								NA			NA		07/08/2009
642	Green Chambers Rd	US 360 Richmond Hwy	49-628 Pattie Swamp Rd	0.30	**70**	R								NA			NA		06/05/2006
643	Airport Rd	Dead End	SR 33 Lewis Puller Mem Hwy	0.83	**280**	R								NA			NA		06/28/2006
644	Jonestown Rd	49-601 Stratton Major Rd	SR 14 Buena Vista Rd	1.40	**210**	R								NA			NA		06/18/2009
645	Page Lane	Dead End	49-605 Plain View Lane	0.60	**60**	R								NA			NA		06/26/2006
646	Curtis St	SR 14 The Trail	49-678 Riverview Ave	0.20	**160**	R								NA			NA		06/26/2006
647	Milby Town Rd	Dead End	0.80 ME Dead End	0.80	**120**	R								NA			NA		06/29/2009
647	Milby Town Rd	0.80 ME Dead End	49-609 New Hope Rd	1.00	**180**	R								NA			NA		06/29/2009
648	Kingston Rd	Dead End	49-605 Plain View Lane	1.40	**110**	R								NA			NA		06/26/2006
649	Kays Lane	49-625 Byrds Mill Rd	Dead End	0.70	**2**	R								NA			NA		07/15/2009
650	Smithfield School Rd	49-631 Smithfield Rd	Essex County Line	1.60	**240**	R								NA			NA		06/13/2006
651	Dewsville Rd	Dead End	49-625 Byrds Mill Rd	1.00	**60**	R								NA			NA		07/08/2009

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Route		Length	AADT	QA	4Tire	Bus	2Axle	3+Axle	1Trail	2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
652	Vessels Rd (From: 49-721 W, Newtown Rd To: 49-641 Salvia Rd)	1.40	**80**	**R**								NA			NA		07/15/2009
652	Vessels Rd (From: 49-641 Salvia Rd To: 49-721 E, Newtown Rd)	0.60	**150**	**R**								NA			NA		07/08/2009
653	Coates Lane (From: 49-609 New Hope Rd To: Dead End)	0.70	**4**	**R**								NA			NA		06/26/2006
654	Davis Beech Rd (From: Dead End To: SR 14 The Trail)	1.20	**120**	**R**								NA			NA		06/22/2006
655	Courthouse Landing Rd (From: Dead End To: 49-681 Allens Circle)	1.00	**50**	**R**								NA			NA		06/22/2006
656	Barn Gate Rd (From: Dead End To: 49-610 Coldwater Rd)	0.40	**8**	**R**								NA			NA		06/26/2006
657	Limehouse Rd (From: Dead End To: SR 14 The Trail)	1.28	**110**	**R**								NA			NA		06/22/2006
658	Travellers Rd (From: 49-605 York River Rd To: 49-601 Stratton Major Rd)	3.14	**40**	**R**								NA			NA		06/18/2009
659	Mantapike Landing Rd (From: Dead End To: 49-631 Bunker Hill Rd)	0.60	**110**	**R**								NA			NA		06/19/2006
659	Mantapike Landing Rd (From: 49-631 Bunker Hill Rd To: SR 14 The Trail)	1.80	**4**	**R**								NA			NA		06/19/2006
660	Sorghum Rd (From: 49-721 Newtown Rd To: 49-619 Owens Mill Rd)	2.10	**250**	**R**								NA			NA		06/15/2006
661	Brookshire Rd (From: Dead End To: 49-687 Simpson Creek Rd)	0.37	**20**	**R**								NA			NA		06/29/2009
661	Brookshire Rd (From: 49-687 Simpson Creek Rd To: SR 33 Lewis Puller Mem Hwy)	0.31	**210**	**R**								NA			NA		06/29/2009
662	Greenbriar Rd (From: Dead End To: 49-634 Cantebury Rd)	0.46	**60**	**R**								NA			NA		07/15/2009
663	Scuffletown Rd (From: Dead End To: 49-629 Walkerton Rd)	0.31	**40**	**R**								NA			NA		06/15/2006
664	Peach Grove Rd (From: 49-721 Newtown Rd To: Dead End)	0.95	**150**	**R**								NA			NA		07/08/2009
665	Hell Bottom Rd (From: Dead End To: 49-721 Newtown Rd)	1.04	**210**	**R**								NA			NA		07/08/2009
666	Tuckers Rd (From: Dead End To: 49-667 Wrights Dock Rd)	0.76	**260**	**R**								NA			NA		06/18/2009
666	Tuckers Rd (From: 49-667 Wrights Dock Rd To: 49-605 Plain View Lane)	0.60	**330**	**R**								NA			NA		06/18/2009
667	Wrights Dock Rd (From: Dead End To: 49-666 Tuckers Rd)	1.20	**50**	**R**								NA			NA		06/26/2006

Route		Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
King & Queen County																	
668	Morris Lane	0.25	**160**	**R**								NA			NA		06/28/2006
	From: 49-605 York River Rd To: Dead End																
669	Buzzards Roost Rd	1.20	**30**	**R**								NA			NA		07/06/2009
	From: Dead End To: 28-620, Essex County Line																
670	Virginia Ave	0.15	**80**	**R**								NA			NA		06/28/2006
	From: Dead End To: SR 33 Lewis Puller Mem Hwy																
671	Old Millwood Rd	0.87	**40**	**R**								NA			NA		07/18/2009
	From: Dead End To: 49-641 Salvia Rd																
672	Holmestown Rd	0.84	**50**	**R**								NA			NA		07/06/2009
	From: 49-631 Fleets Mill Rd To: Dead End																
673	Martin Town Rd	0.79	**100**	**R**								NA			NA		07/08/2009
	From: 49-619 Owens Mill Rd To: Dead End																
674	Shepards Warehouse R	0.29	**47**	**R**								NA			NA		06/28/2006
	From: Dead End To: 49-605 Chain Ferry Rd																
675	North Bank Rd	0.32	**40**	**R**								NA			NA		07/15/2009
	From: Dead End To: 49-633 Bendley Lane																
676	Goulders Creek Rd	0.26	**80**	**R**								NA			NA		06/28/2006
	From: Dead End To: SR 33 Lewis Puller Mem Hwy																
677	Suttons Court	0.26	**30**	**R**								NA			NA		07/06/2009
	From: Dead End O.26 MN To: SR 14 The Trail																
677	Suttons Court	0.19	**49**	**R**								NA			NA		07/06/2009
	From: SR 14 The Trail To: Dead End O.19 MS																
678	Centerville Rd	0.17	**250**	**R**								NA			NA		06/26/2006
	From: SR 33 Lewis Puller Mem Hwy To: SR 14 W, The Trail																
678	Centreville Rd	0.91	**690**	**G**	96%	1%	0%	1%	2%	0%	C	0.117	F	0.697	720	G	2010
	From: SR 14 W, The Trail To: 49-608 Clancie Rd																
678	Riverview Ave	0.33	**590**	**G**	96%	1%	0%	1%	2%	0%	F	0.106	F	0.698	620	G	2010
	From: 49-608 Clancie Rd To: SR 14, SR 33 Lewis Puller Mem Hwy																
679	Beaulah Rd	1.18	**50**	**R**								NA			NA		06/26/2006
	From: SR 33 W, Lewis Puller Mem Hwy To: SR 33 E, Lewis Puller Mem Hwy																
680	Hockley Lane	0.49	**80**	**R**								NA			NA		06/26/2006
	From: Cul-de-Sac To: 49-605 York River Rd																
681	Allens Circle	0.28	**220**	**R**								NA			NA		06/29/2009
	From: SR 14 The Trail To: SR 14 The Trail																
682		0.15	**30**	**R**								NA			NA		07/06/2009
	From: US 360 Richmond Hwy To: Dead End																
683	Gregory Lane	0.07	**60**	**R**								NA			NA		06/28/2006
	From: Dead End To: SR 33 Lewis Puller Mem Hwy																

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Route		Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
684	The Forge Rd From: Dead End To: 49-639 Eastern View Rd	1.37	**100**	R								NA			NA		06/05/2006
685	Fish Hatchery Rd From: SR 14 The Trail To: 0.64 MN SR 14	0.64	**60**	R								NA			NA		06/19/2006
685	Fish Hatchery Rd From: 0.64 MN SR 14 To: Dead End	0.16	**10**	R								NA			NA		06/19/2006
686	Ashby Rd From: Dead End To: SR 33 Lewis Puller Mem Hwy	0.06	**60**	R								NA			NA		06/28/2006
687	Simpson Creek Rd From: Dead End To: 49-661 Brookshire Rd	0.26	**100**	R								NA			NA		06/28/2006
688	Howard Lane From: 49-691 Apple Rd To: Dead End	0.15	**30**	R								NA			NA		06/28/2006
689	Frog Pond Rd From: 49-624 Root Swamp Rd To: Dead End	0.26	**20**	R								NA			NA		06/13/2006
690	Dudley Ferry Rd From: Dead End To: 49-661 Brookshire Rd	0.26	**70**	R								NA			NA		06/28/2006
691	Apple Rd From: 49-605 York River Rd To: SR 33 Lewis Puller Mem Hwy	0.22	**20**	R								NA			NA		06/29/2009
692	Dahlgren Rd From: Dead End To: 49-632 Hockley Neck Rd	0.06	**100**	R								NA			NA		06/19/2006
693	Level Green Rd From: Dead End To: 49-721 Newtown Rd	0.40	**80**	R								NA			NA		06/05/2006
694	New Beginning Rd From: 49-609 New Hope Rd To: Dead End	0.24	**70**	R								NA			NA		06/29/2009
700	Coxs Lane From: 49-608 Clancie Rd To: 49-701 Airville Rd	0.14	**100**	R								NA			NA		06/29/2009
701	Airville Rd From: 49-608 Clancie Rd To: 49-700 Coxs Lane	0.17	**40**	R								NA			NA		06/26/2006
721	Newtown Rd From: US 360; SR 14 The Trail To: 49-619 Owens Mill Rd	1.60	**2300**	G	94%	1%	1%	1%	3%	0%	C	0.093	F	0.63	2400	G	2010
721	Newtown Rd From: 49-619 Owens Mill Rd To: 49-639 Eastern View Rd	3.94	**1500**	G	94%	1%	1%	1%	3%	0%	F	0.09	F	0.685	1500	G	2010
721	Newtown Rd From: 49-639 Eastern View Rd To: 49-635 Bradley Farm Rd	2.66	**1400**	G	94%	1%	1%	1%	3%	0%	F	0.099	F	0.667	1400	G	2010
721	Newtown Rd From: 49-635 Bradley Farm Rd To: 49-623 Indian Neck Rd	1.12	**770**	G	94%	1%	1%	1%	3%	0%	F	0.102	F	0.535	800	G	2010
721	Newtown Rd From: 49-623 Indian Neck Rd To: 49-627 Roundabout Route Rd	1.79	**580**	G	94%	1%	1%	1%	3%	0%	F	0.107	F	0.613	610	G	2010
721	Newtown Rd From: 49-627 Roundabout Route Rd To: Caroline County Line	2.84	**450**	G	94%	1%	1%	1%	3%	0%	F	0.135	F	0.504	470	G	2010

King & Queen County

Route		Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
725	Riverview Rd From: Cul-de-Sac To: 49-659 Mantapike Landing Rd	0.34	**50**	**R**								NA			NA		06/30/2009
1000	River View Dr From: 49-1001 Rivers Bluff Lane To: 49-631 Bunker Hill Rd	0.40	**80**	**R**								NA			NA		06/30/2009
1001	Rivers Bluff Lane From: Cul-de-Sac To: 49-1000 River View Dr	0.35	**46**	**R**								NA			NA		06/30/2009
1001	Rivers Bluff Lane From: 49-1000 River View Dr To: Cul-de-Sac	0.15	**20**	**R**								NA			NA		06/30/2009
1202	White Marsh Lane From: 49-629 Walkerton Rd To: Dead End	0.20	**40**	**R**								NA			NA		06/15/2006
1203	Masonic Lane From: 49-629 Walkerton Rd To: Dead End	0.30	**50**	**R**								NA			NA		07/06/2009
9211	Pleasant Hills High Sch From: Pleasant Hills High Sch To: SR 14 The Trail	0.09	**30**	**R**								NA			NA		06/28/2006
9493	King & Queen High Sch From: K & Q Cen High School To: 0.05 ME SR 14	0.05	**20**	**R**								NA			NA		06/28/2006
9493	King & Queen High Sch From: 0.05 ME SR 14 To: SR 14 The Trail	0.16	**40**	**R**								NA			NA		06/28/2006
9958	Lawson Elem Sch From: Lawson Elem Sch To: 49-721 Newtown Rd	0.08	**80**	**R**								NA			NA		06/05/2006

King and Queen County, Virginia

2030 Comprehensive Plan

Appendix E: VDOT AADT 2015 Preliminary Draft Report

2016
Virginia Department of Transportation
Daily Traffic Volume Estimates
Including Vehicle Classification Estimates

where available

Jurisdiction Report
49

King & Queen County

Prepared By

Virginia Department of Transportation
Traffic Engineering Division

In Cooperation With

U.S. Department of Transportation
Federal Highway Administration

Virginia Department of Transportation
Traffic Engineering Division
Traffic Monitoring Section

The Virginia Department of Transportation (VDOT) conducts a program where traffic count data are gathered from sensors in or along streets and highways and other sources. From these data, estimates of the average number of vehicles that traveled each segment of road are calculated. VDOT periodically publishes booklets listing these estimates.

One of these booklets, titled "Average Daily Traffic Volumes with Vehicle Classification Data, on Interstate, Arterial and Primary Routes" includes a list of each Interstate and Primary highway segment with the estimated Annual Average Daily Traffic (AADT) for that segment. AADT is the total annual traffic estimate divided by the number of days in the year. This booklet also includes information such as estimates of the percentage of the AADT made up by 6 different vehicle types, ranging from cars to double trailer trucks; estimated Annual Average Weekday Traffic (AAWDT), which is the number of vehicles estimated to have traveled the segment of highway during a 24 hour weekday averaged over the year; as well as Peak Hour and Peak Direction factors used by planners to formulate design criteria.

In addition to the Primary and Interstate publication, one hundred books are published periodically, one for each of 100 areas across the state defined by VDOT for record-keeping purposes. These books include traffic volume estimates for roads within the county, cities, and towns within the area. These books are titled "Daily Traffic Volumes Including Vehicle Classification Estimates, where available; Jurisdiction Report numbers 00 through 99".

Also available are a number of reports summarizing the average Vehicle Miles Traveled (VMT) in selected jurisdictions and other categories of highways. There are many different ways to present traffic volume summary information. Because the user determines the value of each presentation, the reports have been redesigned based on user requests and feedback. The people of the VDOT Traffic Engineering Division Traffic Monitoring Section who produce these books welcome requests for other helpful ways of presenting the summary information.

A compact disc (CD) is available that includes files in the Adobe® Portable Document Format (PDF) that can be displayed, searched, and printed using common desktop computer equipment. The CD includes the publications described above as well as a number of other reports, including specialized VMT summaries and smaller AADT reports for each city and town separately.

Publication Notes

Parallel Roads

For road inventory and management purposes, some roadways are counted separately by direction and have separately published traffic estimates for each direction of travel. Examples of such roadways are the interstate system and routes with separated facilities and (usually) one-way traffic facilities in urban areas. In these publications, they are referred to as parallel roads. As a convenience for the users of the publication, the listing for segments of roads with parallel segments are published with both the traffic estimates for their own direction of travel (e.g. I-95 Northbound) as well as the estimate of the total of all traffic on the same route including parallel roadways (all directions of I-95). The publication will have a "Combined Traffic Estimates for Parallel Roadways on this Route" or "Combined Traffic" identifiers for the combined direction of travel estimates.

Roadways such as I-395 with a North segment, a South segment and a separate Reversible lane segment will have the estimate for more than two parallel roadways included in the entire combined traffic estimate.

Some routes have very complicated paths through cities and towns. These parallel paths may be too complex to allow a relationship between nearby sections of the opposite direction on the same route. In this case, to indicate that the traffic estimates for such a road segment may not include all directions of traffic on that route, the line that would list the combined values will indicate "NA" for not available.

VDOT's traffic monitoring program includes more than 100,000 segments of roads and highways ranging from several mile sections of Interstate highways to very short sections of city streets. Due to problems experienced obtaining some traffic count data, and the level of quality necessary to maintain confidence in the data, no estimate is currently available for some segments of roadway. These segments are included in the publications indicating "NA" for not available. It is the intention of the VDOT Traffic Engineering Division Traffic Monitoring group to obtain the data necessary and to report traffic volume estimates on all road segments included in these publications.

Many of the road segments in this program are local secondary roads. The amount and detail of data collected on these roads are not as great as the data collected on higher volume roads. The vehicle classification, average weekday traffic volumes, and the theoretical design hour traffic volumes are not calculated for these roads. The publications indicate "NA" for the information that is not available.

This publication is based on a traffic monitoring program initiated in 1997. Because the data collection techniques and statistical evaluation processes are different than those used in previous years, comparison with previous publications may be misleading.

Glossary of Terms:

Route: The Route Number assigned to this segment of roadway with the master inventory route number if this is an overlapping route, with official street or highway name if available.

Length: Length of the traffic segment in miles.

AADT: Annual Average Daily Traffic. The estimate of typical daily traffic on a road segment for all days of the week, Sunday through Saturday, over the period of one year.

QA: Quality of AADT:

- A Average of Complete Continuous Count Data
- B Average of Selected Continuous Count Data
- F Factored Short Term Traffic Count Data
- G Factored Short Term Traffic Count Data with Growth Element
- H Historical Estimate
- M Manual Uncounted Estimate
- N AADT of Similar Neighboring Traffic Link
- O Provided By External Source
- R Raw Traffic Count, Unfactored

4Tire: Percentage of the traffic volume made up of motorcycles, passenger cars, vans and pickup trucks.

Bus: Percentage of the traffic volume made up of busses.

2Axle Truck: Percentage of the traffic volume made up of 2 axle single unit trucks (not including pickups and vans).

3+Axle Truck: Percentage of the traffic volume made up of single unit trucks with three or more axles.

1Trail Truck: Percentage of the traffic volume made up of units with a single trailer.

2Trail Truck: Percentage of the traffic volume made up of units with more than one trailer.

QC: Quality of Classification Data:

- A Average of Complete Continuous Count Data
- B Average of Selected Continuous Count Data
- C Short Term Classified Traffic Count Data
- F Factored Short Term Traffic Count Data
- H Historical Estimate
- M Mass Collective Average
- N Classification Estimates of Similar Neighboring Traffic Link

K Factor: The estimate of the portion of the traffic volume traveling during the peak hour or design hour.

QK: Quality of the K Factor estimate:

- A Factor based on 30th Highest Hour Observed During at least 250 days of Continuous Traffic Data
- B Factor based on other Hour Observed During Less than 250 days of Continuous Traffic Data
- F Factor based on Highest Hour Collected at in a 48 Hour Weekday Period
- M Factor based on Manual Estimate of design hour
- N Design Hour Factor (K Factor) of Similar Neighboring Traffic Link
- O Provided by External Source

Dir Factor: The estimate of the portion of the traffic volume traveling in the peak direction during the peak hour..

AAWDT: Average Annual Weekday Traffic. The estimate of typical traffic over the period of one year for the days between Monday through Thursday inclusive.

QW: Quality of AAWDT:

- A Average of Complete Continuous Count Data
- B Average of Selected Continuous Count Data
- F Factored Short Term Traffic Count Data
- G Factored Short Term Traffic Count Data with Growth Element
- M Manual Uncounted Estimate
- N AAWDT of Similar Neighboring Traffic Link
- O Provided by External Source

Year: Year for which the published values are appropriate. If the Quality of AADT (QA) is “R”, the year is the year that the raw traffic count was collected, and if available,

Route Shield Legend

Route Systems

North 81	Interstate Route — Traffic volume data for Interstate Routes and some other routes are reported separately by direction, as well as combined.
29	US Route
7	Virginia State Route
F241	Frontage Road (F precedes frontage route number)
600	Secondary Route

Special Routes

Bus 29 ALT 220	Bus - Business Route Bypas - Bypass Route Truck - Truck Route ALT - Alternate Route Wye - Wye Route connector
11 P	P - Parallel Route; Southbound or Westbound direction lanes of a numbered route where they are on a different road facility than the other direction.
600 154	The VDOT Maintainenance Jurisdiction number is displayed below the Secondary Route Number if the Maintenance Jurisdiction is different than the jurisdiction in the title of the report.

Route	Jurisdiction	From / To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW
14 The Trail	King & Queen County	From: US 360; St Stephens Church To: 49-629 Walkerton Landing Rd	6.14	**370**	**G**	79%	0%	1%	3%	17%	0%	F	0.107		0.748	380	G
14 The Trail	King & Queen County	From: 49-629 Walkerton Landing Rd To: 49-620 W, Duck Pond Rd	1.81	**440**	**G**	79%	0%	1%	3%	17%	0%	F	0.114		0.523	460	G
14 The Trail	King & Queen County	From: 49-620 W, Duck Pond Rd To: 49-617 Carletons Corner Rd	9.74	**310**	**G**	79%	0%	1%	3%	17%	0%	C	0.114		0.571	320	G
14 The Trail	King & Queen County	From: 49-617 Carletons Corner Rd To: 49-614 Clifton Lane	5.63	**730**	**G**	79%	0%	1%	3%	17%	0%	F	0.103		0.607	750	G
14 The Trail	King & Queen County	From: 49-614 Clifton Lane To: SR 33 Shacklefords	6.81	**1400**	**G**	79%	0%	1%	3%	17%	0%	F	0.082		0.559	1400	G
14 33 Lewis Puller Mem. Hwy	King & Queen County	From: SR 33 Shacklefords To: SR 33 Shacklefords Fork	1.66	**12000**	**G**	91%	1%	1%	1%	6%	0%	C	0.084		0.652	13000	G
14 Buena Vista Rd	King & Queen County	From: SR 33 Lewis Puller Mem Hwy To: Gloucester County Line	4.95	**4200**	**G**	94%	1%	1%	2%	3%	0%	C	0.092		0.564	4300	G
33 Lewis Puller Mem Hwy	King & Queen County	From: King William County Line To: 49-678 Centerville Road	3.30	**15000**	**G**	92%	0%	1%	1%	5%	0%	C	0.090		0.652	15000	G
33 Lewis Puller Mem Hwy	King & Queen County	From: 49-678 Centerville Rd W To: SR 14 Buena Vista Rd, Shacklefords Fork	0.14	**15000**	**G**	92%	0%	1%	1%	5%	0%	F	0.082		0.630	16000	G
33 14 Lewis Puller Mem. Hwy	King & Queen County	From: SR 14 Shackelfords To: SR 14 Shackelfords Fork	1.66	**12000**	**G**	91%	1%	1%	1%	6%	0%	C	0.084		0.652	13000	G
33 Lewis Puller Mem Hwy	King & Queen County	From: SR 14 Buena Vista Rd, Shacklefords Fork To: Gloucester County Line	2.61	**8100**	**G**	92%	0%	1%	1%	5%	0%	F	0.083		0.654	8400	G
360 Richmond Hwy	King & Queen County	From: King William County Line To: SR 14 The Trail	2.91	**11000**	**G**	94%	0%	1%	1%	3%	0%	F	0.09		0.617	12000	G
360 Richmond Hwy	King & Queen County	From: SR 14 The Trail To: Essex County Line	6.29	**9300**	**G**	92%	1%	1%	2%	4%	0%	C	0.088		0.63	9600	G

King & Queen County

Route		Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
F600	Pine Tree Rd (From: Dead End; To: SR 33 Lewis Puller Mem Hwy)	0.19	10	R								0.292		0.571	NA		06/02/2015
600	Pine Tree Rd (From: 49-616 Mt Zion Rd; To: 49-617 Exol Rd)	1.48	40	R								NA			NA		05/28/2015
601	Cherry Row Lane (From: Dead End; To: 1.39 MN Dead End)	1.39	80	R								NA			NA		06/27/2012
601	Cherry Row Lane (From: 1.39 MN Dead End; To: 49-605 S, Plain View Lane)	0.91	160	R								NA			NA		06/27/2012
601	Stratton Major Rd (From: 49-605 N, York River Rd; To: SR 14 W, Buena Vista Rd)	3.40	150	G	96%	2%	2%	0%	0%	0%	C	0.157		0.679	150	G	2016
601	Pear Tree Ave (From: SR 14 E, Buena Vista Rd; To: SR 33 Lewis Puller Mem Hwy)	1.25	190	R								NA			NA		06/02/2015
601	Farmville Rd (From: SR 33 Lewis Puller Mem Hwy; To: Liberty St)	0.08	150	R								NA			NA		06/02/2015
601	Liberty St (From: Pear Tree Ave; To: Southwest End State Mainteancne)	0.05	20	R								NA			NA		06/02/2015
601	Liberty St (From: Northeast End State Maintenance; To: Pear Tree Ave)	0.03	20	R								NA			NA		06/27/2012
602	Melrose Landing Rd (From: Dead End; To: SR 14 The Trail)	1.20	100	R								NA			NA		05/28/2015
602	Truhart Rd (From: SR 14 The Trail; To: 1.00 MN SR 14)	1.00	30	R								NA			NA		06/06/2012
602	Truhart Rd (From: 1.00 MN SR 14; To: 49-614 Devils 3 Jump Rd)	3.60	10	R								NA			NA		05/28/2015
602	Mt Olive Rd (From: 49-614 Devils 3 Jump Rd; To: 49-610 Timber Branch Rd)	1.90	60	G	87%	3%	8%	0%	2%	0%	C	0.185		0.583	60	G	2016
602	Timber Branch Rd (From: 49-610 Timber Branch Rd; Mt Olive Rd; To: 49-610 Piedmont Rd)	0.20	180	G	87%	3%	8%	0%	2%	0%	F	0.14		0.585	190	G	2016
602	Wares Church Rd (From: 49-610 Piedmont Rd; To: Middlesex County Line)	1.57	160	G	87%	3%	8%	0%	2%	0%	F	0.185		0.583	170	G	2016
603	Lombardy Rd (From: SR 14 The Trail; To: 49-610 Coldwater Rd; Elsom Mascot Rd)	4.39	150	G	95%	0%	1%	2%	2%	0%	F	0.145		0.667	150	G	2016
603	Dragon Bridge Rd (From: 49-610 Coldwater Rd; Elsom Mascot Rd; To: Middlesex County Line)	0.86	340	G	95%	0%	1%	2%	2%	0%	C	0.107		0.595	350	G	2016
604	Byrds Bridge Rd (From: 49-614 Poplar Grove Rd; Rock Spring Rd; To: Essex County Line)	0.70	110	R								NA			NA		05/28/2015
605	Chain Ferry Rd (From: Dead End; To: 49-674 Shepards Warehouse Rd)	0.03	10	R								NA			NA		06/25/2012
605	Chain Ferry Rd (From: 49-674 Shepards Warehouse Rd; To: SR 33 Lewis Puller Mem Hwy)	1.31	140	R								NA			NA		06/25/2012
605	York River Rd (From: SR 33 Lewis Puller Mem Hwy; To: 49-606 Taylorsville Rd)	3.46	830	G	96%	1%	1%	0%	2%	0%	C	0.096		0.622	860	G	2016
605	York River Rd (From: 49-606 Taylorsville Rd; To: 49-601 N, Cherry Row Lane)	1.39	470	G	96%	1%	1%	0%	2%	0%	F	0.106		0.648	480	G	2016

King & Queen County

Route No.	Route	From	To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
605	Plain View Lane	49-601 N, Cherry Row Lane	49-601 S, Cherry Row Lane	0.61	**470**	N	96%	1%	1%	0%	2%	0%	N	0.106		0.648	480	N	2016
605	Plain View Lane	49-601 S, Cherry Row Lane	SR 14 Buena Vista Rd	2.68	**320**	R								NA			NA		06/27/2012
606	Taylorsville Rd	49-605 York River Rd	49-601 Stratton Major Rd	2.40	**140**	R								NA			NA		06/27/2012
607	Crouches Rd	49-631 Poor House Lane	49-617 E, Providence Rd	1.10	**50**	R								NA			NA		05/28/2015
607	Princess Rd	49-617 W, Providence Rd	Essex County Line	1.40	**40**	R								NA			NA		05/28/2015
608	Clancie Rd	49-678 Centerville Rd W	49-700 Airville Rd	0.17	**750**	G	93%	1%	1%	2%	2%	0%	C	0.098		0.597	770	G	2016
608	Clancie Rd	49-700 Airville Rd	49-609 W, New Hope Rd	2.73	**420**	G	93%	1%	1%	2%	2%	0%	F	0.109		0.661	440	G	2016
608	Royal Oak School Rd	49-609 E, New Hope Rd	1.89 MN 49-609	1.89	**140**	R								NA			NA		06/27/2012
608	Royal Oak School Rd	1.89 MN 49-609	Cul-de-Sac	0.29	**40**	R								NA			NA		06/27/2012
609	Mt Olive Bottom Rd	Dead End	49-614 N, Devils 3 Jump Rd	0.60	**30**	R								NA			NA		05/28/2015
609	Iris Rd	49-614 S, Devils 3 Jump Rd	0.64 ME 49-614	0.64	**630**	R								NA			NA		05/28/2015
609	Iris Rd	0.64 ME 49-614	49-613 Dabney Rd	2.31	**30**	R								NA			NA		06/06/2012
609	Iris Rd	49-613 Dabney Rd	49-611 Tastine Rd	0.30	**30**	R								NA			NA		06/06/2012
609	Iris Rd	49-611 Tastine Rd	49-603 Lombardy Rd; Gap	1.80	**30**	R								NA			NA		06/06/2012
609	New Hope Rd	49-610 Elsom Mascot Rd; Gap	SR 33 Lewis Puller Mem Hwy	5.80	**120**	R								NA			NA		06/02/2015
610	Elsom Mascot Rd	SR 14 The Trail	49-609 New Hope Rd	3.65	**380**	G	98%	0%	1%	0%	1%	0%	C	0.123		0.809	390	G	2016
610	Elsom Mascot Rd	49-609 New Hope Rd	49-603 Dragon Bridge Rd; Lombardy Rd	1.89	**350**	G	98%	0%	1%	0%	1%	0%	F	0.114		0.663	370	G	2016
610	Coldwater Rd	49-603 Dragon Bridge Rd; Lombardy Rd	49-656 Barn Gate Rd	1.19	**130**	R								NA			NA		06/04/2012
610	Coldwater Rd	49-656 Barn Gate Rd	49-613 Dabney Rd	2.14	**100**	R								NA			NA		06/04/2012
610	Piedmont Rd	49-613 Dabney Rd	49-602 S, Wares Church Rd; Timber Branch Rd	2.30	**60**	R								NA			NA		06/04/2012
610	Timber Branch Rd	49-602 N, Mt Olive Rd	49-614 S, Devils 3 Jump Rd	1.40	**100**	R								NA			NA		06/04/2012
610	Dragonville Rd	49-614 S, Devils 3 Jump Rd	49-614 N, Rock Spring Rd	0.70	**150**	G	95%	2%	0%	1%	2%	0%	C	0.144		0.609	150	G	2016

King & Queen County

Route		Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year	From	To
610	Hickory Hill Rd	0.20	**220**	R								NA			NA		06/04/2012	49-614 N, Rock Spring Rd	49-616 E, Liberty Hall Rd
610	Hickory Hill Rd	0.85	**30**	R								NA			NA		06/04/2012	49-616 E, Liberty Hall Rd	0.85 MN 49-616
610	Liberty Hall Rd	0.75	**2**	R								NA			NA		06/04/2012	0.85 MN 49-616	49-615 Union Hope Church Rd
610	Spring Garden Rd	1.70	**9**	R								NA			NA		06/04/2012	49-615 Union Hope Church Rd	49-616 W, Liberty Hall Rd; Mt Zion Rd
611	Tastine Rd	2.00	**40**	R								NA			NA		06/06/2012	49-609 Iris Rd	2.00 MS 49-609
611	Tastine Rd	1.00	**46**	R								NA			NA		06/06/2012	2.00 MS 49-609	SR 14 E, The Trail
611	Water Lane	1.60	**160**	R								NA			NA		05/28/2015	SR 14 W, The Trail	Dead End
612	Lily Pond Rd	0.30	**180**	R								NA			NA		06/04/2012	SR 14 The Trail	49-630 Deshazo Rd
612	Lily Pond Rd	2.77	**60**	R								NA			NA		06/04/2012	49-630 Deshazo Rd	49-617 S, Providence Rd
612	Lily Pond Rd	1.53	**90**	R								NA			NA		06/04/2012	49-617 S, Providence Rd	Essex County Line
613	Allens Mill Pond Rd	1.10	**6**	R								NA			NA		05/28/2015	Dead End	49-614 N, Devils 3 Jump Rd
613	Dabney Rd	4.10	**70**	R								NA			NA		05/28/2015	49-614 S, Devils 3 Jump Rd	49-610 Piedmont Rd; Coldwater Rd
614	Clifton Lane	1.90	**80**	R								NA			NA		05/28/2015	Dead End	SR 14 The Trail
614	Devils 3 Jump Rd	0.90	**530**	G	71%	1%	2%	4%	22%	0%	C	0.095		0.585	550	G	2016	SR 14 The Trail	49-613 S, Dabney Rd
614	Devils 3 Jump Rd	1.00	**470**	G	71%	1%	2%	4%	22%	0%	F	0.116		0.52	490	G	2016	49-613 S, Dabney Rd	49-613 N, Allens Mill Pond Rd
614	Devils 3 Jump Rd	0.80	**460**	G	71%	1%	2%	4%	22%	0%	F	0.118		0.519	480	G	2016	49-613 N, Allens Mill Pond Rd	49-609 S, Iris Rd
614	Devils 3 Jump Rd	1.30	**160**	G	71%	1%	2%	4%	22%	0%	F	0.110		0.532	160	G	2016	49-609 S, Iris Rd	49-602 Truhart Rd; Wares Church Rd
614	Devils 3 Jump Rd	1.00	**70**	G	71%	1%	2%	4%	22%	0%	F	0.165		0.563	70	G	2016	49-602 Truhart Rd; Wares Church Rd	49-610 E, Dragonville Rd
614	Rock Spring Rd	4.65	**130**	R								NA			NA		06/04/2012	49-610 W, Liberty Hall Rd; Dragonville Rd	49-615 Union Hope Church Rd
614	Rock Spring Rd	0.70	**80**	R								0.099		0.5	NA		05/28/2015	49-615 Union Hope Church Rd	49-604 Byrds Bridge Rd
614	Poplar Grove Rd	3.30	**40**	R								NA			NA		06/04/2012	49-604 Byrds Bridge Rd	49-617 Exol Rd; White House Lane
615	Union Hope Church Rd	1.40	**9**	R								NA			NA		06/04/2012	49-610 Liberty Hall Rd	49-614 Rock Spring Rd

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Route No.	Route	From	To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
616	Mt Zion Rd	SR 14 The Trail	49-610 E, Spring Garden Rd	3.20	**150**	R								NA			NA		06/07/2012
616	Liberty Hall Rd	49-610 E, Spring Garden Rd	49-610 W, Hickory Hill Rd	3.70	**90**	R								NA			NA		06/04/2012
617	Providence Rd	49-631 Poor House Lane	49-607 E, Princess Rd	2.20	**100**	R								NA			NA		05/28/2015
617	Providence Rd	49-607 E, Princess Rd	49-612 S, Lily Pond Rd	2.00	**50**	R								NA			NA		05/28/2015
617	White House Lane	49-612 N, Lily Pond Rd	49-614 Popular Grove Rd	1.80	**80**	R								NA			NA		05/28/2015
617	Exol Rd	49-614 Popular Grove Rd	49-616 Mt Zion Rd	2.60	**50**	R								NA			NA		05/28/2015
617	Carletons Corner Rd	49-616 Mt Zion Rd	SR 14 The Trail	4.90	**110**	R								NA			NA		05/28/2015
618	Shilo Rd	SR 14 The Trail	Dead End	1.00	**40**	R								NA			NA		06/07/2012
619	Owens Mill Rd	49-721 Newtown Rd	49-673 Martin Town Rd	2.80	**390**	G	98%	0%	2%	0%	0%	0%	F	0.102		0.6	400	G	2016
619	Owens Mill Rd	49-673 Martin Town Rd	49-660 Sorghum Rd	1.80	**310**	G	98%	0%	2%	0%	0%	0%	C	0.098		0.531	320	G	2016
619	Owens Mill Rd	49-660 Sorghum Rd	Essex County Line	3.00	**250**	G	98%	0%	2%	0%	0%	0%	F	0.093		0.577	260	G	2016
620	Duck Pond Rd	49-633 Stones Rd	SR 14 W, The Trail	2.20	**10**	R								NA			NA		06/07/2012
620	Powcan Rd	SR 14 E, The Trail	49-631 E, Poor House Lane	2.89	**160**	G	93%	1%	1%	1%	5%	0%	F	0.141		0.661	170	G	2016
620	Powcan Rd	49-631 E, Poor House Lane	Essex County Line	1.00	**540**	G	93%	1%	1%	1%	5%	0%	C	0.107		0.652	560	G	2016
621	Bruington Rd	SR 14 The Trail	US 360; Essex County Line	3.80	**550**	G	90%	0%	1%	0%	9%	0%	C	0.102		0.603	570	G	2016
622	Minor Rd	US 360 Richmond Hwy	Essex County Line	0.49	**350**	G	98%	0%	0%	0%	1%	0%	C	0.107		0.667	360	G	2016
623	Indian Neck Rd	49-721 Newtown Rd	49-635 S, Bradley Farm Rd	1.05	**150**	G	94%	1%	3%	2%	0%	0%	C	0.124		0.684	160	G	2016
623	Indian Neck Rd	49-635 N, Bradley Farm Rd	49-619 Owens Mill Rd	4.60	**210**	R								NA			NA		06/21/2012
623	Indian Neck Rd	49-619 Owens Mill Rd	Essex County Line	1.80	**20**	R								NA			NA		06/21/2012
624	Root Swamp Rd	49-635 Bradley Farm Rd	49-689 Frog Pond Rd	1.13	**90**	R								NA			NA		05/28/2015
624	Root Swamp Rd	49-689 Frog Pond Rd	Caroline County Line	1.97	**80**	R								NA			NA		05/28/2015

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Route No.	Route	From	To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
625	Poplar Hill Rd	49-628 Spring Cottage Rd; Poplar Hill Rd	49-651 Dewsville Rd	1.60	**140**	G	89%	3%	3%	3%	1%	0%	F	0.106		0.778	150	G	2016
625	Poplar Hill Rd	49-651 Dewsville Rd	49-721 Newtown Rd	1.00	**170**	G	89%	3%	3%	3%	1%	0%	F	0.099		0.632	170	G	2016
625	Byrds Mill Rd	49-721 Newtown Rd	49-649 Kays Lane	1.50	**160**	G	89%	3%	3%	3%	1%	0%	C	0.124		0.75	160	G	2016
625	Byrds Mill Rd	49-649 Kays Lane	49-641 Salvia Rd	1.10	**170**	R								NA			NA		06/21/2012
625	Byrds Mill Rd	49-641 Salvia Rd	Caroline County Line	2.00	**10**	R								NA			NA		06/21/2012
626	Roseville Rd	49-623 Indians Neck Rd	0.46 MN 49-623	0.46	**4**	R								NA			NA		05/04/2015
626	Roseville Rd	0.46 MN 49-623	Dead End	0.04	**4**	R								NA			NA		05/04/2015
627	Roundabout Route Rd	Caroline County Line	49-721 Newtown Rd	2.04	**120**	R								NA			NA		06/25/2012
628	Green Chambers Rd	US 360 Richmond Hwy	49-642 Pattie Swamp Rd	0.50	**40**	R								NA			NA		06/21/2012
628	Pattie Swamp Rd	49-642 Green Chambers Rd	49-721 S, Newtown Rd	1.00	**40**	R								NA			NA		06/21/2012
628	Todds Bridge Rd	49-721 N, Newtown Rd	1.20 MW 49-721	1.20	**170**	R								NA			NA		06/21/2012
628	Todds Bridge Rd	1.20 MW 49-721	2.60 MW 49-721 GAP	1.40	**40**	R								NA			NA		06/21/2012
628	Spring Cottage Rd	Dead End; Gap	49-639 Eastern View Rd	1.80	**20**	R								NA			NA		06/21/2012
628	Spring Cottage Rd	49-639 Eastern View Rd	49-625 Byrds Mill Rd	1.80	**60**	R								NA			NA		06/21/2012
628	Spring Cottage Rd	49-625 Poplar Hill Rd	King William County Line	1.90	**220**	G	82%	0%	1%	5%	12%	0%	C	0.14		0.9	230	G	2016
629	Walkerton Rd	King William County Line; 50-629	SR 14 The Trail	3.11	**760**	G	90%	1%	1%	0%	8%	0%	C	0.107		0.674	790	G	2016
630	Deshazo Rd	49-631 Poor House Lane	49-612 Lily Pond Rd	2.50	**70**	R								NA			NA		05/28/2015
631	Frazier Ferry Rd	Dead End	SR 14 E, The Trail	1.45	**90**	R								NA			NA		05/28/2015
631	Bunker Hill Rd	SR 14 W, The Trail	49-632 Hockley Neck Rd	2.60	**640**	G	96%	2%	2%	0%	0%	0%	C	0.11		0.575	670	G	2016
631	Stevensville Rd	49-632 Hockley Neck Rd	SR 14 S; 49-633 Stones Rd	1.45	**350**	G	96%	2%	2%	0%	0%	0%	F	0.105		0.553	360	G	2016
631	Poor House Lane	SR 14 N, The Trail	49-630 Deshazo Rd	1.58	**210**	G	96%	2%	2%	0%	0%	0%	F	0.128		0.517	210	G	2016
631	Poor House Lane	49-630 Deshazo Rd	49-620 E, Powcan Rd	2.54	**310**	G	96%	2%	2%	0%	0%	0%	F	0.109		0.711	320	G	2016

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Route		From	To	Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
631	Norwood Rd	49-620 W, Powcan Rd	SR 14 E, The Trail	3.03	50	R								NA			NA		05/04/2015
631	Fleets Mill Rd	SR 14 W, The Trail	49-672 Holmestown Rd	0.98	130	R								NA			NA		05/04/2015
631	Fleets Mill Rd	49-672 Holmestown Rd	1.44 MW 49-672	1.44	220	R								NA			NA		05/04/2015
631	Fleets Mill Rd	1.44 MW 49-672	US 360 E, Richmond Hwy	0.06	220	R								NA			NA		05/04/2015
631	Smithfield Rd	US 360 W, Richmond Hwy	49-650 Smithfield School Rd	2.20	370	G	97%	0%	2%	1%	0%	0%	C	0.098		0.878	380	G	2016
631	Smithfield Rd	49-650 Smithfield School Rd	49-619 Owens Manor Rd	2.15	100	R								NA			NA		05/04/2015
632	Hockley Neck Rd	49-633 Stones Rd	49-631 Poor House Lane; Bunker Hill Rd	1.79	380	G	98%	0%	1%	0%	0%	0%	C	0.097		0.585	400	G	2016
633	Bendley Lane	Dead End	49-675, N Blank Rd	0.27	10	R								NA			NA		05/04/2015
633	Bendley Lane	49-675, N Blank Rd	49-634 S, Canterbury Rd	0.65	40	R								NA			NA		06/21/2012
633	Rose Mount Rd	49-634 N, Canterbury Rd	49-636 W, Minter Lane	1.41	210	G	96%	0%	2%	0%	1%	0%	F	0.148		0.582	220	G	2016
633	Rose Mount Rd	49-636 W, Minter Lane	49-636 E, Pea Ridge Rd	0.30	180	G	96%	0%	2%	0%	1%	0%	F	0.148		0.561	180	G	2016
633	Rose Mount Rd	49-636 E, Pea Ridge Rd	0.69 ME 49-636	0.69	150	R								NA			NA		05/04/2015
633	Rose Mount Rd	0.69 ME 49-636	49-629 N, Walkerton Rd	1.31	160	R								NA			NA		05/04/2015
633	Stones Rd	49-629 S, Walkerton Landing Rd	49-634 Mt Elba Rd	1.70	120	G	96%	0%	2%	0%	1%	0%	F	0.112		0.936	120	G	2016
633	Mantau Rd	49-634 Mt Elba Rd	49-632 Hockley Neck Rd	2.60	530	G	96%	0%	2%	0%	1%	0%	C	0.092		0.660	550	G	2016
633	Stones Rd	49-632 Hockley Neck Rd	SR 14 The Trail; 49-631 Poor House Lane	2.60	100	R								NA			NA		05/04/2015
634	Mt Elba Rd	49-633 Stones Rd	49-629 E, Walkerton Landing Rd	1.35	510	G	93%	0%	1%	0%	6%	0%	F	0.094		0.639	530	G	2016
634	Canterbury Rd	49-629 W, Walkerton Landing Rd	49-636 Miner Lane	1.72	470	G	93%	0%	1%	0%	6%	0%	F	0.091		0.598	490	G	2016
634	Canterbury Rd	49-636 Miner Lane	49-633 S, Bewdley Lane	1.78	340	G	93%	0%	1%	0%	6%	0%	F	0.123		0.511	360	G	2016
634	Canterbury Rd	49-633 S, Bewdley Lane	49-633 N, Rose Mount Rd	0.47	350	G	93%	0%	1%	0%	6%	0%	F	0.114		0.535	360	G	2016
634	Canterbury Rd	49-633 N, Rose Mount Rd	SR 14 The Trail	2.07	600	G	93%	0%	1%	0%	6%	0%	C	0.111		0.561	620	G	2016
635	Bradley Farm Rd	49-721 Newtown Rd	49-623 S, Indians Neck Rd	1.19	320	G	98%	0%	0%	1%	1%	0%	C	0.109		0.65	330	G	2016
635	Bradley Farm Rd	49-623 S, Indians Neck Rd	Essex County Line	4.43	230	G	98%	0%	0%	1%	1%	0%	F	0.115		0.539	240	G	2016

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Route		Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
636	Minter Lane From: 49-634 Canterbury Rd To: 49-633 W, Rose Mount Rd	2.00	70	R								NA			NA		06/21/2012
636	Pea Ridge Rd From: 49-633 E, Rose Mount Rd To: SR 14 The Trail	2.00	180	R								NA			NA		06/21/2012
637	Chatham Hill Rd From: Dead End To: 49-634 Canterbury Rd	1.40	160	R								NA			NA		05/04/2015
638	Aspen Hill Rd From: 49-620 S, Powcan Rd To: 49-620 N, Powcan Rd	0.20	20	R								NA			NA		05/04/2015
639	Eastern View Rd From: 49-628 Spring Cottage Rd To: 49-684 The Forge Rd	0.45	110	R								NA			NA		05/04/2015
639	Eastern View Rd From: 49-684 The Forge Rd To: 49-721 Newtown Rd	1.15	310	R								NA			NA		05/04/2015
640	Lyneville Rd From: 49-721 Newtown Rd To: 1.00 MN 49-721	1.00	280	R								NA			NA		06/21/2012
640	Lyneville Rd From: 1.00 MN 49-721 To: 49-623 Indians Neck Rd	1.30	90	R								NA			NA		06/21/2012
641	Salvia Rd From: 49-652 Vessels Rd To: 49-625 Byrds Mill Rd	2.00	130	R								NA			NA		05/04/2015
642	Green Chambers Rd From: US 360 Richmond Hwy To: 49-628 Pattie Swamp Rd	0.30	60	R								NA			NA		06/21/2012
643	Airport Rd From: Dead End To: SR 33 Lewis Puller Mem Hwy	0.83	260	R								NA			NA		06/25/2012
644	Jonestown Rd From: 49-601 Stratton Major Rd To: SR 14 Buena Vista Rd	1.40	170	R								NA			NA		06/02/2015
645	Page Lane From: Dead End To: 49-605 Plain View Lane	0.60	60	R								NA			NA		06/27/2012
646	Curtis St From: SR 14 The Trail To: 49-678 Riverview Ave	0.20	110	R								NA			NA		06/27/2012
647	Milby Town Rd From: Dead End To: 0.80 ME Dead End	0.80	110	R								NA			NA		06/02/2015
647	Milby Town Rd From: 0.80 ME Dead End To: 49-609 New Hope Rd	1.00	150	R								NA			NA		06/02/2015
648	Kingston Rd From: Dead End To: 49-605 Plain View Lane	1.40	150	R								NA			NA		06/27/2012
649	Kays Lane From: 49-625 Byrds Mill Rd To: Dead End	0.70	5	R								NA			NA		05/04/2015
650	Smithfield School Rd From: 49-631 Smithfield Rd To: Essex County Line	1.60	260	R								NA			NA		06/21/2012

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Route		Length	AADT	QA	4Tire	Bus	2Axle	3+Axle	1Trail	2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
651	Dewsville Rd (From: Dead End To: 49-625 Byrds Mill Rd)	1.00	60	R								NA			NA		06/04/2012
652	Vessels Rd (From: 49-721 W, Newtown Rd To: 49-641 Salvia Rd)	1.40	80	R								NA			NA		07/15/2009
652	Vessels Rd (From: 49-641 Salvia Rd To: 49-721 E, Newtown Rd)	0.60	230	R								NA			NA		05/04/2015
653	Coates Lane (From: 49-609 New Hope Rd To: Dead End)	0.70	2	R								NA			NA		06/27/2012
654	Davis Beech Rd (From: Dead End To: SR 14 The Trail)	1.20	170	R								NA			NA		06/06/2012
655	Courthouse Landing Rd (From: Dead End To: 49-681 Allens Circle)	1.00	70	R								NA			NA		06/06/2012
656	Barn Gate Rd (From: Dead End To: 49-610 Coldwater Rd)	0.40	7	R								NA			NA		06/04/2012
657	Limehouse Rd (From: Dead End To: SR 14 The Trail)	1.28	190	R								NA			NA		06/06/2012
658	Travellers Rd (From: 49-605 York River Rd To: 49-601 Stratton Major Rd)	3.14	170	R								NA			NA		06/27/2012
659	Mantapike Landing Rd (From: Dead End To: 49-631 Bunker Hill Rd)	0.60	120	R								NA			NA		06/06/2012
659	Mantapike Landing Rd (From: 49-631 Bunker Hill Rd To: SR 14 The Trail)	1.80	20	R								NA			NA		06/06/2012
660	Sorghum Rd (From: 49-721 Newtown Rd To: 49-619 Owens Mill Rd)	2.10	160	R								NA			NA		06/21/2012
661	Brookshire Rd (From: Dead End To: 49-687 Simpson Creek Rd)	0.37	20	R								NA			NA		06/02/2015
661	Brookshire Rd (From: 49-687 Simpson Creek Rd To: SR 33 Lewis Puller Mem Hwy)	0.31	220	R								NA			NA		06/02/2015
662	Greenbriar Rd (From: Dead End To: 49-634 Canterbury Rd)	0.46	60	R								NA			NA		05/04/2015
663	Scuffletown Rd (From: Dead End To: 49-629 Walkerton Rd)	0.31	40	R								NA			NA		06/07/2012
664	Peach Grove Rd (From: 49-721 Newtown Rd To: Dead End)	0.95	150	R								NA			NA		05/04/2015
665	Hell Bottom Rd (From: Dead End To: 49-721 Newtown Rd)	1.04	130	R								NA			NA		05/04/2015
666	Tuckers Rd (From: Dead End To: 49-667 Wrights Dock Rd)	0.76	220	R								NA			NA		06/02/2015
666	Tuckers Rd (From: 49-667 Wrights Dock Rd To: 49-605 Plain View Lane)	0.60	340	R								NA			NA		06/02/2015

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Route		Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
667	Wrights Dock Rd	1.20	60	R	From: Dead End	To: 49-666 Tuckers Rd						NA			NA		06/27/2012
668	Morris Lane	0.25	150	R	From: 49-605 York River Rd	To: Dead End						NA			NA		06/25/2012
669	Buzzards Roost Rd	1.20	20	R	From: Dead End	To: 28-620; Essex County Line						NA			NA		06/04/2012
670	Virginia Ave	0.15	80	R	From: Dead End	To: SR 33 Lewis Puller Mem Hwy						NA			NA		06/25/2012
671	Old Millwood Rd	0.87	40	R	From: Dead End	To: 49-641 Salvia Rd						NA			NA		06/04/2012
672	Holmestown Rd	0.84	50	R	From: 49-631 Fleets Mill Rd	To: Dead End						NA			NA		05/04/2015
673	Martin Town Rd	0.79	70	R	From: 49-619 Owens Mill Rd	To: Dead End						NA			NA		05/04/2015
674	Shepards Warehouse Rd	0.29	60	R	From: Dead End	To: 49-605 Chain Ferry Rd						NA			NA		06/25/2012
675	North Bank Rd	0.32	30	R	From: Dead End	To: 49-633 Bendley Lane						NA			NA		05/04/2015
676	Goulders Creek Rd	0.26	70	R	From: Dead End	To: SR 33 Lewis Puller Mem Hwy						NA			NA		06/25/2012
677	Suttons Court	0.26	20	R	From: Dead End O.26 MN	To: SR 14 The Trail						NA			NA		05/04/2015
677	Suttons Court	0.19	20	R	From: SR 14 The Trail	To: Dead End O.19 MS						NA			NA		05/04/2015
678	Centerville Rd	0.17	170	G	94%	3%	1%	1%	3%	0%	C	0.117		0.905	180	G	2016
	From: SR 33 Lewis Puller Mem Hwy	To: SR 14 W, The Trail															
678	Centreville Rd	0.91	690	G	94%	1%	1%	1%	3%	0%	C	0.097		0.603	720	G	2016
	From: SR 14 W, The Trail	To: 49-608 Clancie Rd															
678	Centerville Road	0.33	570	G	94%	1%	1%	1%	3%	0%	F	0.097		0.603	590	G	2016
	From: 49-608 Clancie Rd	To: SR 14, SR 33 Lewis Puller Mem Hwy															
679	Beaulah Rd	1.18	60	R	From: SR 33 W, Lewis Puller Mem Hwy	To: SR 33 E, Lewis Puller Mem Hwy						NA			NA		06/27/2012
680	Hockley Lane	0.49	90	R	From: Cul-de-Sac	To: 49-605 York River Rd						NA			NA		06/27/2012
681	Allens Circle	0.28	200	R	From: SR 14 The Trail	To: SR 14 The Trail						NA			NA		05/28/2014
682		0.15	20	R	From: US 360 Richmond Hwy	To: Dead End						NA			NA		05/28/2014

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Route		Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year	From	To
683	Gregory Lane	0.07	40	R								NA			NA		06/25/2012	Dead End	SR 33 Lewis Puller Mem Hwy
684	The Forge Rd	1.37	100	R								NA			NA		06/21/2012	Dead End	49-639 Eastern View Rd
685	Fish Hatchery Rd	0.64	60	R								NA			NA		06/07/2012	SR 14 The Trail	0.64 MN SR 14
685	Fish Hatchery Rd	0.16	20	R								NA			NA		06/07/2012	0.64 MN SR 14	Dead End
686	Ashby Rd	0.06	45	R								NA			NA		06/25/2012	Dead End	SR 33 Lewis Puller Mem Hwy
687	Simpson Creek Rd	0.26	80	R								NA			NA		06/25/2012	Dead End	49-661 Brookshire Rd
688	Howard Lane	0.15	20	R								NA			NA		06/25/2012	49-691 Apple Rd	Dead End
689	Frog Pond Rd	0.26	30	R								NA			NA		06/21/2012	49-624 Root Swamp Rd	Dead End
690	Dudley Ferry Rd	0.26	100	R								NA			NA		06/25/2012	Dead End	49-661 Brookshire Rd
691	Apple Rd	0.22	30	R								NA			NA		06/02/2015	49-605 York River Rd	SR 33 Lewis Puller Mem Hwy
692	Dahlgren Rd	0.06	100	R								NA			NA		06/07/2012	Dead End	49-632 Hockley Neck Rd
693	Level Green Rd	0.40	80	R								NA			NA		06/25/2012	Dead End	49-721 Newtown Rd
694	New Beginning Rd	0.24	70	R								NA			NA		06/02/2015	49-609 New Hope Rd	Dead End
700	Coxs Lane	0.14	90	R								NA			NA		06/02/2015	49-608 Clancie Rd	49-701 Airville Rd
701	Airville Rd	0.17	40	R								NA			NA		06/27/2012	49-608 Clancie Rd	49-700 Coxs Lane
721	Newtown Rd	1.60	2600	G	93%	1%	1%	1%	5%	0%	F	0.09		0.709	2700	G	2016	US 360; SR 14 The Trail	49-619 Owens Mill Rd
721	Newtown Rd	3.94	1600	G	93%	1%	1%	1%	5%	0%	C	0.099		0.530	1600	G	2016	49-619 Owens Mill Rd	49-639 Eastern View Rd
721	Newtown Rd	2.66	1400	G	93%	1%	1%	1%	5%	0%	F	0.102		0.511	1500	G	2016	49-639 Eastern View Rd	49-635 Bradley Farm Rd
721	Newtown Rd	1.12	770	G	93%	1%	1%	1%	5%	0%	F	0.106		0.562	800	G	2016	49-635 Bradley Farm Rd	49-623 Indian Neck Rd
721	Newtown Rd	1.79	640	G	93%	1%	1%	1%	5%	0%	F	0.11		0.551	660	G	2016	49-623 Indian Neck Rd	49-627 Roundabout Route Rd

King & Queen County

Route		Length	AADT	QA	4Tire	Bus	Truck 2Axle	Truck 3+Axle	Truck 1Trail	Truck 2Trail	QC	K Factor	QK	Dir Factor	AAWDT	QW	Year
721	Newtown Rd	2.84	490	G	93%	1%	1%	1%	5%	0%	F	0.139		0.534	510	G	2016
	From: 49-627 Roundabout Route Rd To: Caroline County Line																
725	Riverview Rd	0.34	70	R								NA			NA		06/02/2015
	From: Cul-de-Sac To: 49-659 Mantapike Landing Rd																
1000	River View Dr	0.40	140	R								NA			NA		06/02/2015
	From: 49-1001 Rivers Bluff Lane To: 49-631 Bunker Hill Rd																
1001	Rivers Bluff Lane	0.35	80	R								NA			NA		06/02/2015
	From: Cul-de-Sac To: 49-1000 River View Dr																
1001	Rivers Bluff Lane	0.15	40	R								NA			NA		06/02/2015
	From: 49-1000 River View Dr To: Cul-de-Sac																
1010		0.16	90	R								NA			NA		05/04/2015
	From: 49-634 Canterbury Rd To: 49-1011																
1011		0.12	30	R								NA			NA		05/04/2015
	From: Cul-de-Sac To: 49-1010																
1011		0.11	50	R								NA			NA		05/04/2015
	From: 49-1010 To: Cul-de-Sac																
1202	White Marsh Lane	0.20	30	R								NA			NA		06/07/2012
	From: 49-629 Walkerton Rd To: Dead End																
1203	Masonic Lane	0.30	120	R								NA			NA		05/04/2015
	From: 49-629 Walkerton Rd To: Dead End																
9211	Pleasant Hills High School	0.09	20	R								NA			NA		06/25/2012
	From: Pleasant Hills High Sch To: SR 14 The Trail																
9493	King & Queen High School	0.05	20	R								NA			NA		06/27/2012
	From: K & Q Cen High School To: 0.05 ME SR 14																
9493	King & Queen High School	0.16	40	R								NA			NA		06/27/2012
	From: 0.05 ME SR 14 To: SR 14 The Trail																
9958	Lawson Elem Sch	0.08	30	R								NA			NA		06/25/2012
	From: Lawson Elem Sch To: 49-721 Newtown Rd																

King and Queen County, Virginia

2030 Comprehensive Plan

Appendix F:
Comprehensive Plan Maps

King & Queen County, Virginia

County Map | **Map 1**

Surface

Asphalt
Asphalt (Highway)
Dirt
Gravel

*Data source: King and Queen County GIS

0 1 2 4 6 8 Miles

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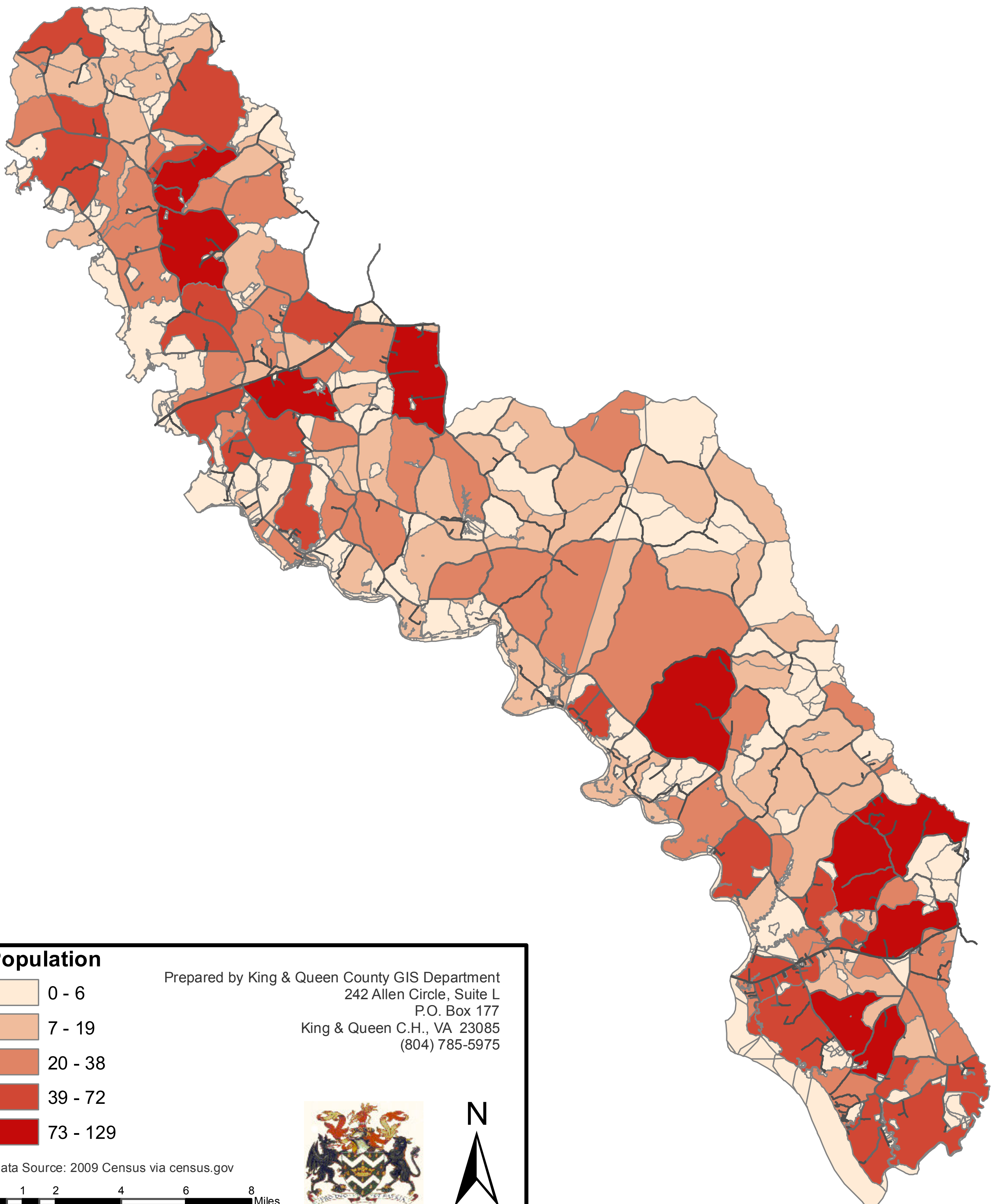
2010 Census Population by Census Block | **Map 2**



Population

- 0 - 6
- 7 - 19
- 20 - 38
- 39 - 72
- 73 - 129

*Data Source: 2009 Census via census.gov

0 1 2 4 6 8 Miles

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Voter Election Districts | **Map 3**

Voting Districts

- Newtown Voting District
- St Stephens Church Voting District
- Stevensville Voting District
- Shanghai Voting District
- Buena Vista Voting District

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*Data Source: King and Queen
GIS approved by DOJ 5/26/11

0 1 2 4 6 8 Miles

N

King & Queen County, Virginia

Corridor and Gateway Map | **Map 4**

1. Lewis B Puller Memorial Highway (US Highway 33 at Gloucester County Line)
2. Lewis B Puller Memorial Highway (US Highway 33 at the Lord Delaware Bridge)
3. Richmond Tappahannock Highway (US Highway 360 at Essex County Line)
4. Richmond Tappahannock Highway (US Highway 360 at King William County Line)
5. Buena Vista Road (State Route 14 at Gloucester County Line)
6. Wares Bridge Road (State Route 602 at Middlesex County Line)
7. New Dragon Bridge Road (State Route 603 at Middlesex County Line)
8. Walkerton Landing Road (State Route 629 at Walkerton/King William County Line)
9. Newtown Road (State Route 721 at Caroline County Line)
10. Bradley Farm Road (State Route 635 at Essex County Line)

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Corridors and Gateways

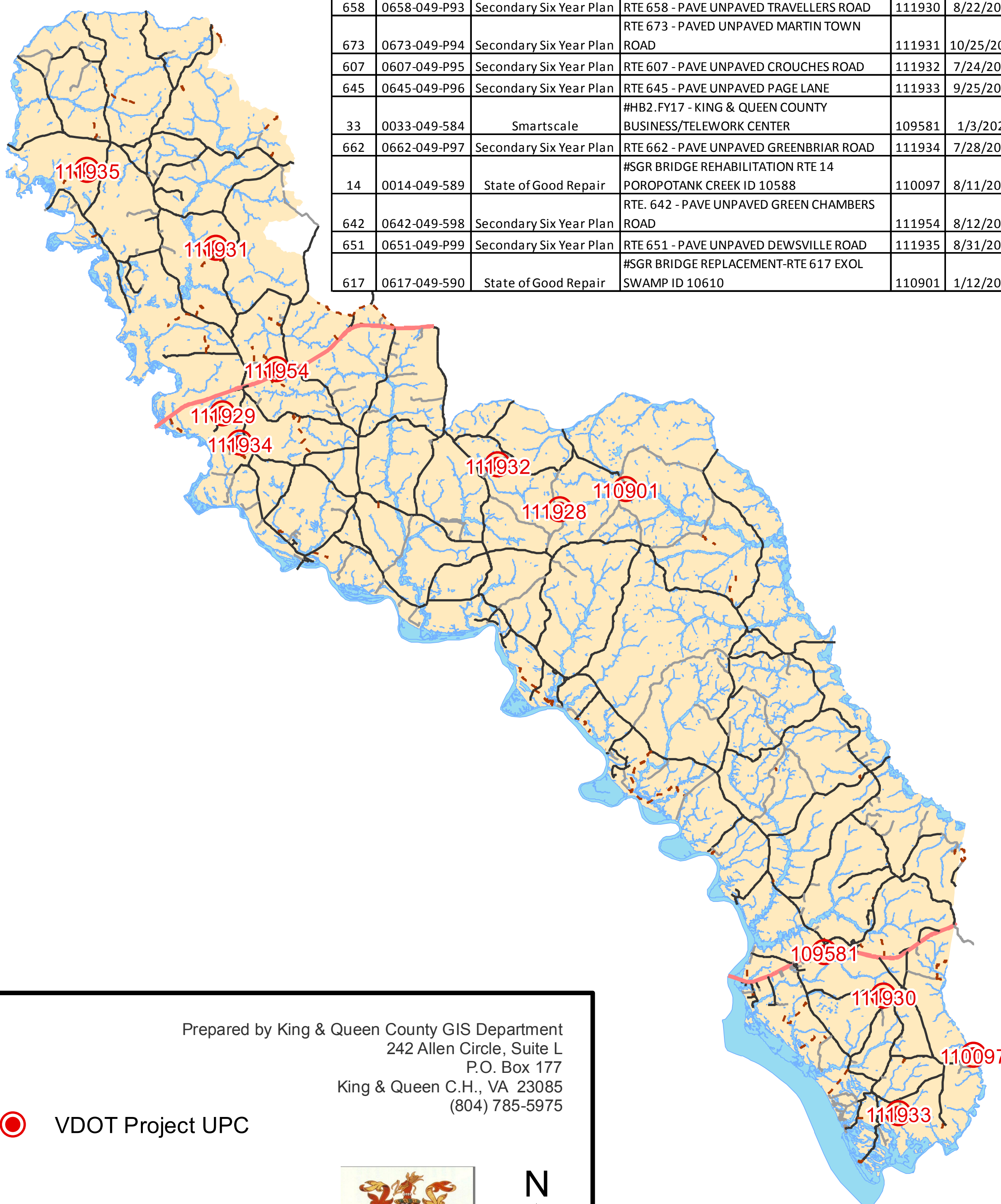
*Data Source: King and Queen GIS

0 0.75 1.5 3 4.5 6
Miles
N

King & Queen County, Virginia

Recommended Transportation Improvements | **Map 5**

Route	State Project #	Funding Source/Plan	Description	UPC	Ad Date	Estimate
637	0637-049-P91	Secondary Six Year Plan	RTE 637 - PAVE UNPAVED CHATHAM HILL ROAD	111929	7/25/2018	$ 54,625.00
612	0612-049-P92	Secondary Six Year Plan	RTE 612 - PAVE UNPAVED LILY POND ROAD	111928	8/7/2018	$ 33,775.00
658	0658-049-P93	Secondary Six Year Plan	RTE 658 - PAVE UNPAVED TRAVELLERS ROAD	111930	8/22/2018	$ 160,000.00
673	0673-049-P94	Secondary Six Year Plan	RTE 673 - PAVED UNPAVED MARTIN TOWN ROAD	111931	10/25/2018	$ 96,307.00
607	0607-049-P95	Secondary Six Year Plan	RTE 607 - PAVE UNPAVED CROUCHES ROAD	111932	7/24/2019	$ 120,174.00
645	0645-049-P96	Secondary Six Year Plan	RTE 645 - PAVE UNPAVED PAGE LANE	111933	9/25/2019	$ 65,500.00
33	0033-049-584	Smartscale	#HB2.FY17 - KING & QUEEN COUNTY BUSINESS/TELEWORK CENTER	109581	1/3/2020	$ 299,350.00
662	0662-049-P97	Secondary Six Year Plan	RTE 662 - PAVE UNPAVED GREENBRIAR ROAD	111934	7/28/2020	$ 50,255.00
14	0014-049-589	State of Good Repair	#SGR BRIDGE REHABILITATION RTE 14 POROPOTANK CREEK ID 10588	110097	8/11/2020	$ 2,250,000.00
642	0642-049-598	Secondary Six Year Plan	RTE. 642 - PAVE UNPAVED GREEN CHAMBERS ROAD	111954	8/12/2020	$ 32,775.00
651	0651-049-P99	Secondary Six Year Plan	RTE 651 - PAVE UNPAVED DEWSVILLE ROAD	111935	8/31/2020	$ 107,528.00
617	0617-049-590	State of Good Repair	#SGR BRIDGE REPLACEMENT-RTE 617 EXOL SWAMP ID 10610	110901	1/12/2021	$ 2,500,000.00



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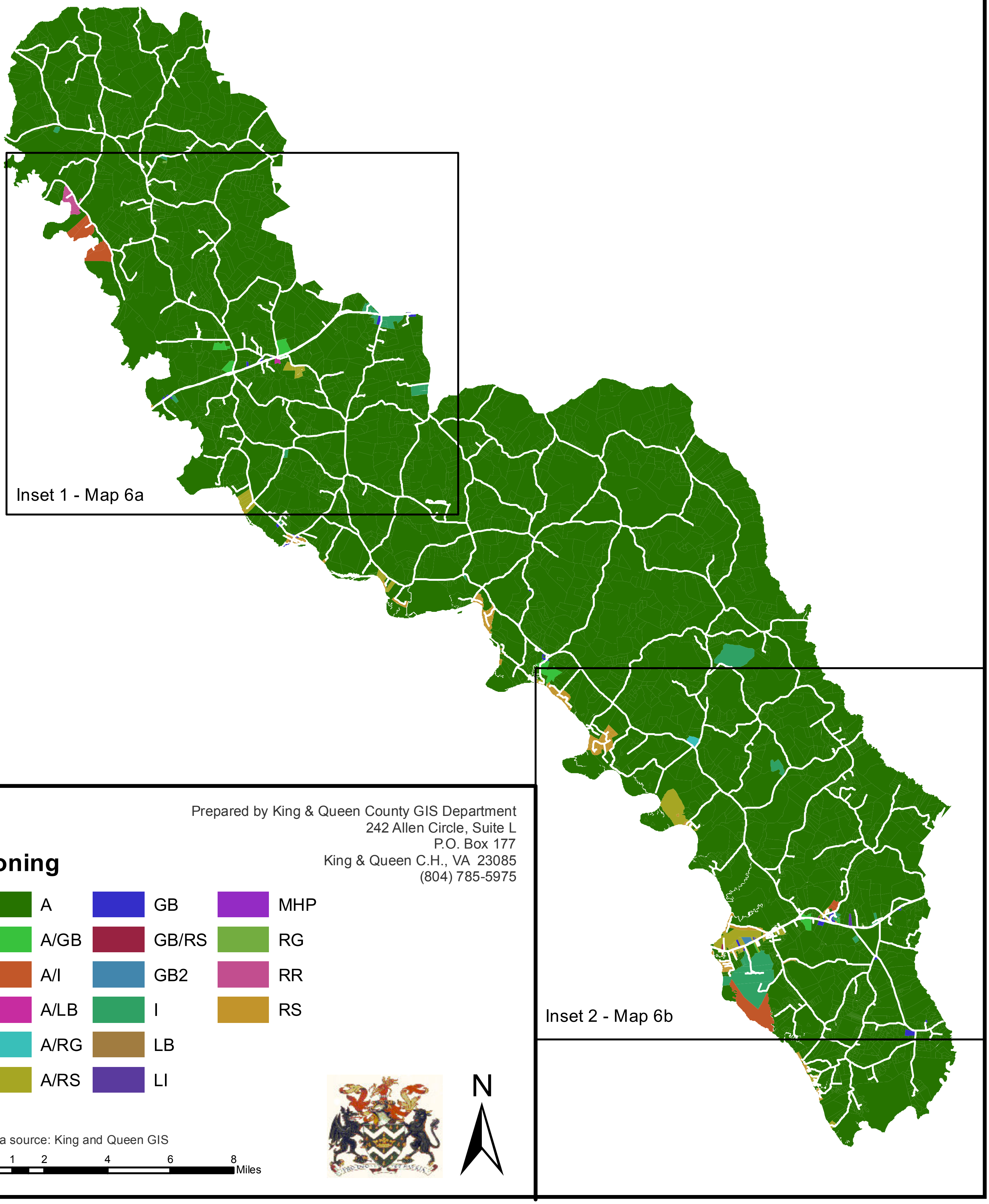
VDOT Project UPC

*Data source: VDOT, Fredericksburg VA

King & Queen County, Virginia

Zoning | **Map 6**



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Zoning

A	GB	MHP
A/GB	GB/RS	RG
A/I	GB2	RR
A/LB	I	RS
A/RG	LB	
A/RS	LI	

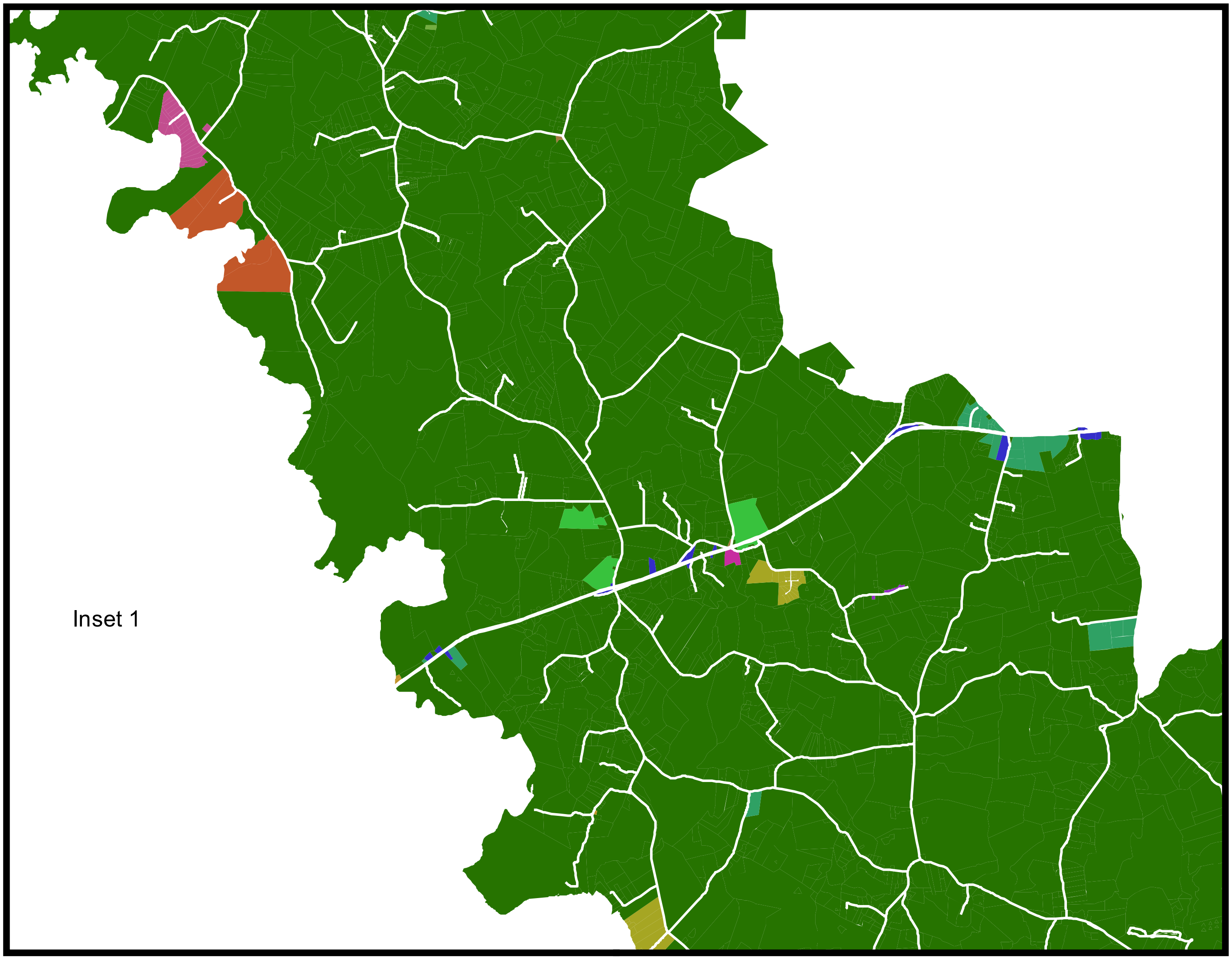
*Data source: King and Queen GIS

0 1 2 4 6 8 Miles

N

King & Queen County, Virginia

Zoning | **Map 6a**



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Zoning

A	GB	MHP
A/GB	GB/RS	RG
A/I	GB2	RR
A/LB	I	RS
A/RG	LB	
A/RS	LI	

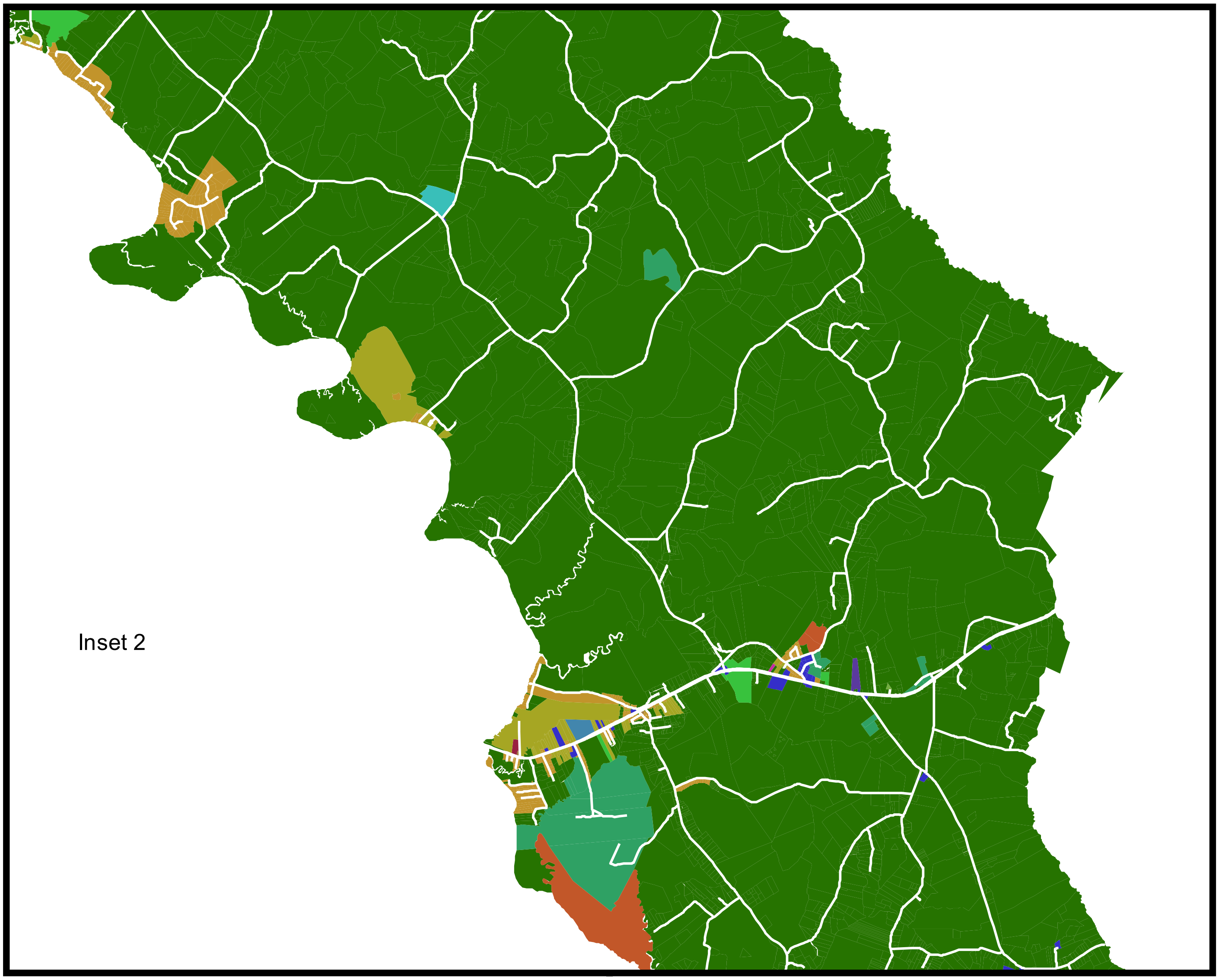
*Data Source: King and Queen GIS

0 0.375 0.75 1.5 2.25 3 Miles

N

King & Queen County, Virginia

Zoning | **Map 6b**



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Zoning

A	GB	MHP
A/GB	GB/RS	RG
A/I	GB2	RR
A/LB	I	RS
A/RG	LB	
A/RS	LI	

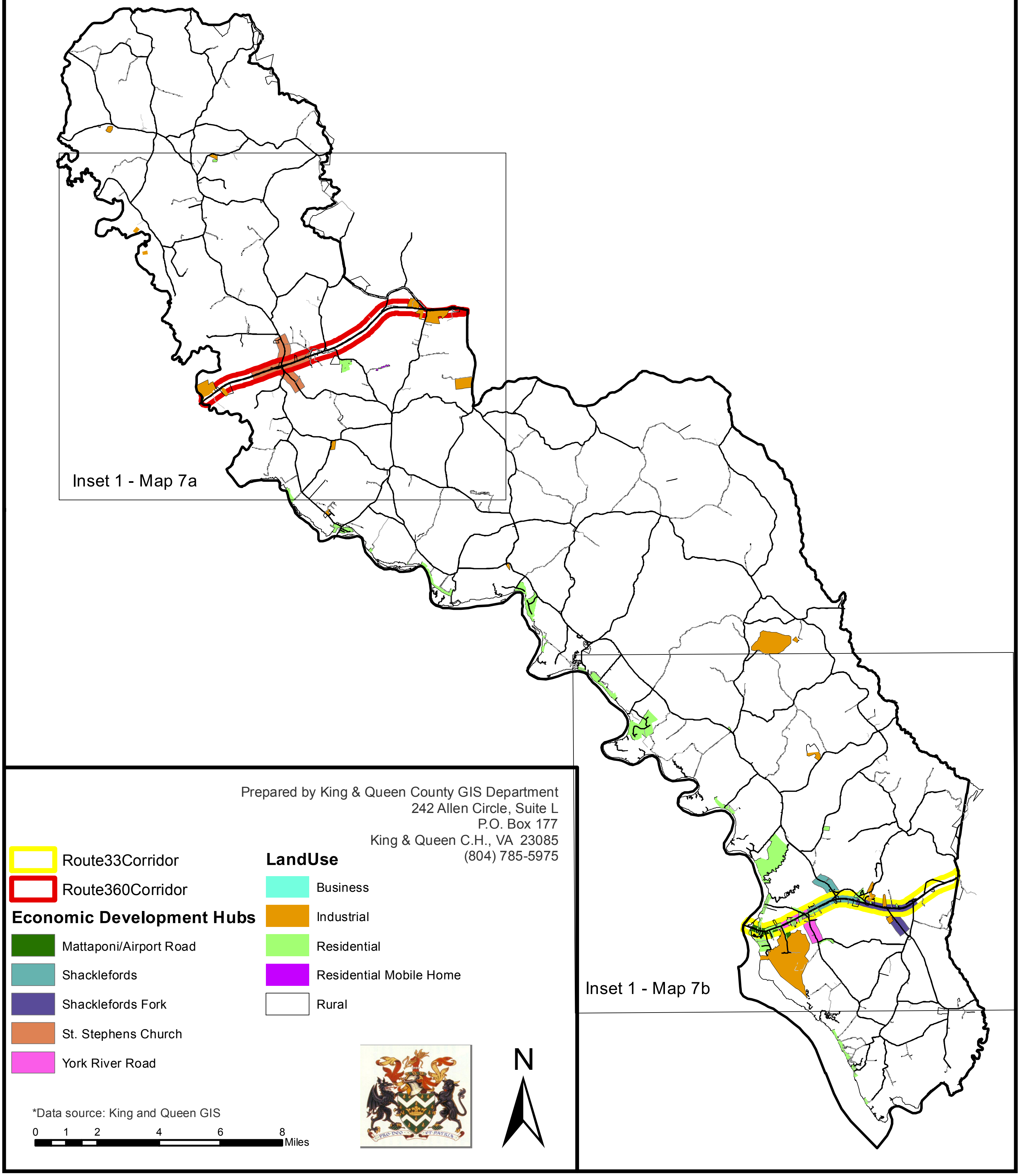
*Data Source: King and Queen GIS

0 0.375 0.75 1.5 2.25 3 Miles

N

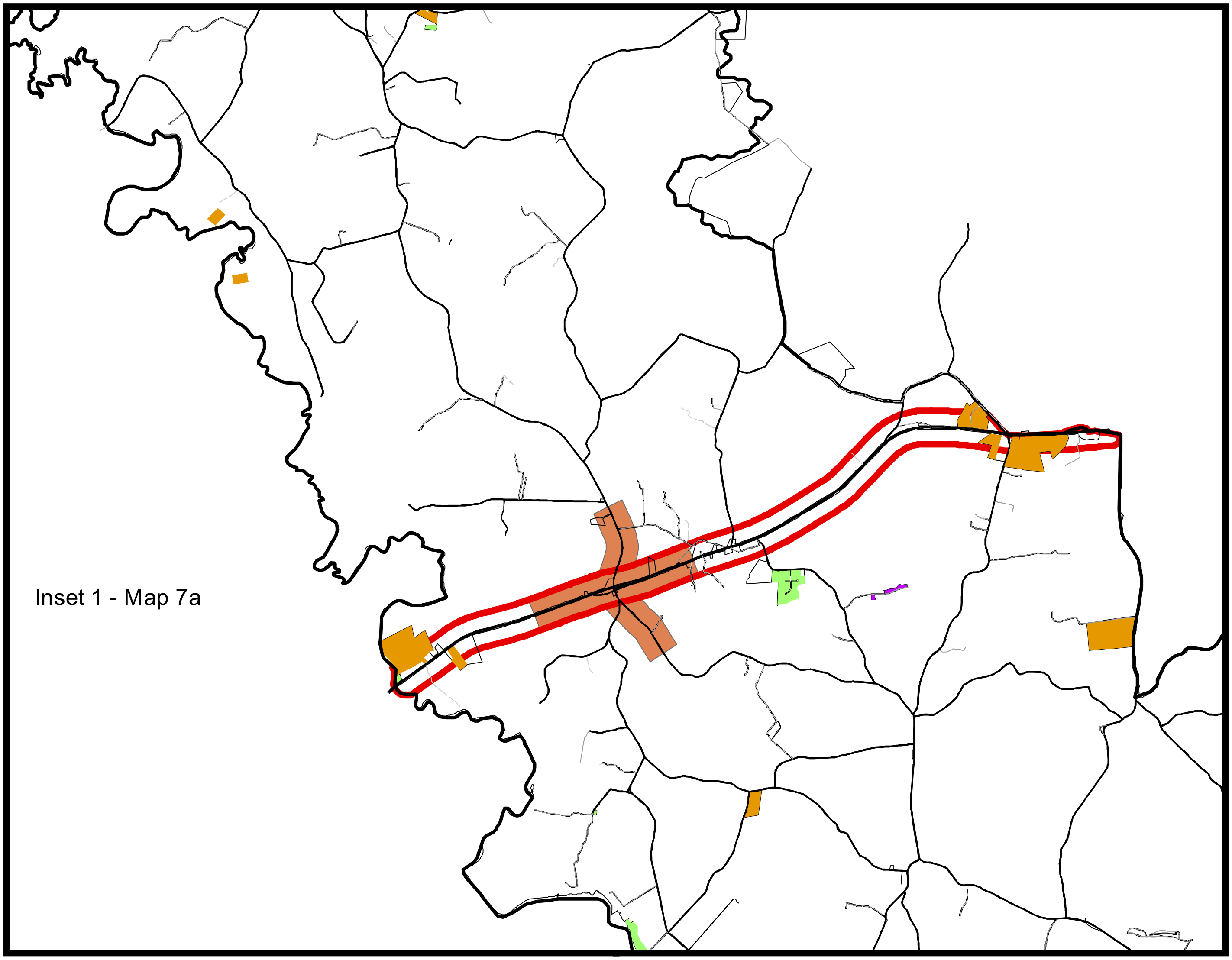
King & Queen County, Virginia

Land Use | Map 7



King & Queen County, Virginia

Land Use | **Map 7a**



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Route33Corridor

Route360Corridor

Economic Development Hubs

- Mattaponi/Airport Road
- Shacklefords
- Shacklefords Fork
- St. Stephens Church
- York River Road

LandUse

- Business
- Industrial
- Residential
- Residential Mobile Home
- Rural

*Data Source: King and Queen County GIS

0 0.475 0.95 1.9 2.85 3.8 Miles

N

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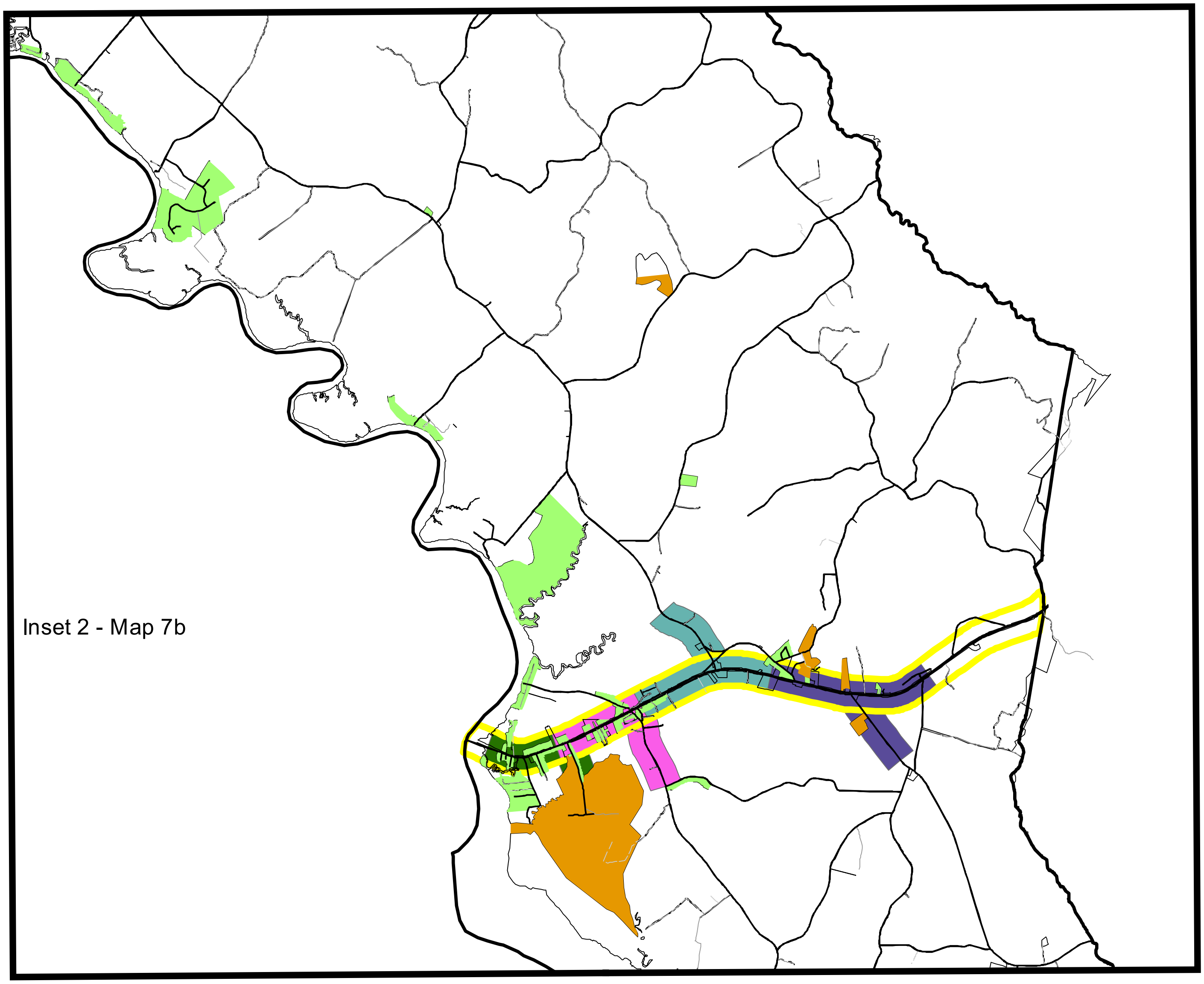
Land Use | **Map 7b**



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Route33Corridor

Route360Corridor

Economic Development Hubs

- Mattaponi/Airport Road
- Shacklefords
- Shacklefords Fork
- St. Stephens Church
- York River Road

LandUse

- Business
- Industrial
- Residential
- Residential Mobile Home
- Rural

*Data Source: King and Queen County GIS

0 0.475 0.95 1.9 2.85 3.8 Miles

N

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Historic Places | **Map 8**

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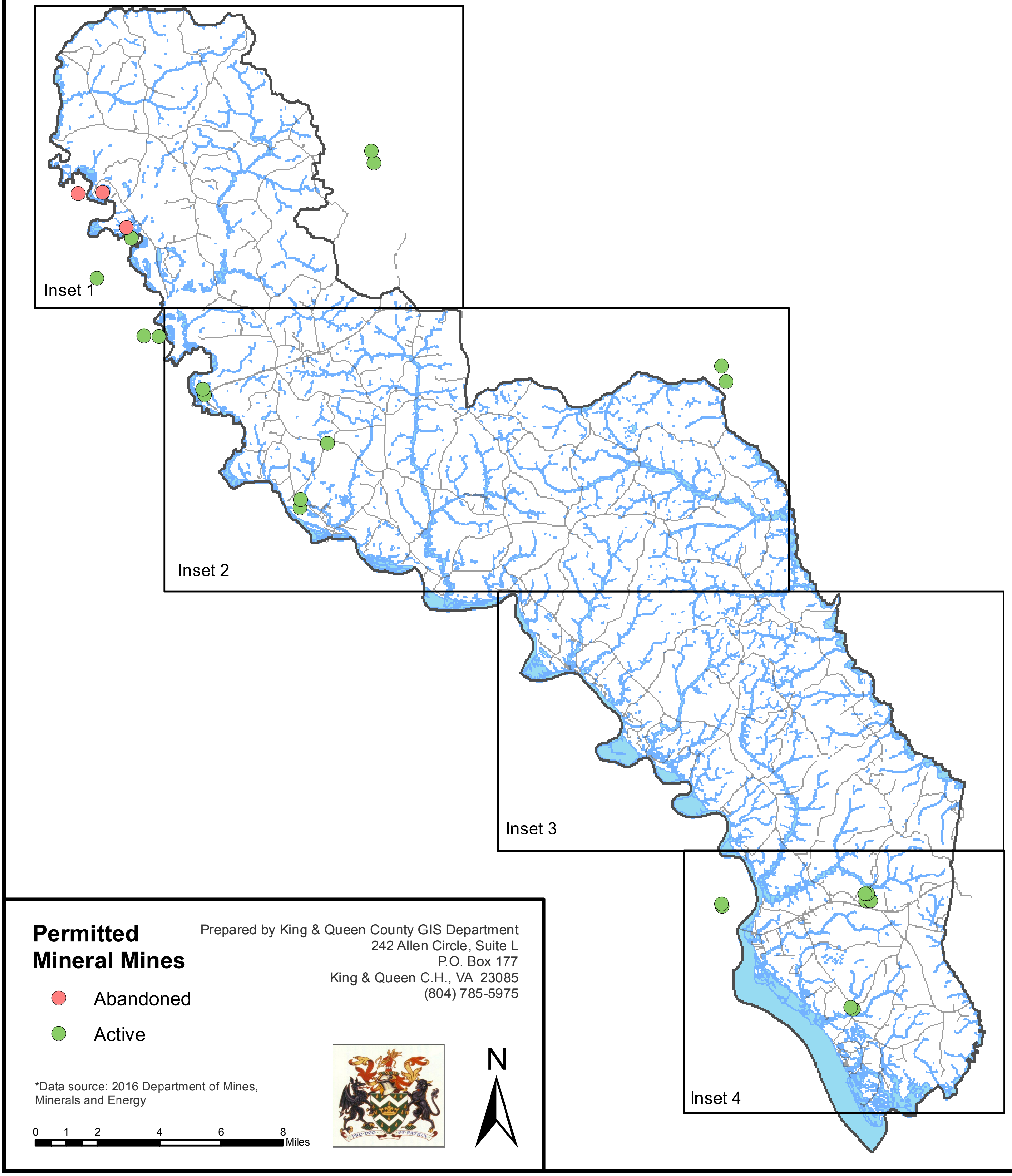
*Data Source: National Registor of Historic Places, points determined by coordinates

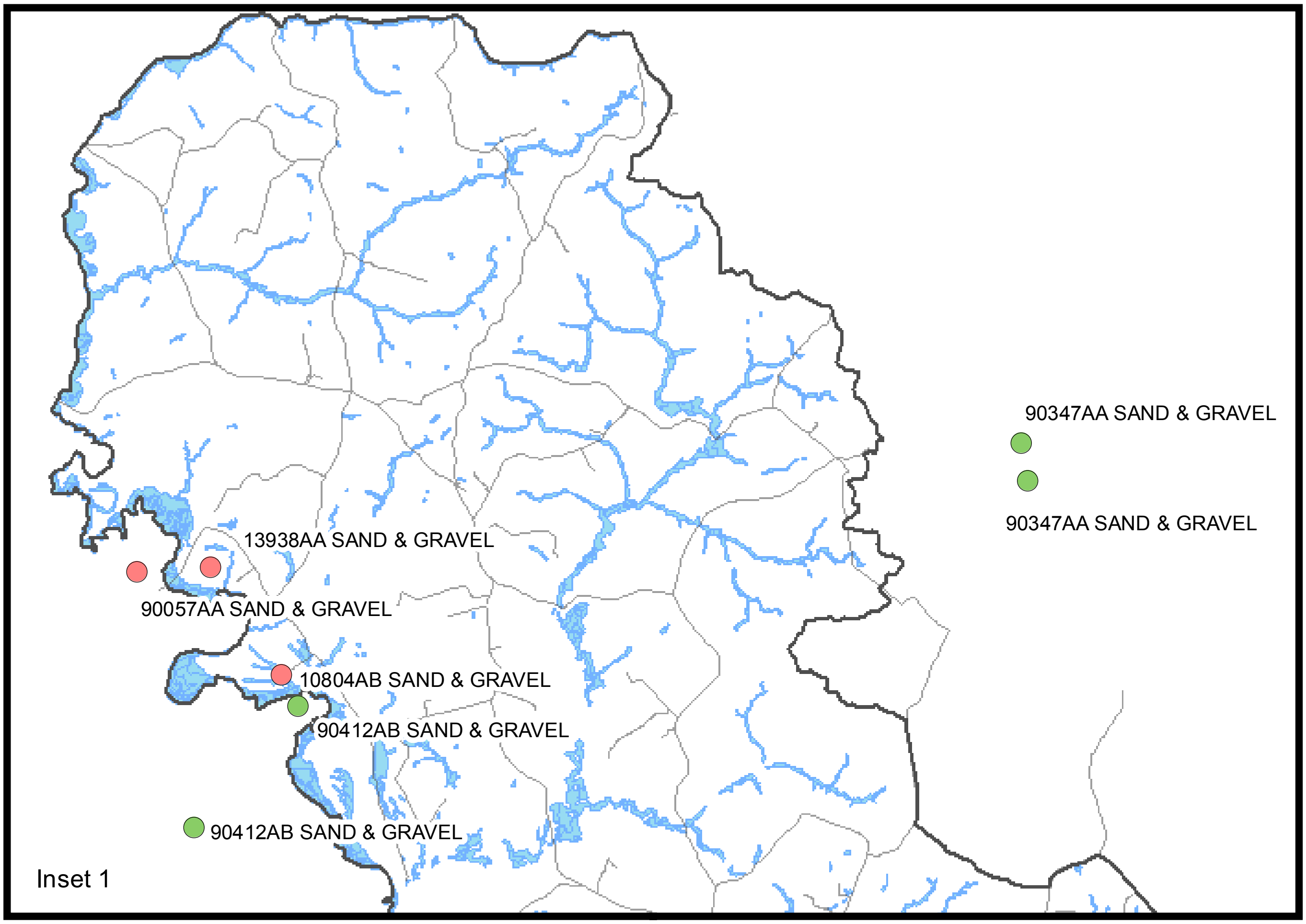
King & Queen County, Virginia

DMME Permitted Mineral Mines (Active & Abandoned) | Map 9



King & Queen County, Virginia

DMME Permitted Mineral Mines (Active & Abandoned) | **Map 9a**



Permitted Mineral Mines

Abandoned

Active

*Data source: 2016 Department of Mines, Minerals and Energy

0 0.475 0.95 1.9 2.85 3.8 Miles

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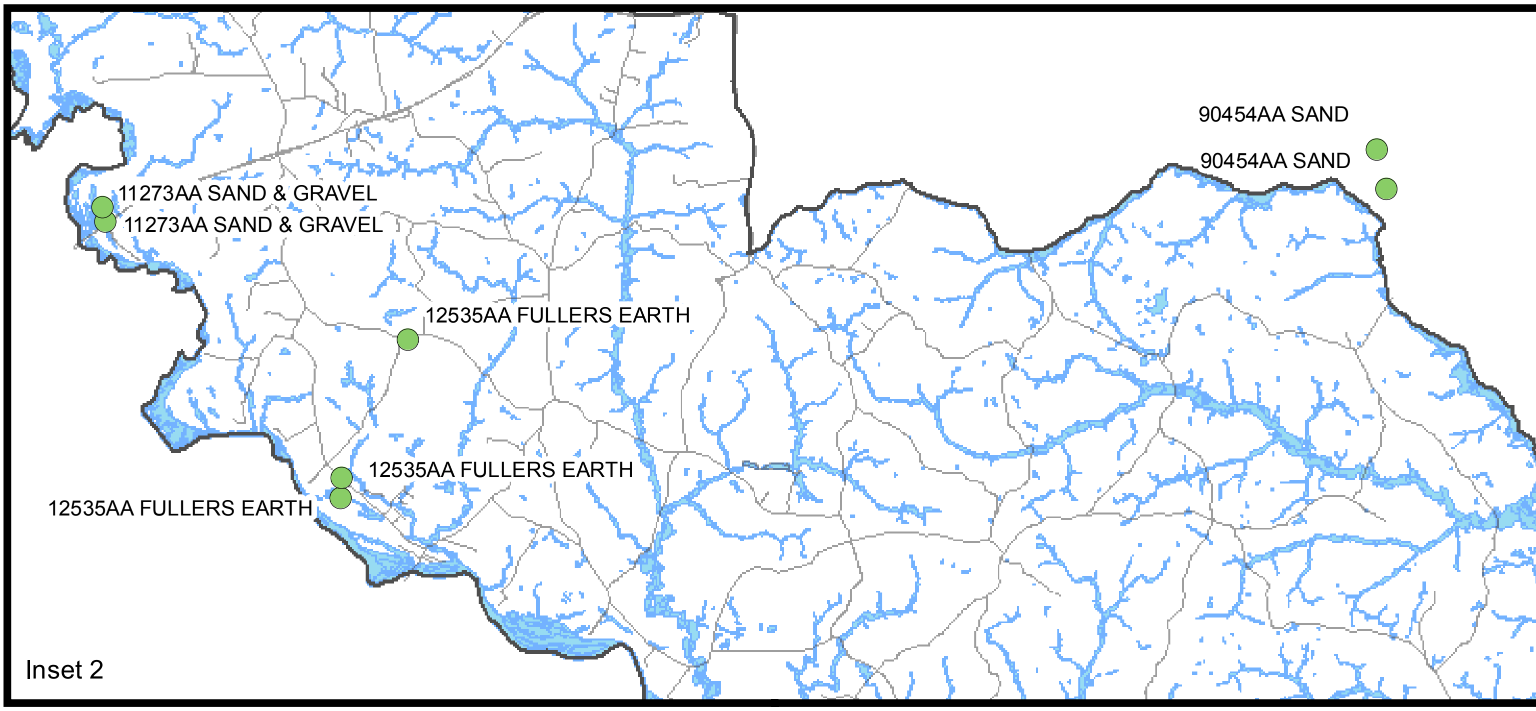
DMME Permitted Mineral Mines (Active & Abandoned) | **Map 9b**



Permitted Mineral Mines

Abandoned

Active

*Data source: 2016 Department of Mines, Minerals and Energy

0 0.5 1 2 3 4 Miles

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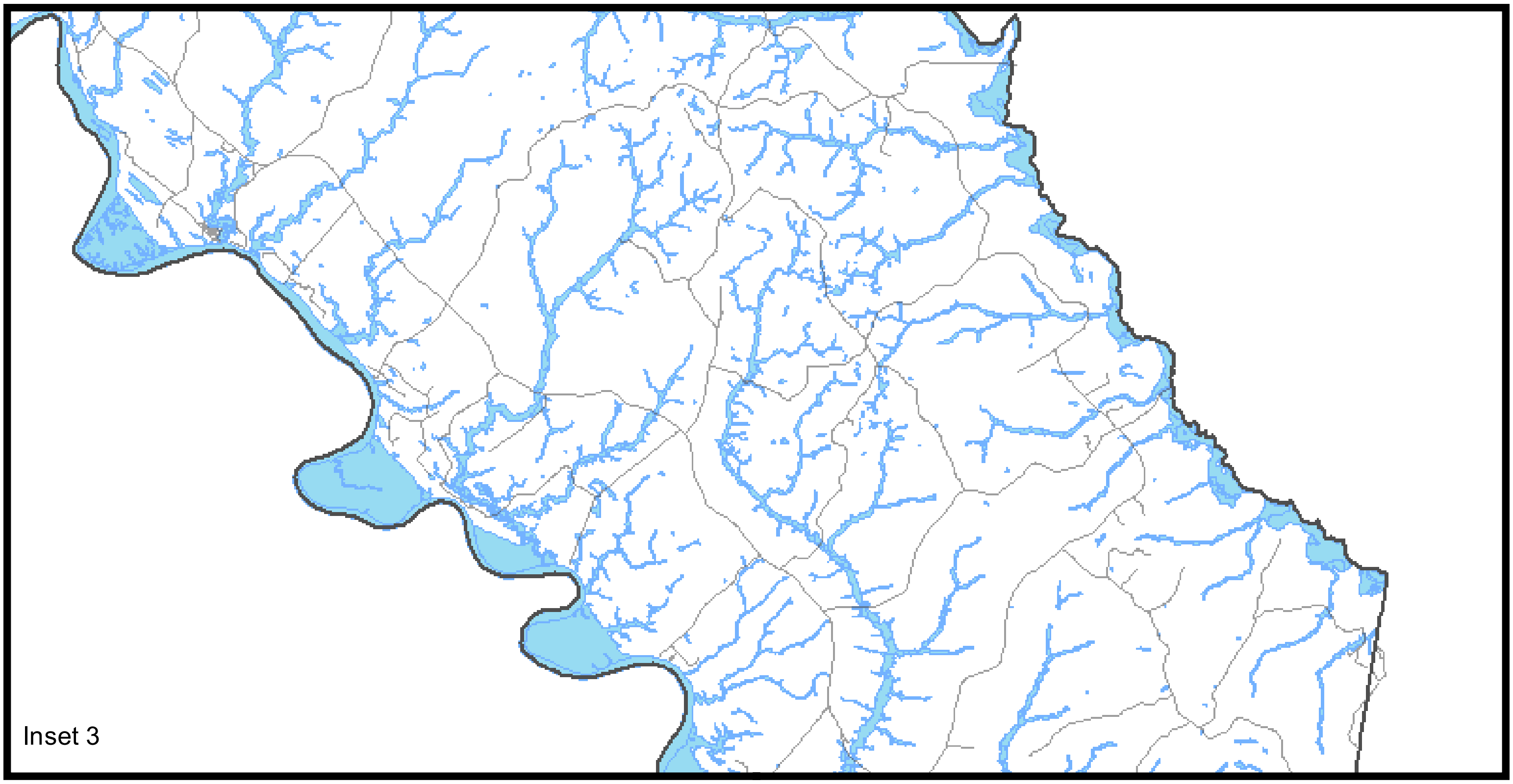
DMME Permitted Mineral Mines (Active & Abandoned) | **Map 9c**



Permitted Mineral Mines

Abandoned

Active

*Data source: 2016 Department of Mines, Minerals and Energy

0 0.5 1 2 3 4 Miles

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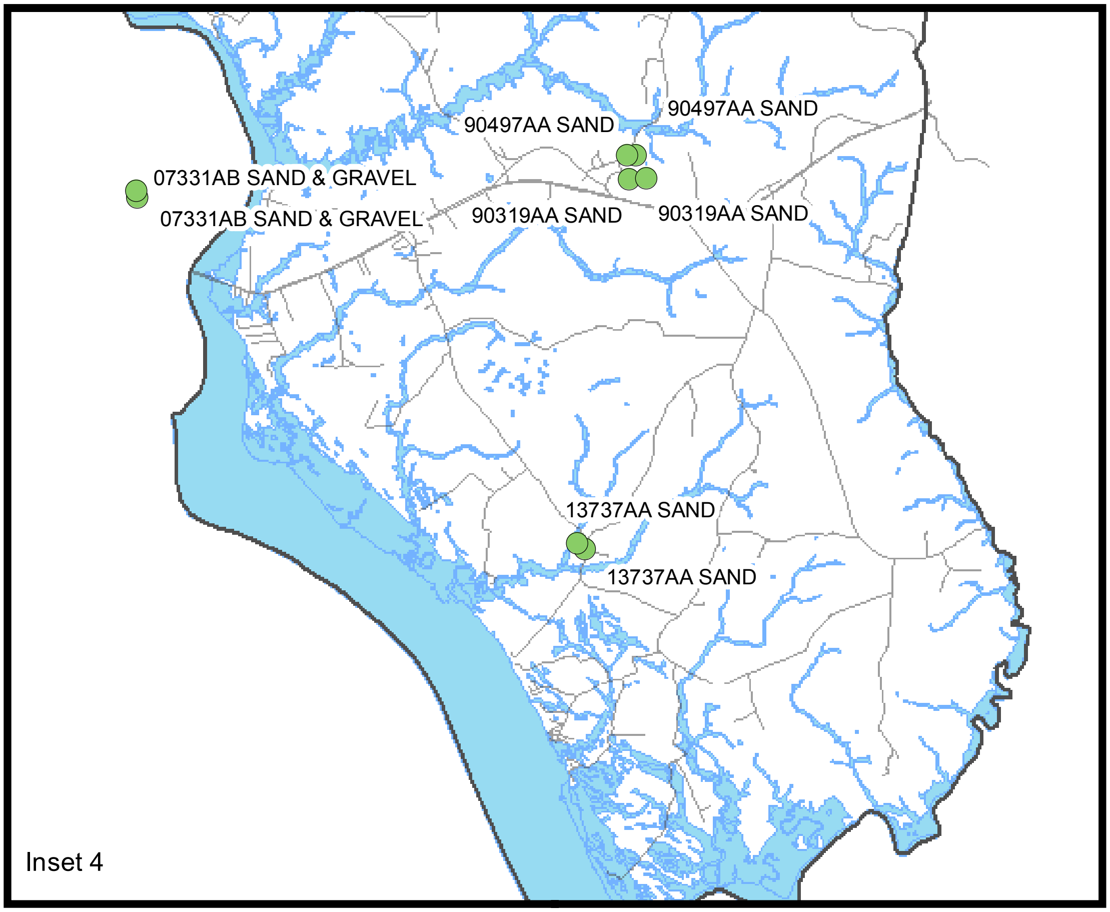
DMME Permitted Mineral Mines (Active & Abandoned) | **Map 9d**



Permitted Mineral Mines

- Abandoned
- Active

*Data source: 2016 Department of Mines, Minerals and Energy

0 0.45 0.9 1.8 2.7 3.6 Miles

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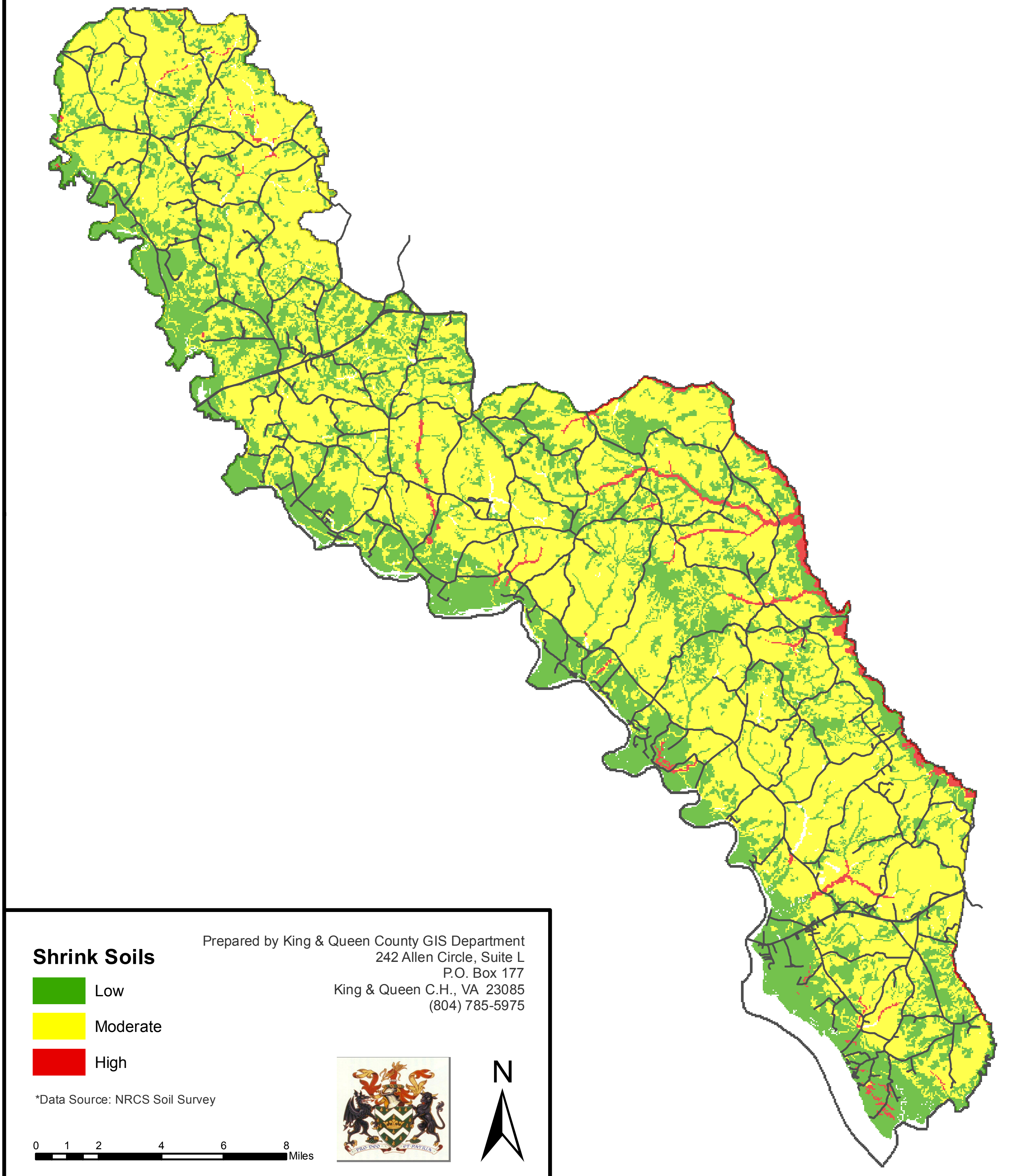
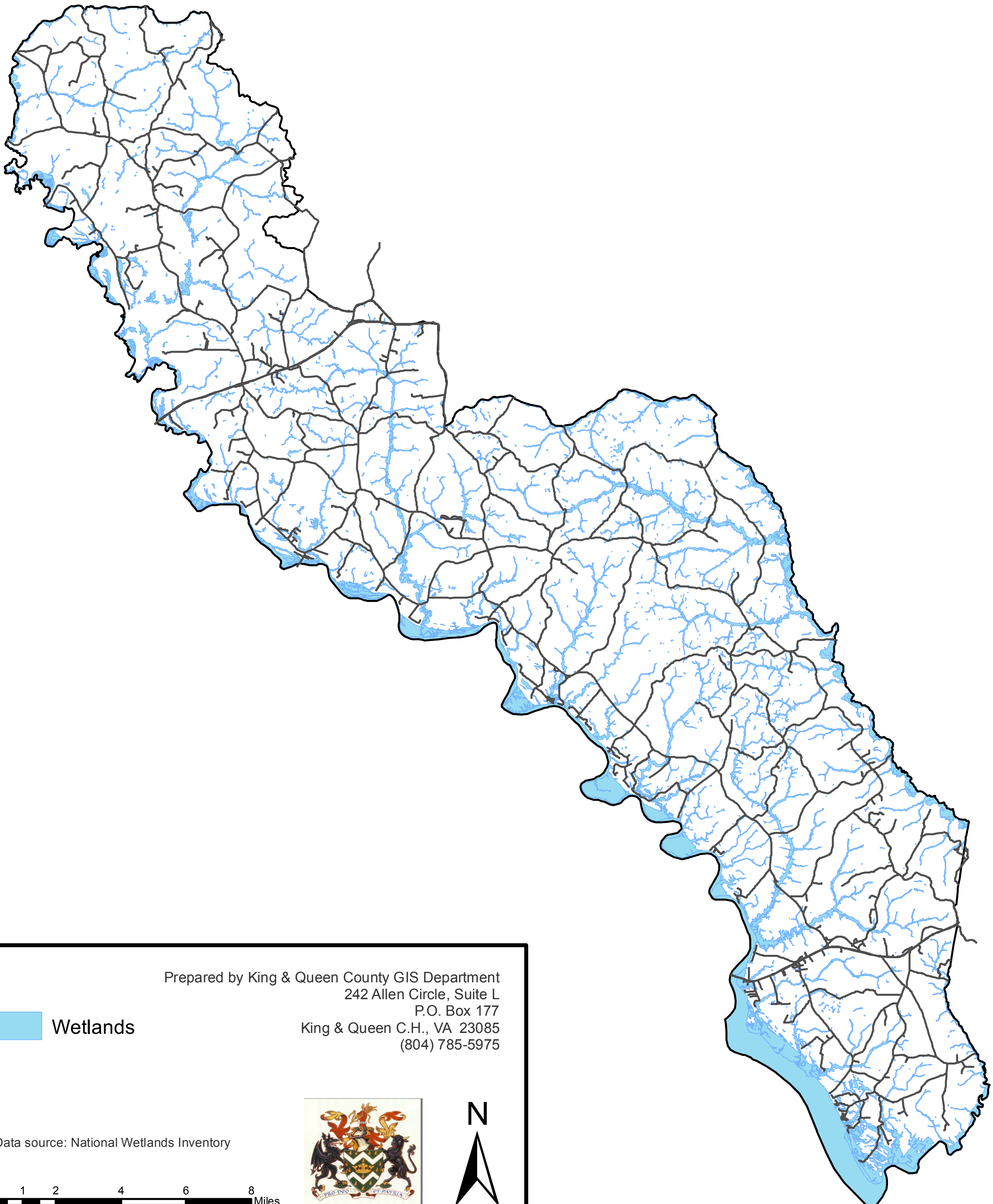
Shrink Soils | **Map 10**



King & Queen County, Virginia

Wetlands Inventory Areas | **Map 11**



Wetlands

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*Data source: National Wetlands Inventory

0 1 2 4 6 8 Miles

N

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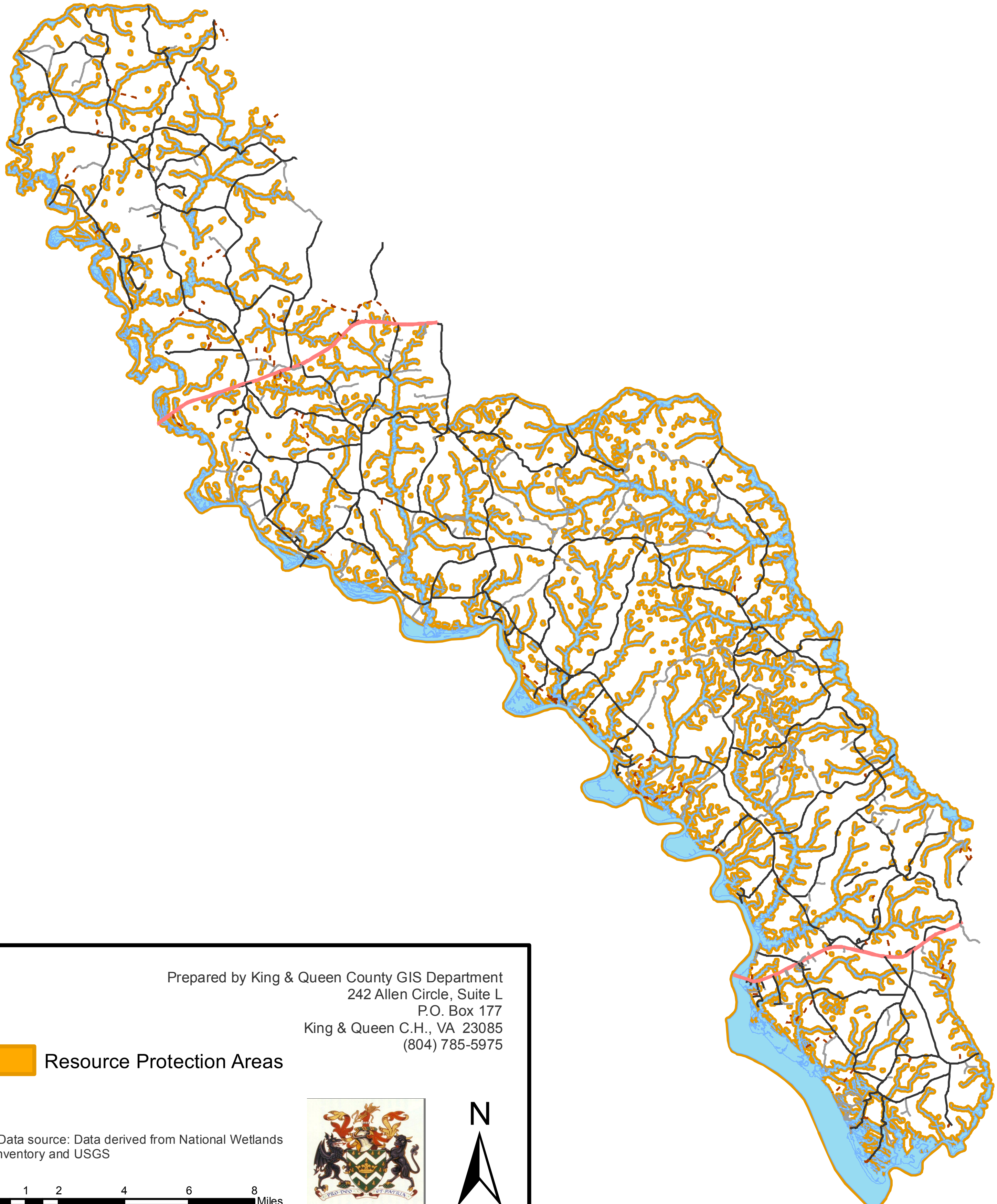
Resource Protection Areas | **Map 12**



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Resource Protection Areas

*Data source: Data derived from National Wetlands Inventory and USGS

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Resource Management Area | **Map 13**

Wetlands

Resource Management Area

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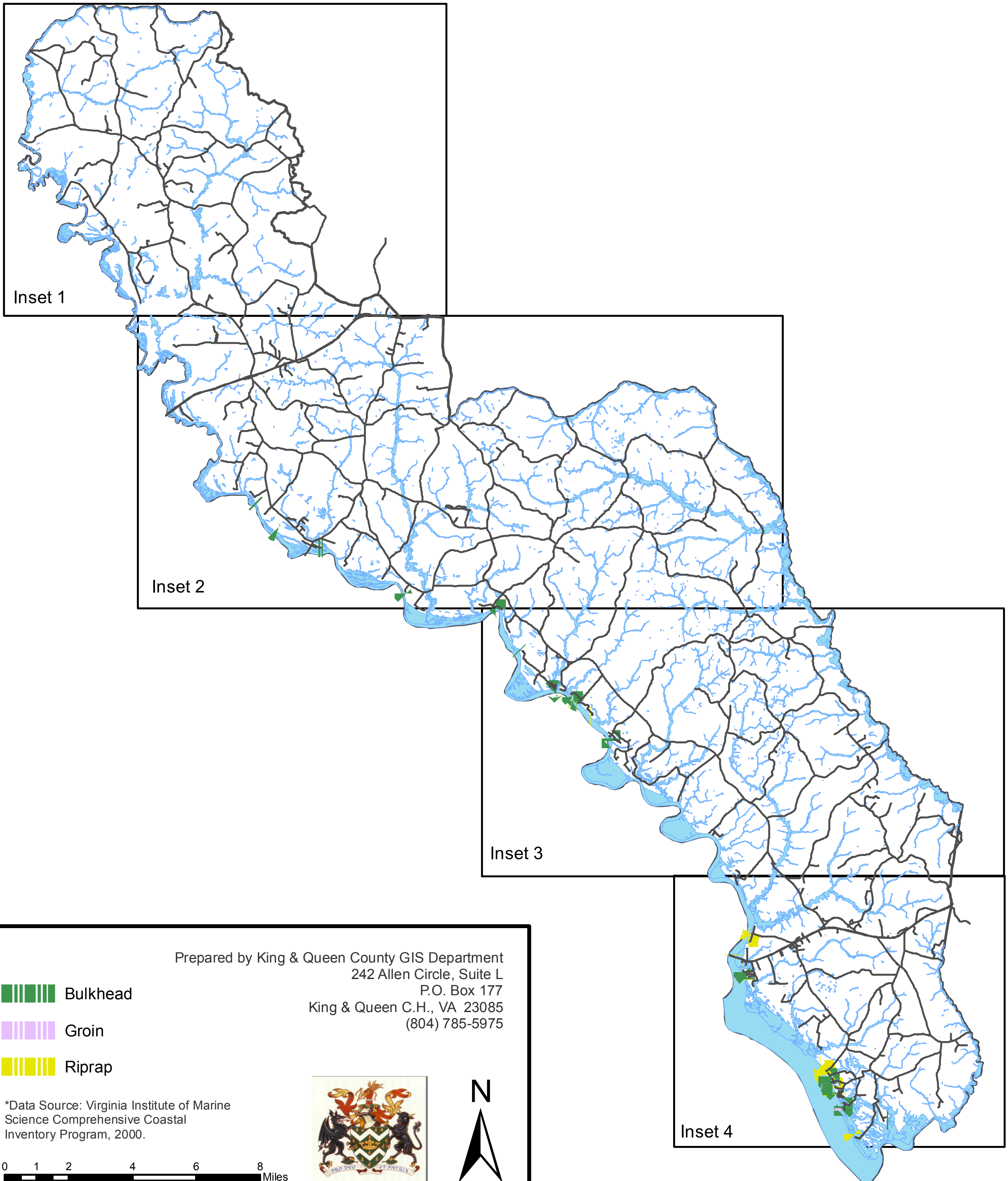
*Data source: Flood Zones from FEMA, Highly Erodible Soils from Highly Erodible Land Report NRCS eFOTG Section II, Highly Permeable Soils and Hydric Soils from NRCS Soil Survey

0 1 2 4 6 8 Miles

N

King & Queen County, Virginia

Shoreline Erosion Defense Structures | **Map 14**



Bulkhead

Groin

Riprap

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

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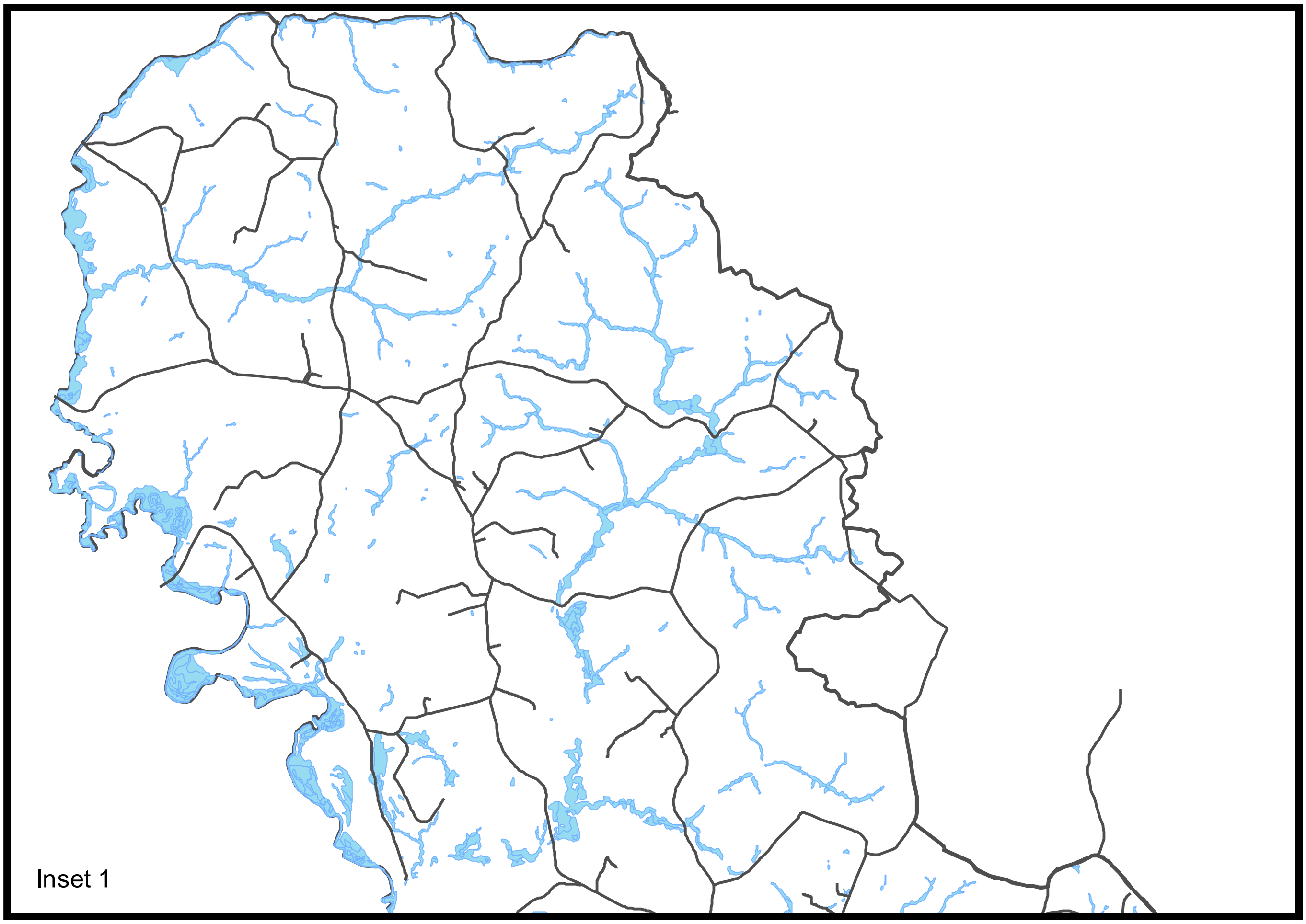
Shoreline Erosion Defense Structures | **Map 14a**



Bulkhead

Groin

Riprap

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.475 0.95 1.9 2.85 3.8
Miles

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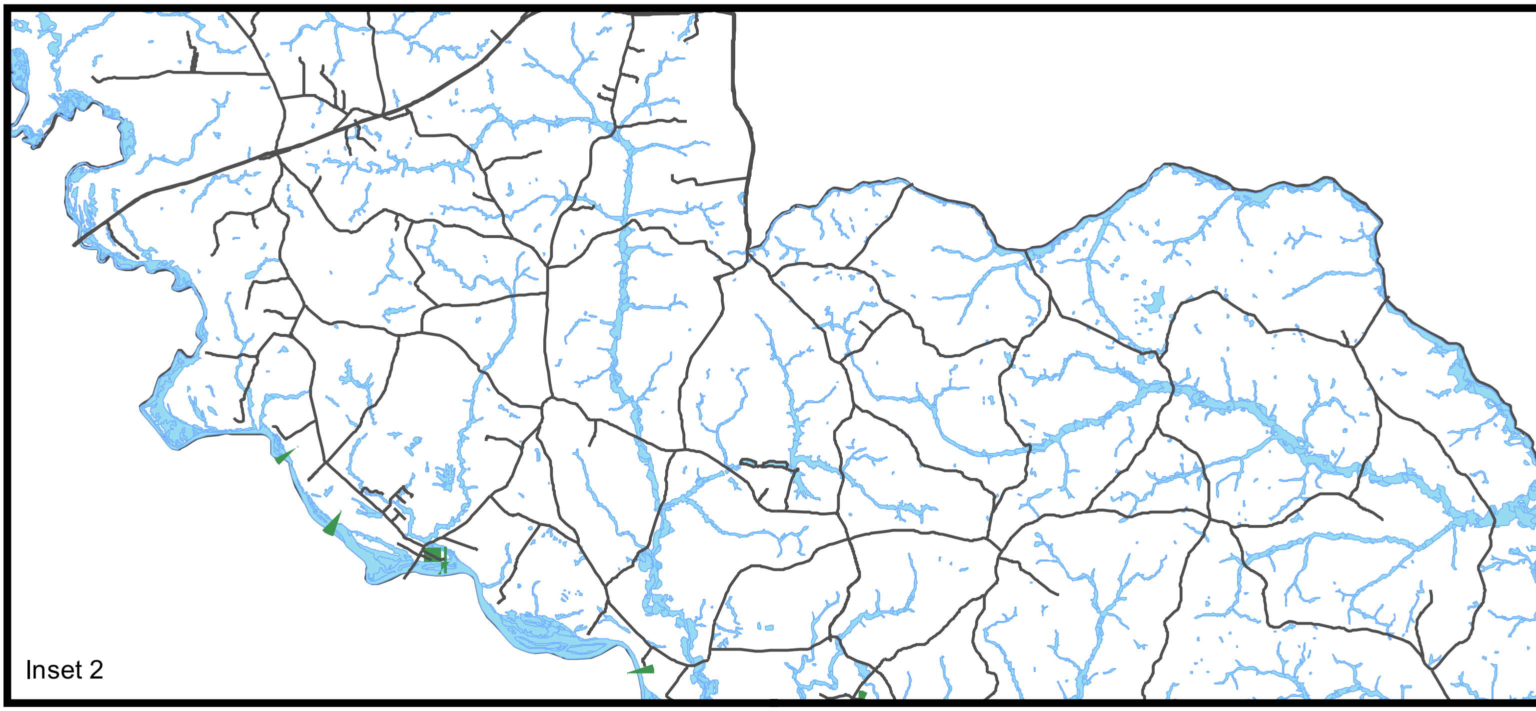
Shoreline Erosion Defense Structures | **Map 14b**



Bulkhead

Groin

Riprap

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.5 1 2 3 4 Miles

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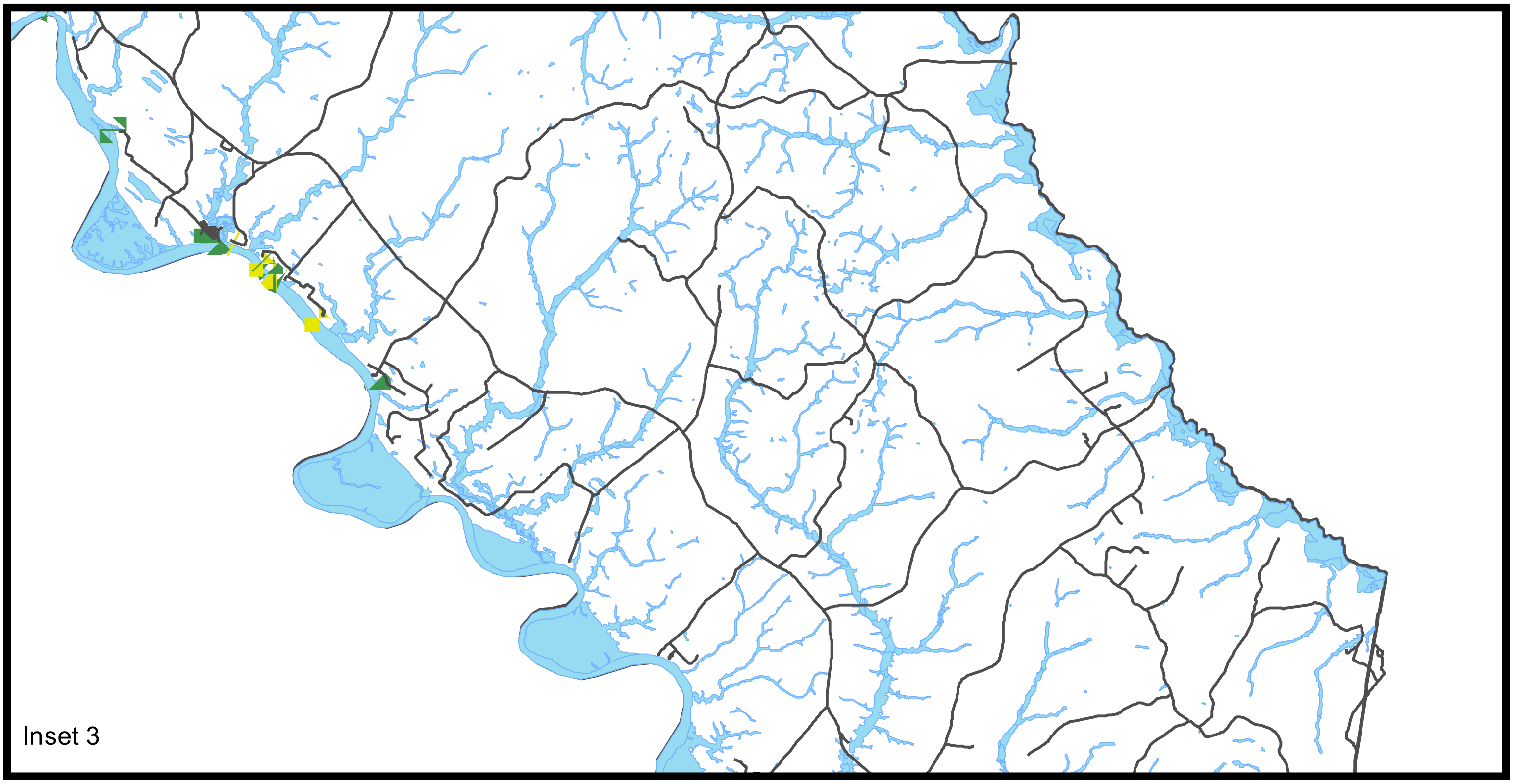
Shoreline Erosion Defense Structures | **Map 14c**



Bulkhead

Groin

Riprap

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.5 1 2 3 4 Miles

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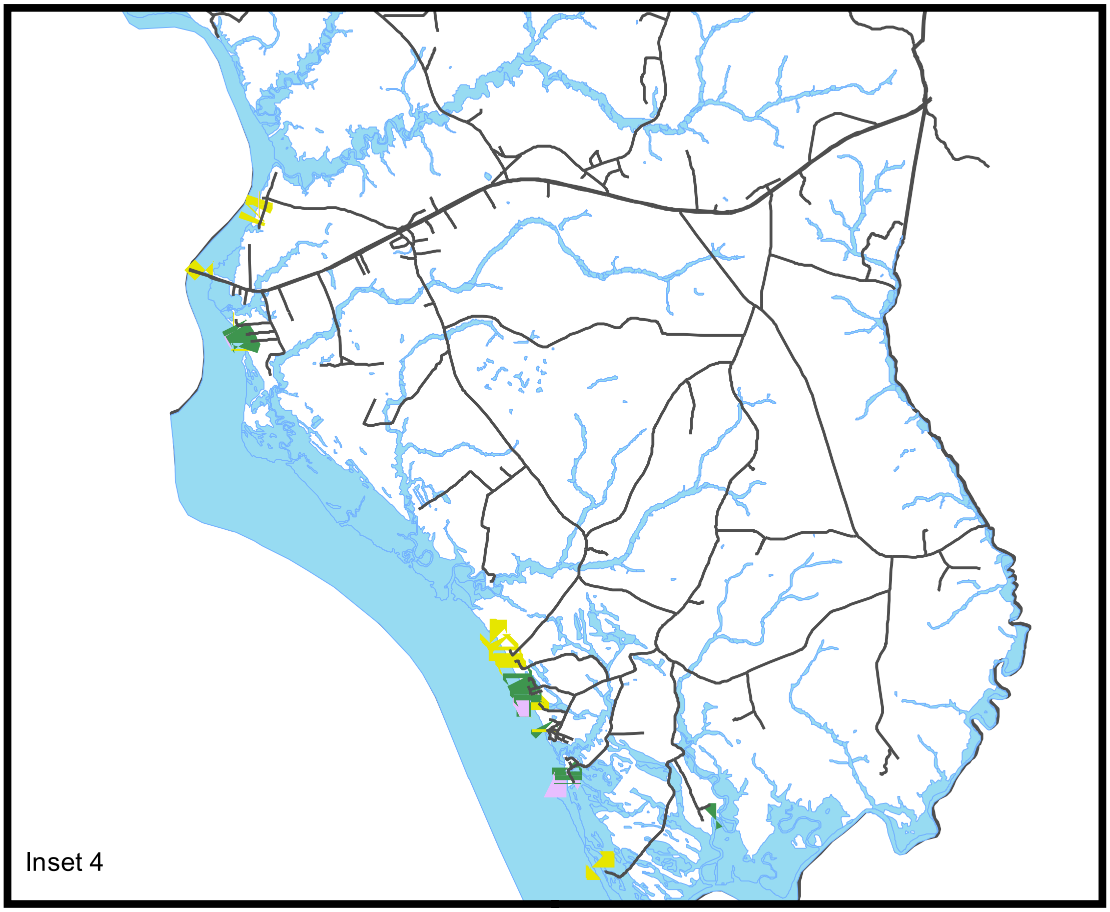
Shoreline Erosion Defense Structures | **Map 14d**



Bulkhead

Groin

Riprap

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.45 0.9 1.8 2.7 3.6 Miles

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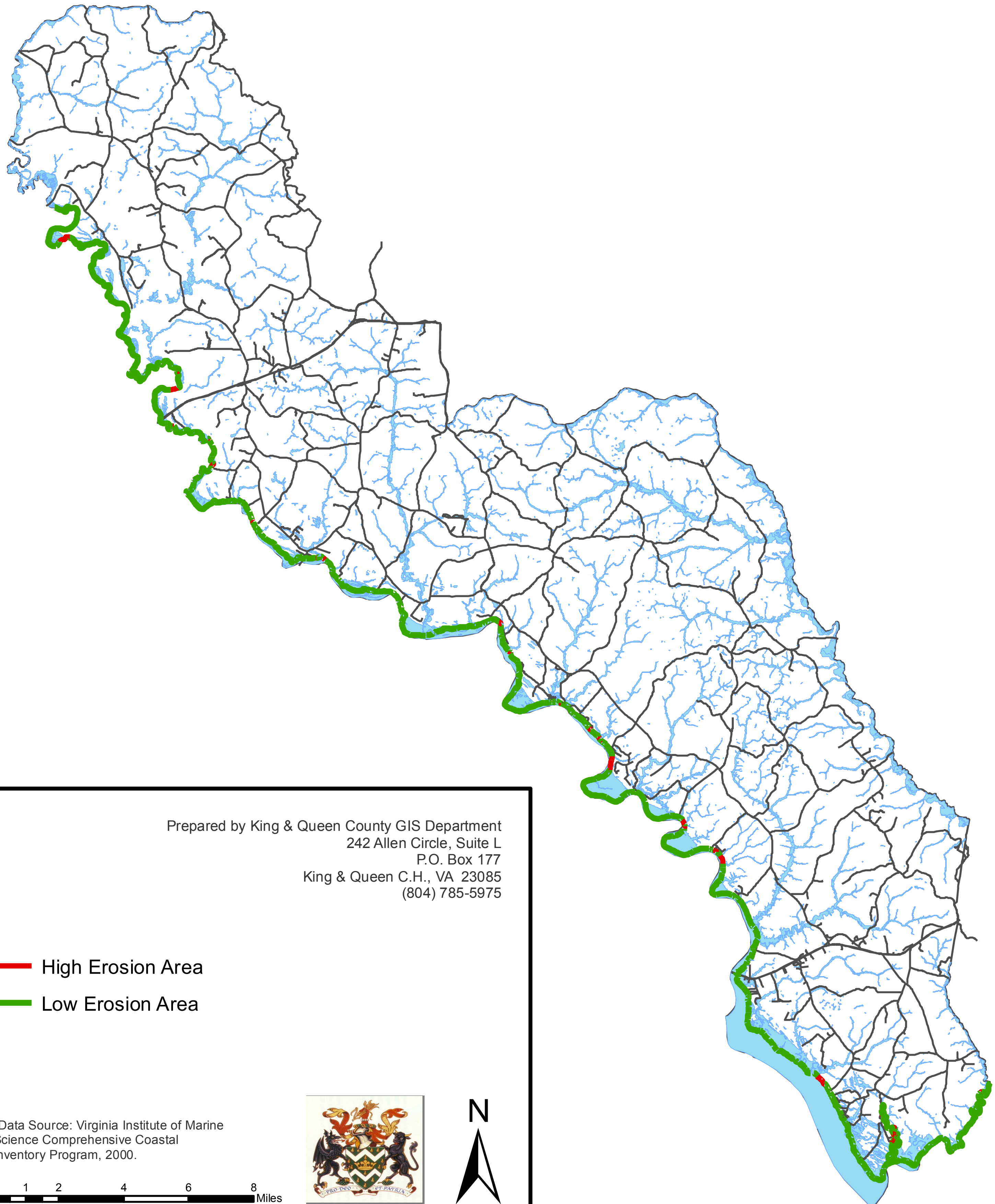
Shoreline Erosion Impact Areas | **Map 15**



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High Erosion Area

Low Erosion Area

*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 1 2 4 6 8 Miles

N

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Fisheries Map | **Map 16**

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Public Water Access Sites | **Map 17**

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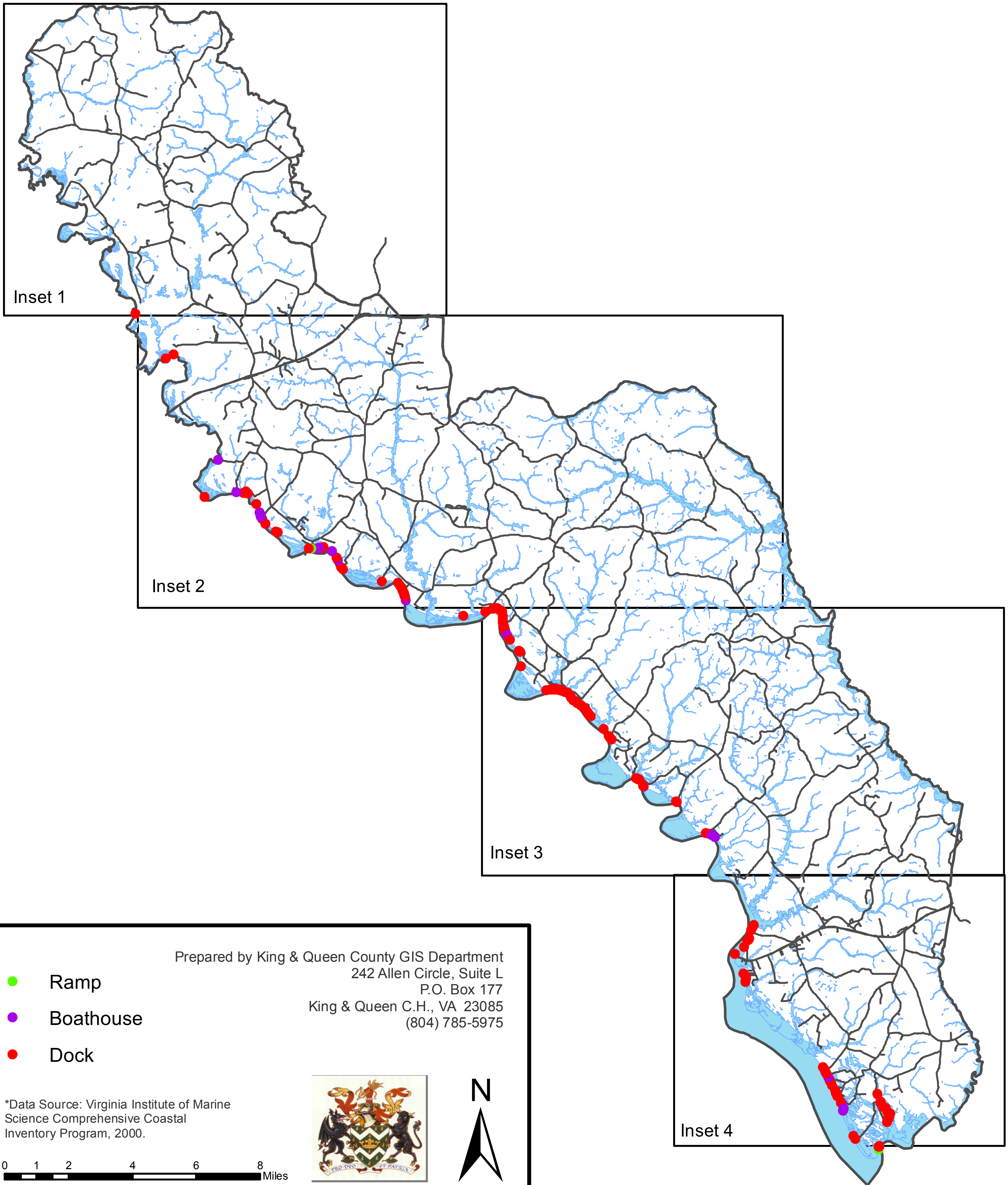
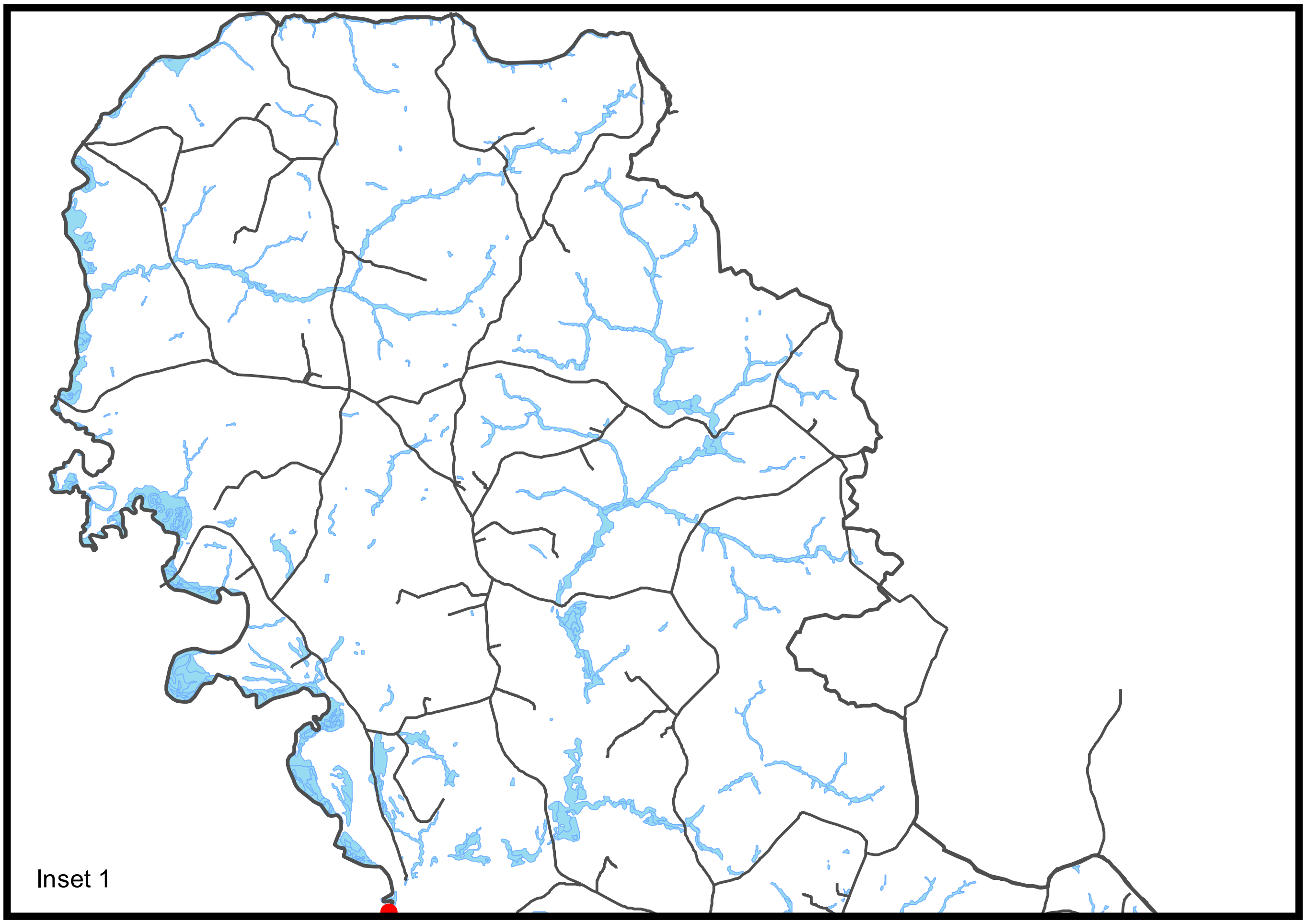
Water Dependent Facilities | **Map 18**



King & Queen County, Virginia

Water Dependent Facilities | **Map 18a**



- Ramp
- Boathouse
- Dock

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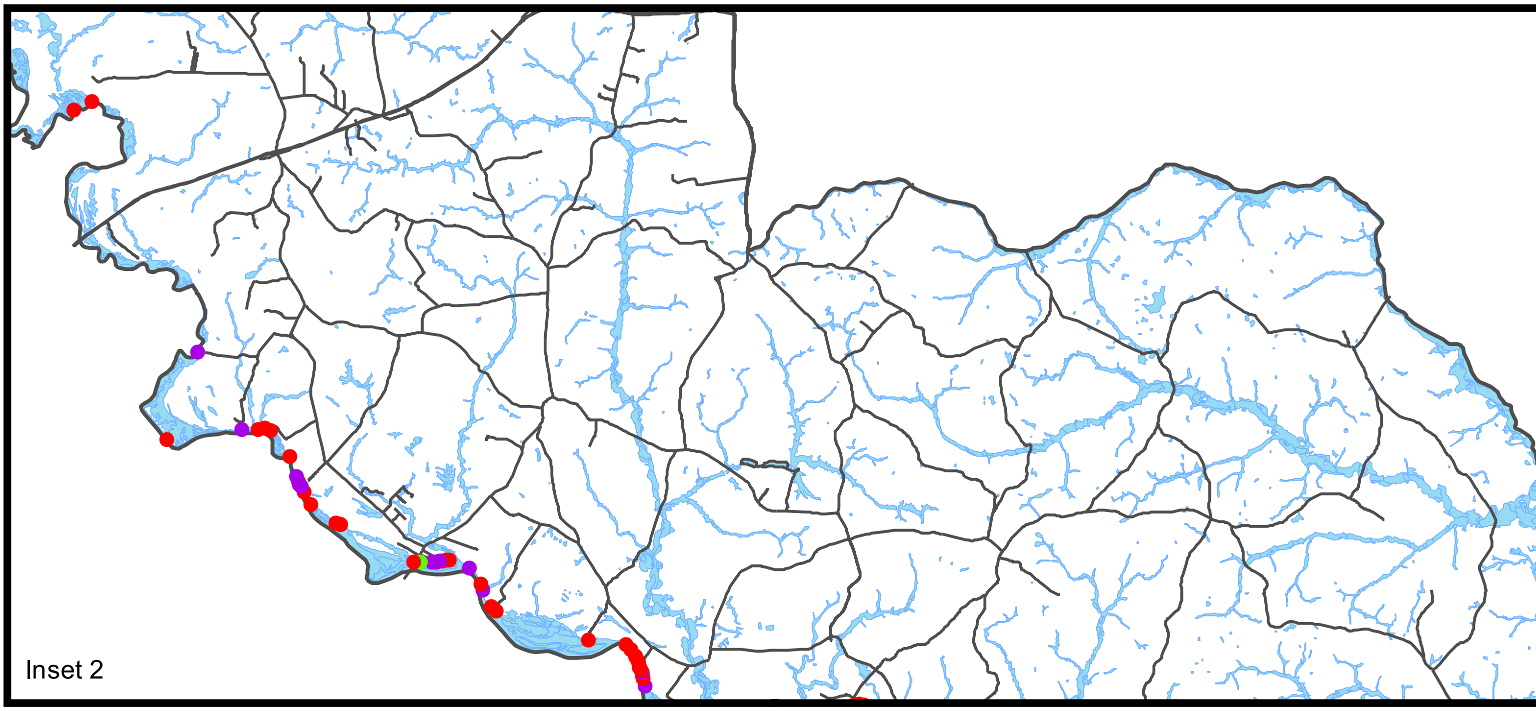
*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.475 0.95 1.9 2.85 3.8 Miles

N

King & Queen County, Virginia

Water Dependent Facilities | **Map 18b**



Ramp

Boathouse

Dock

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

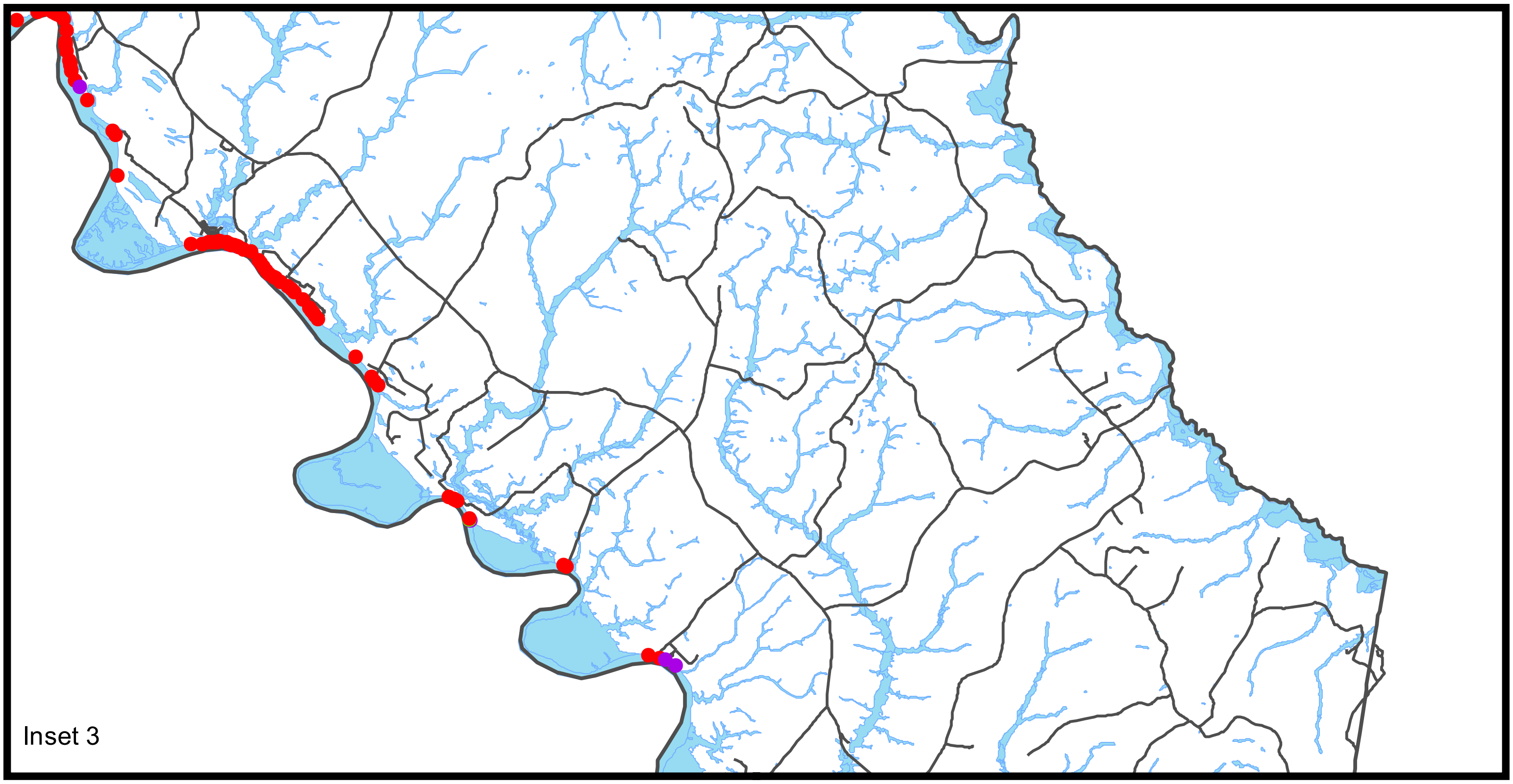
*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.5 1 2 3 4 Miles

N

King & Queen County, Virginia

Water Dependent Facilities | **Map 18c**



Ramp

Boathouse

Dock

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

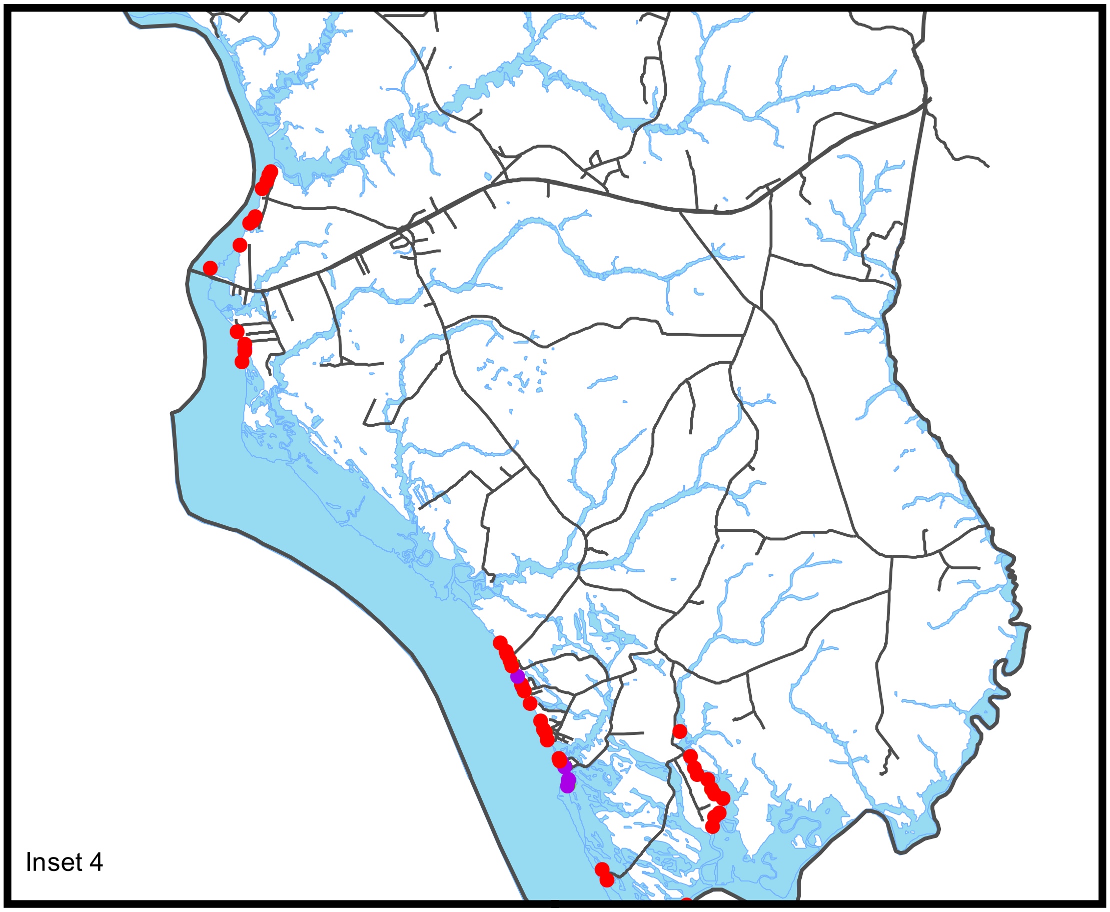
*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.5 1 2 3 4 Miles

N

King & Queen County, Virginia

Water Dependent Facilities | **Map 18d**



Ramp

Boathouse

Dock

Prepared by King & Queen County GIS Department
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P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

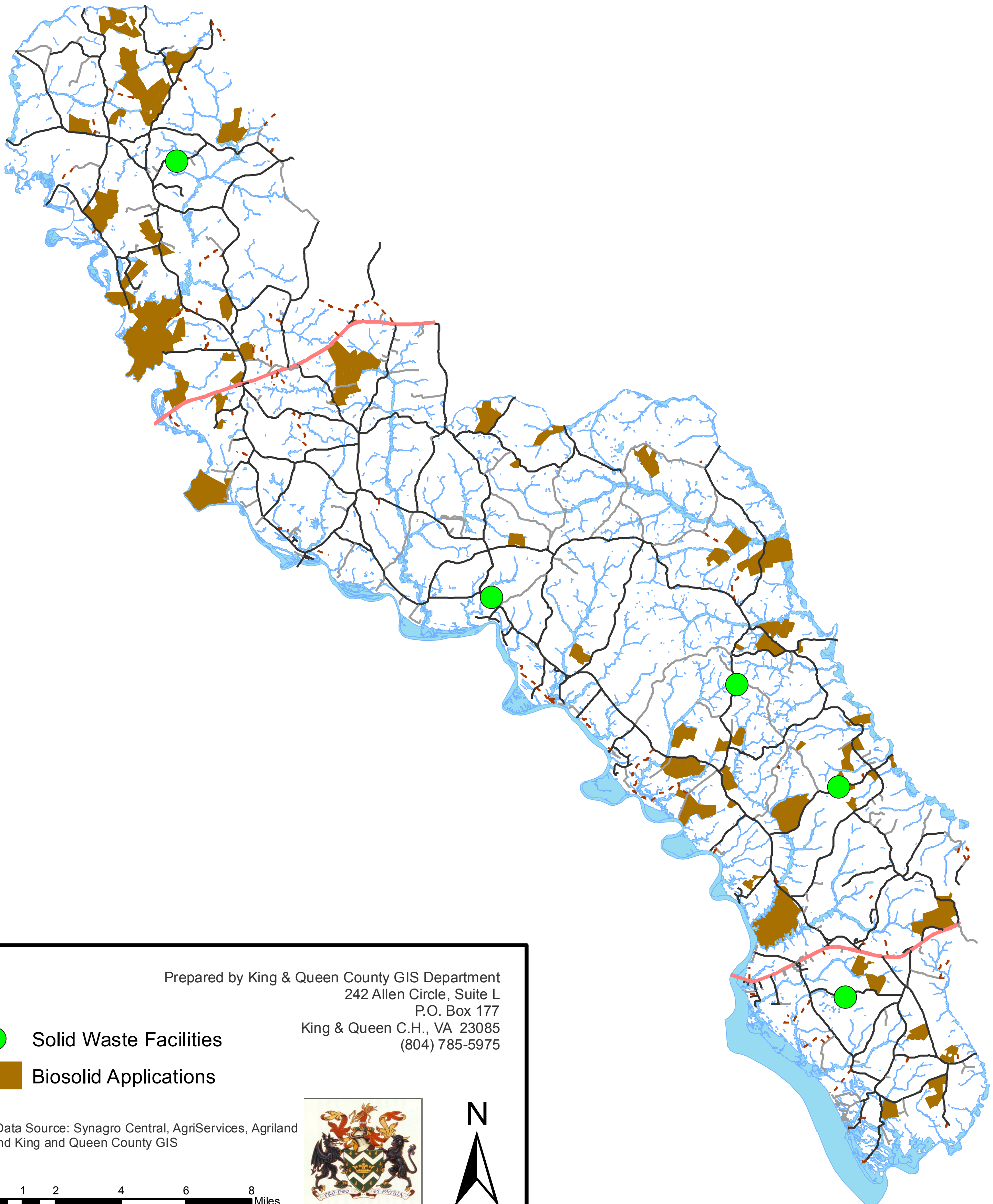
*Data Source: Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, 2000.

0 0.45 0.9 1.8 2.7 3.6 Miles

N

King & Queen County, Virginia

Potential Groundwater Contamination Sources | Map 19



Prepared by King & Queen County GIS Department
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Solid Waste Facilities
Biosolid Applications

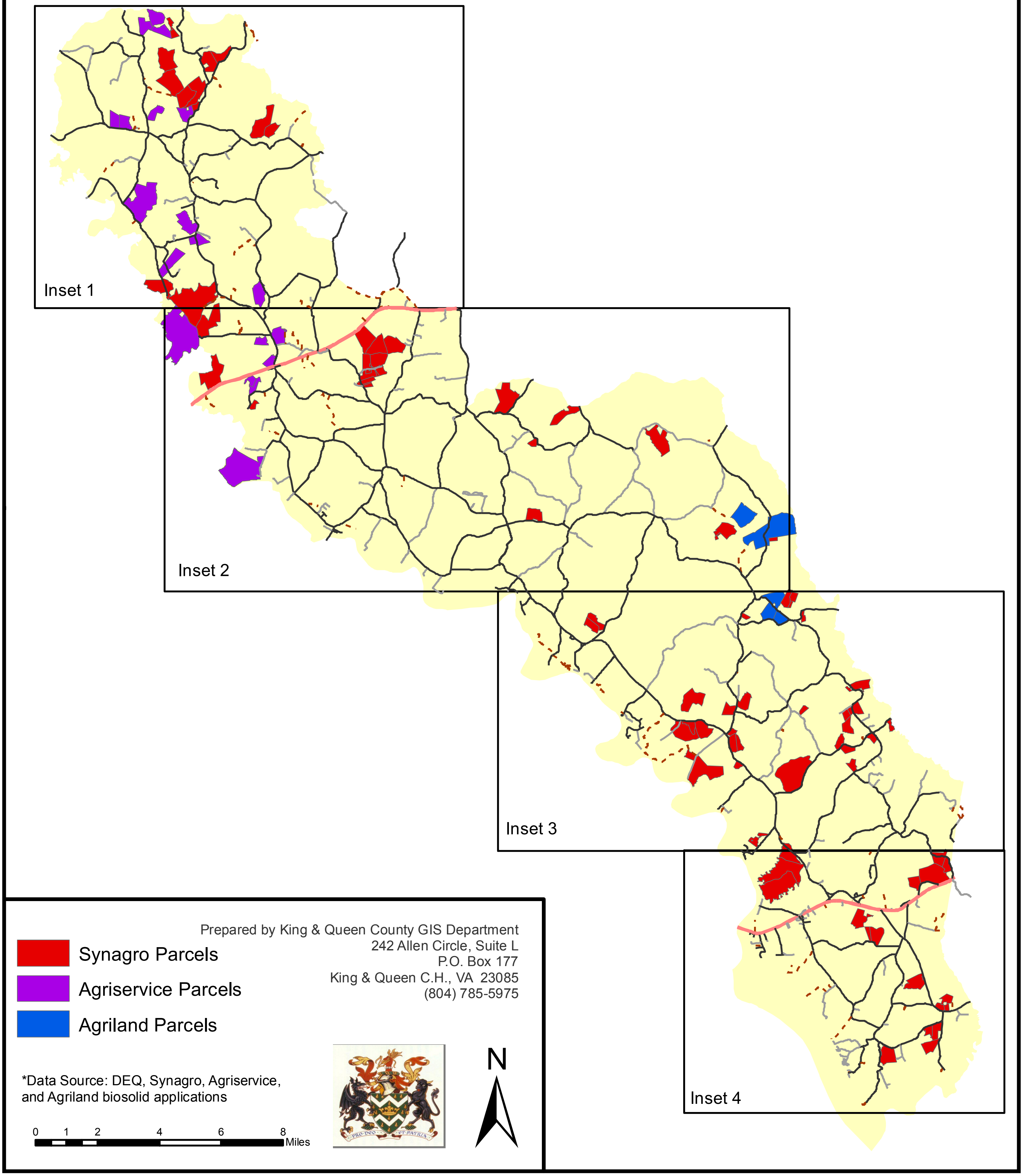
*Data Source: Synagro Central, AgriServices, Agriland and King and Queen County GIS

0 1 2 4 6 8
Miles

N

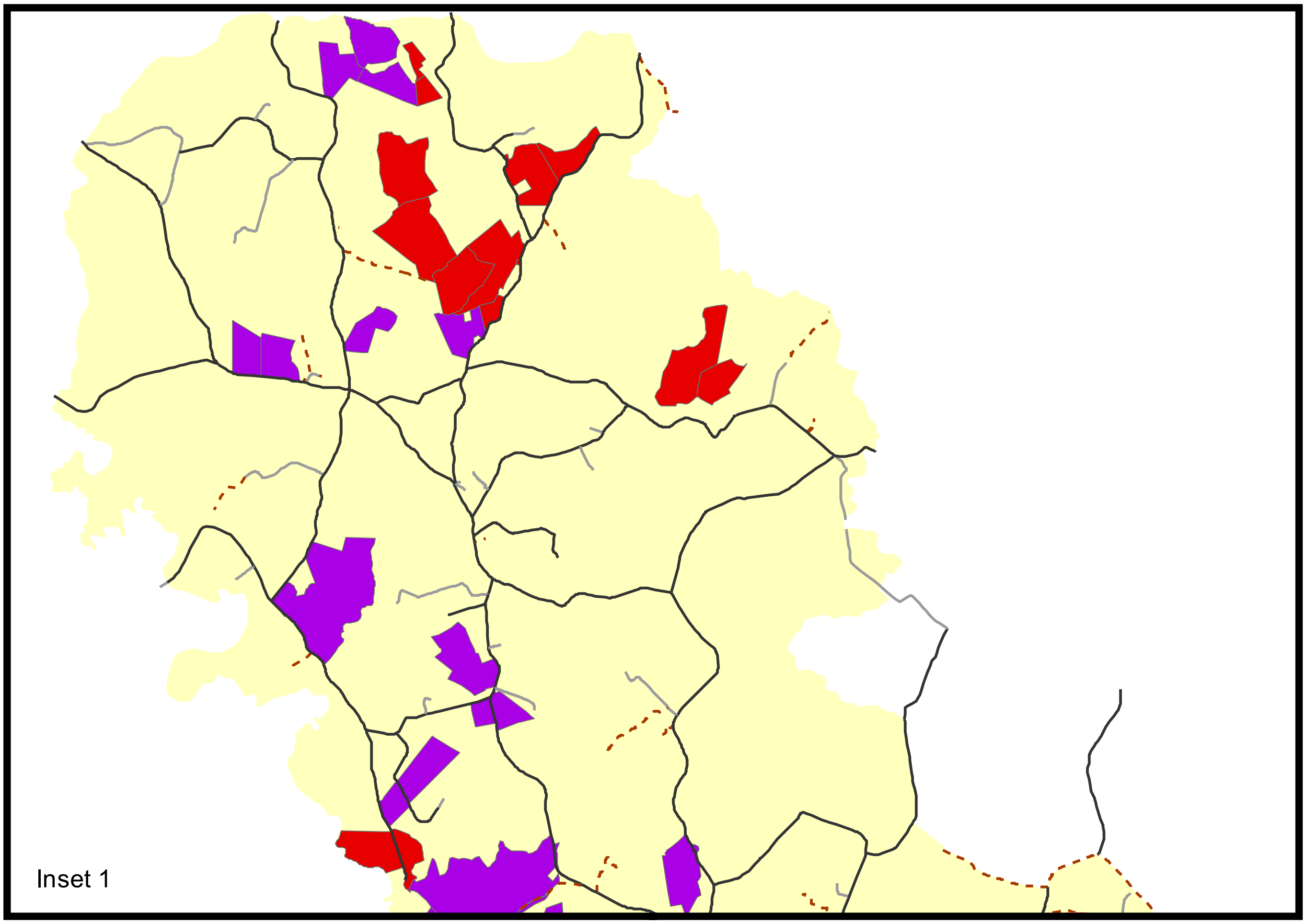
King & Queen County, Virginia

Biosolids Permit Areas | **Map 20**



King & Queen County, Virginia

Biosolids Permit Areas | **Map 20a**



Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
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(804) 785-5975

Agriland Parcels

Agriservice Parcels

Synagro Parcels

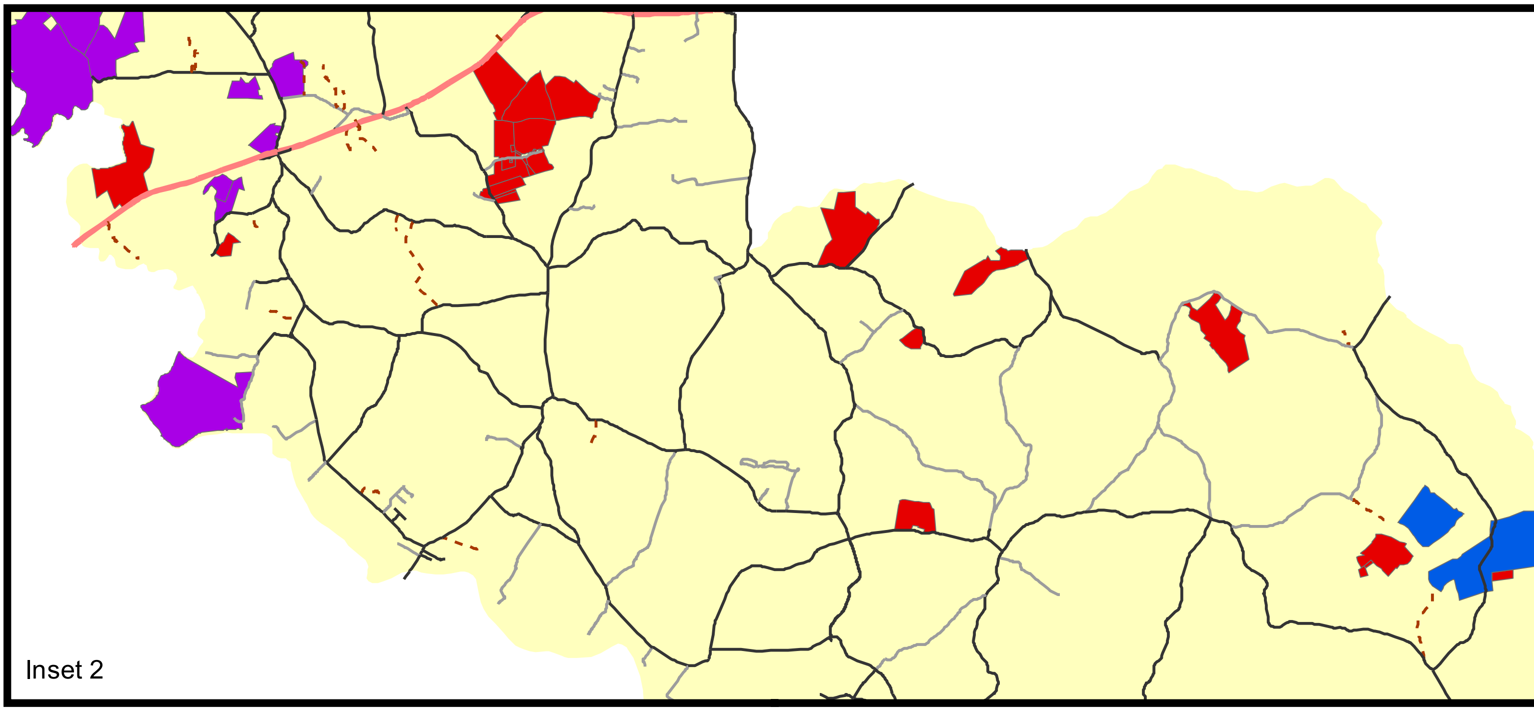
*Data Source: Synagro, Agriservice, and Agriland biosolid applications

0 0.475 0.95 1.9 2.85 3.8 Miles

N

King & Queen County, Virginia

Biosolids Permit Areas | **Map 20b**



Agriland Parcels

Agriservice Parcels

Synagro Parcels

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

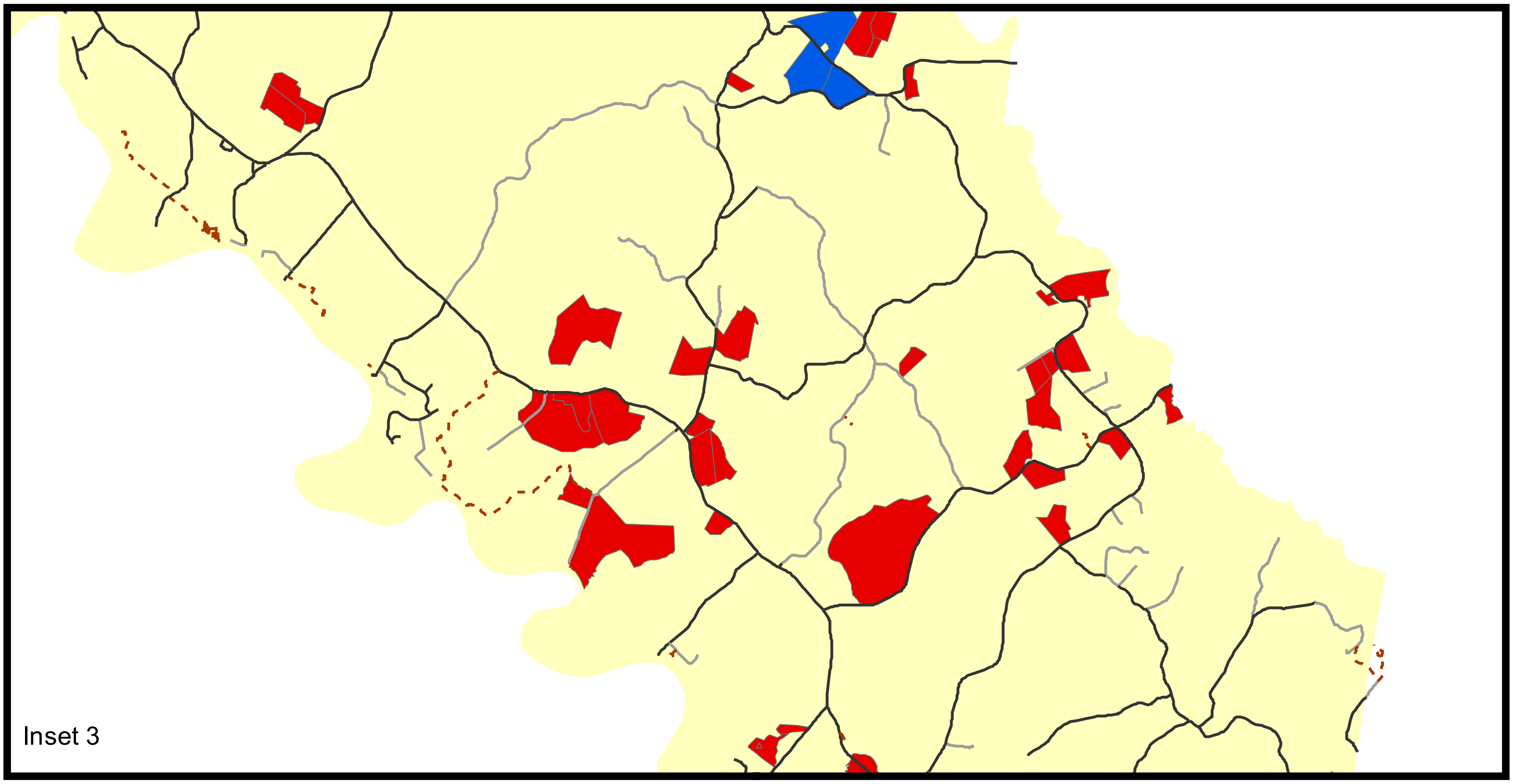
*Data Source: DEQ, Synagro, Agriservice, and Agriland biosolid applications

0 0.5 1 2 3 4 Miles

N

King & Queen County, Virginia

Biosolids Permit Areas | **Map 20c**



Agriland Parcels

Agriservice Parcels

Synagro Parcels

*Data Source: DEQ, Synagro, Agriservice, and Agriland biosolid applications

0 0.5 1 2 3 4 Miles

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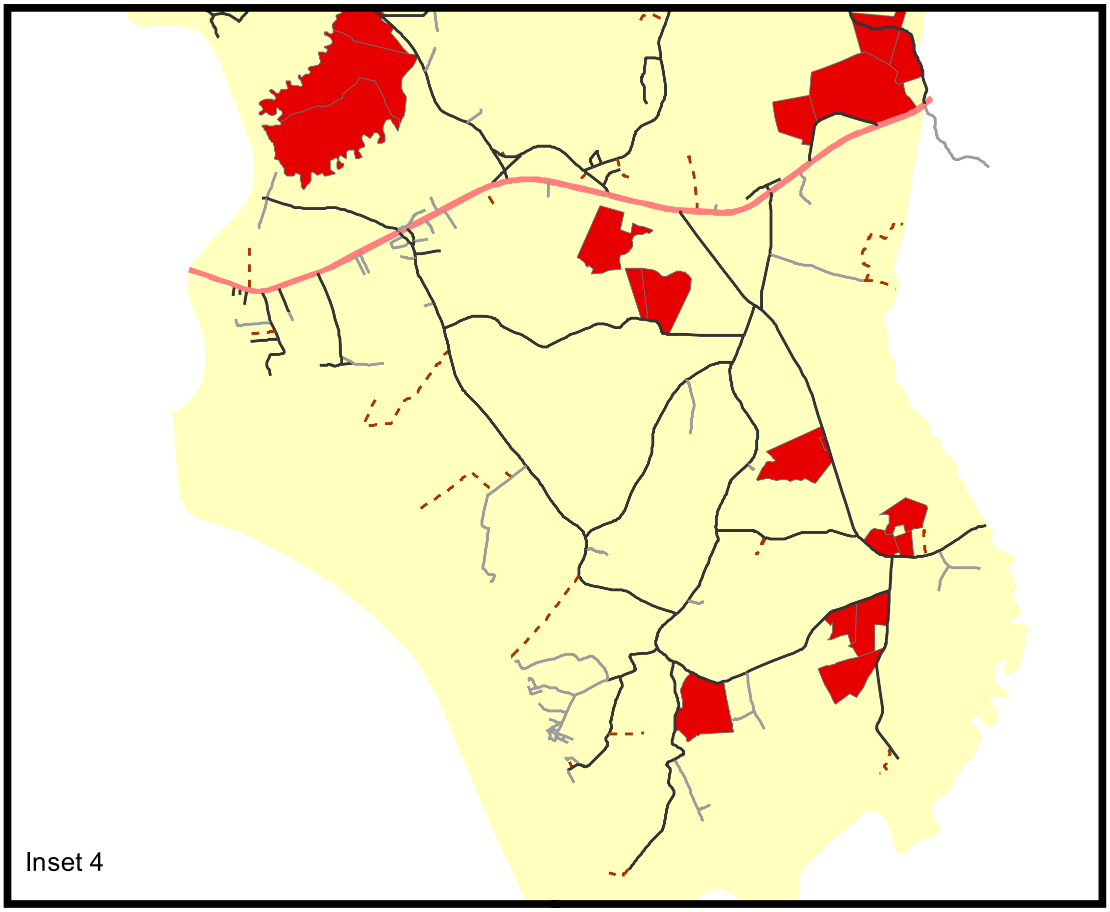
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

N

King & Queen County, Virginia

Biosolids Permit Areas | **Map 20d**



Agriland Parcels

Agriservice Parcels

Synagro Parcels

*Data Source: DEQ, Synagro, Agriservice, and Agriland biosolid applications

0 0.425 0.85 1.7 2.55 3.4 Miles

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P.O. Box 177
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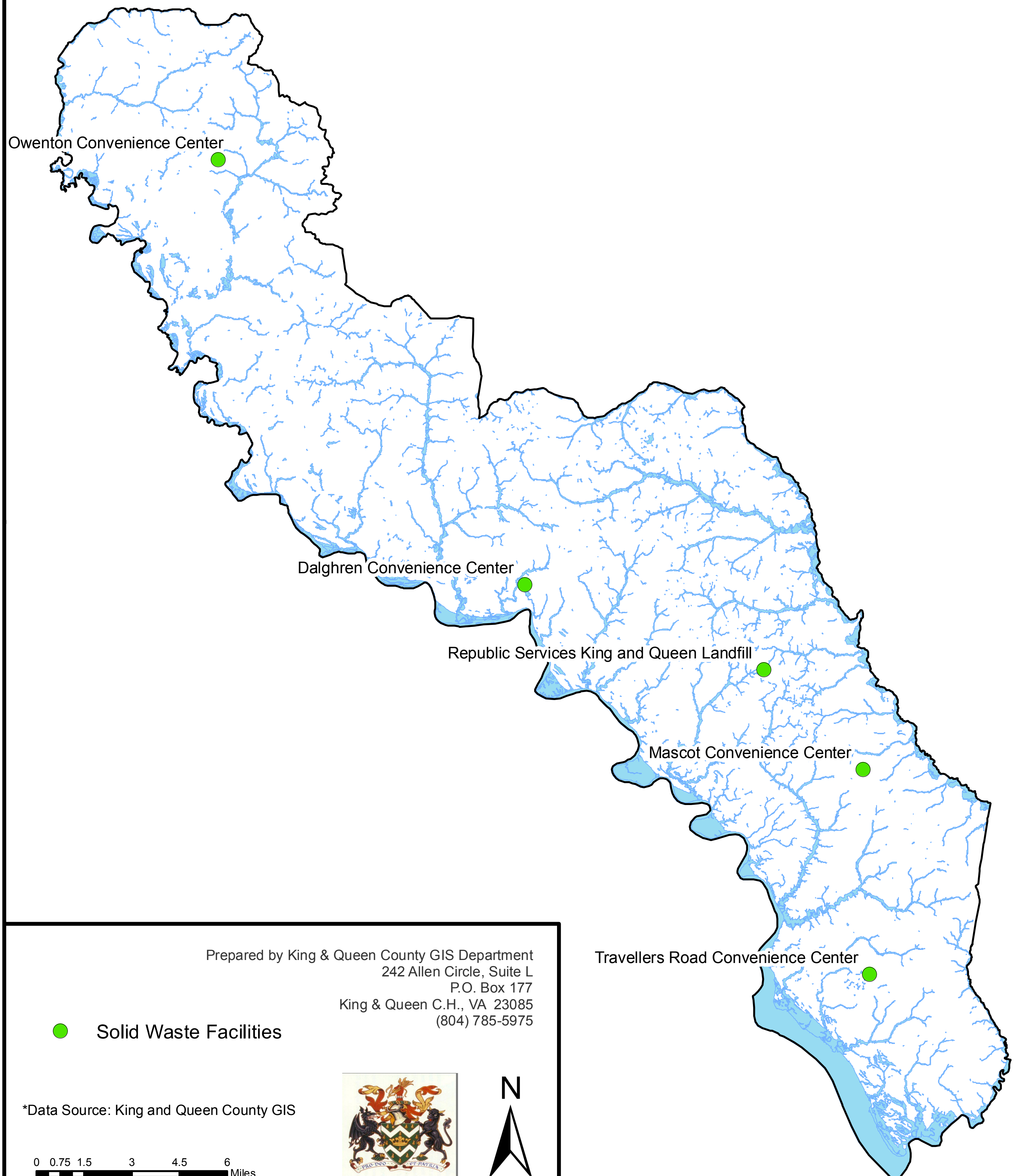
(804) 785-5975

N

King & Queen County, Virginia

Solid Waste Management Facilities | **Map 21**



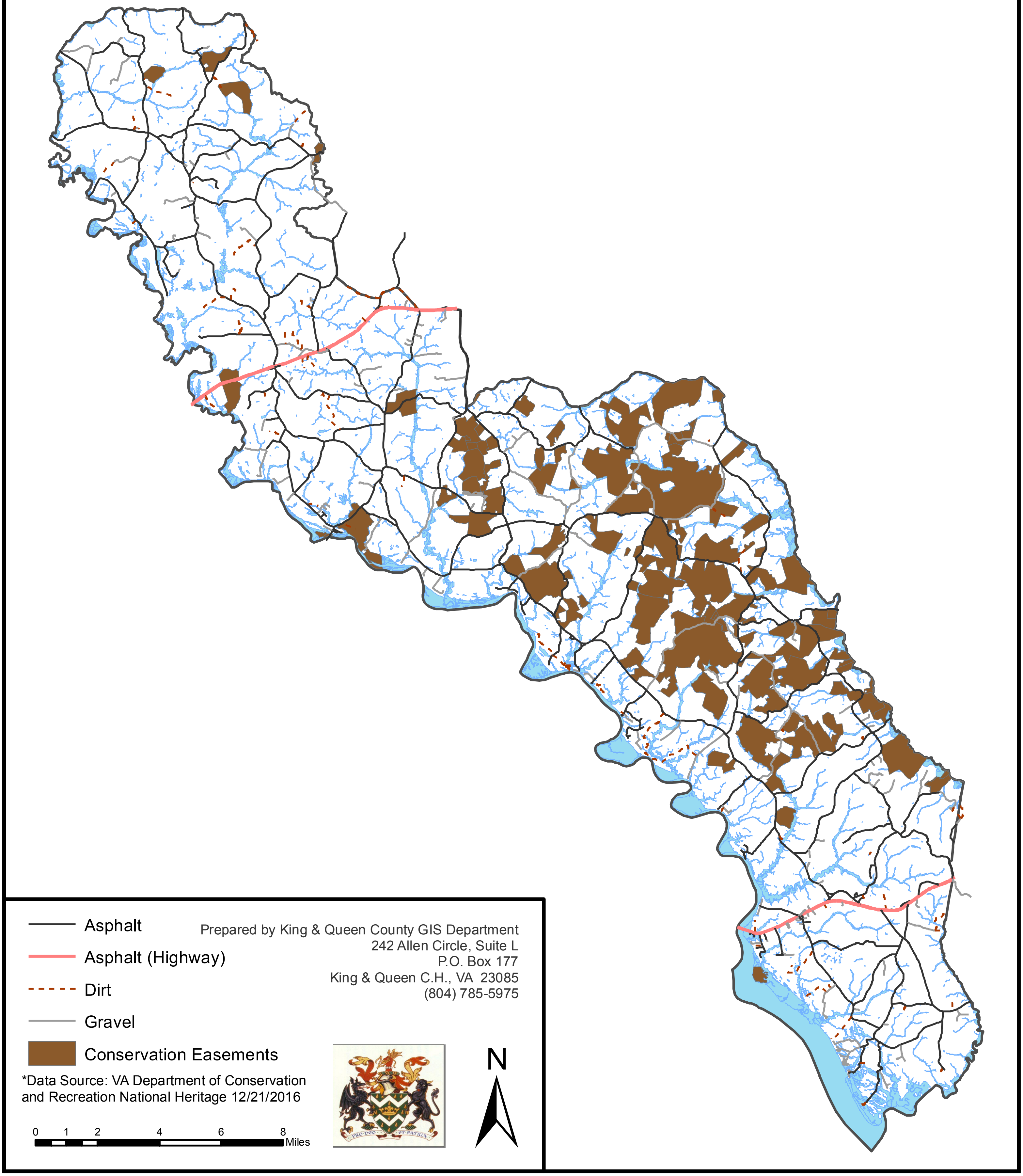
Solid Waste Facilities

*Data Source: King and Queen County GIS

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

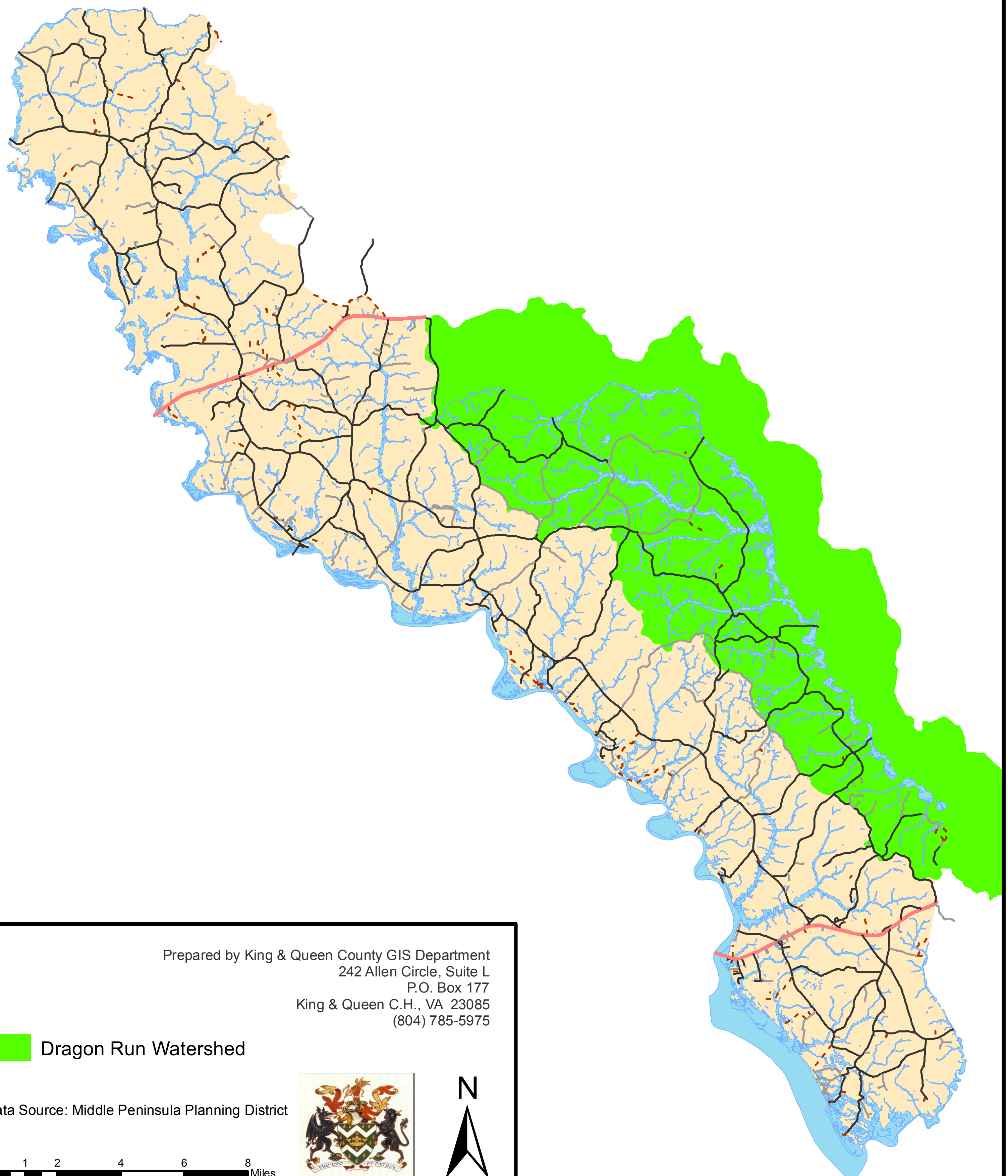
King & Queen County, Virginia

Lands in Conservation Easement | **Map 22**



King & Queen County, Virginia

Dragon Run Watershed | **Map 23**



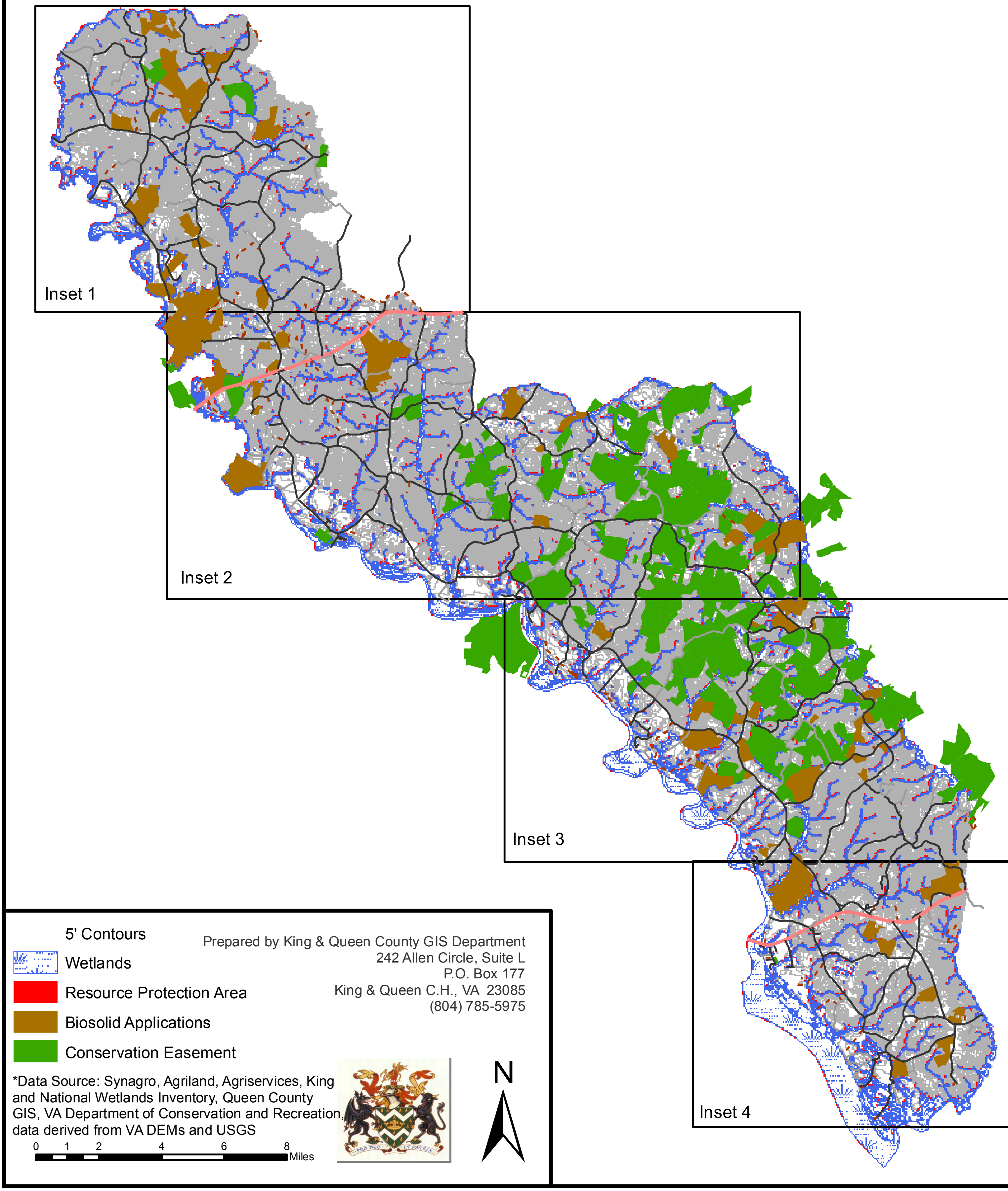
Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

Dragon Run Watershed

*Data Source: Middle Peninsula Planning District

King & Queen County, Virginia

Site Impairment Areas | **Map 24**



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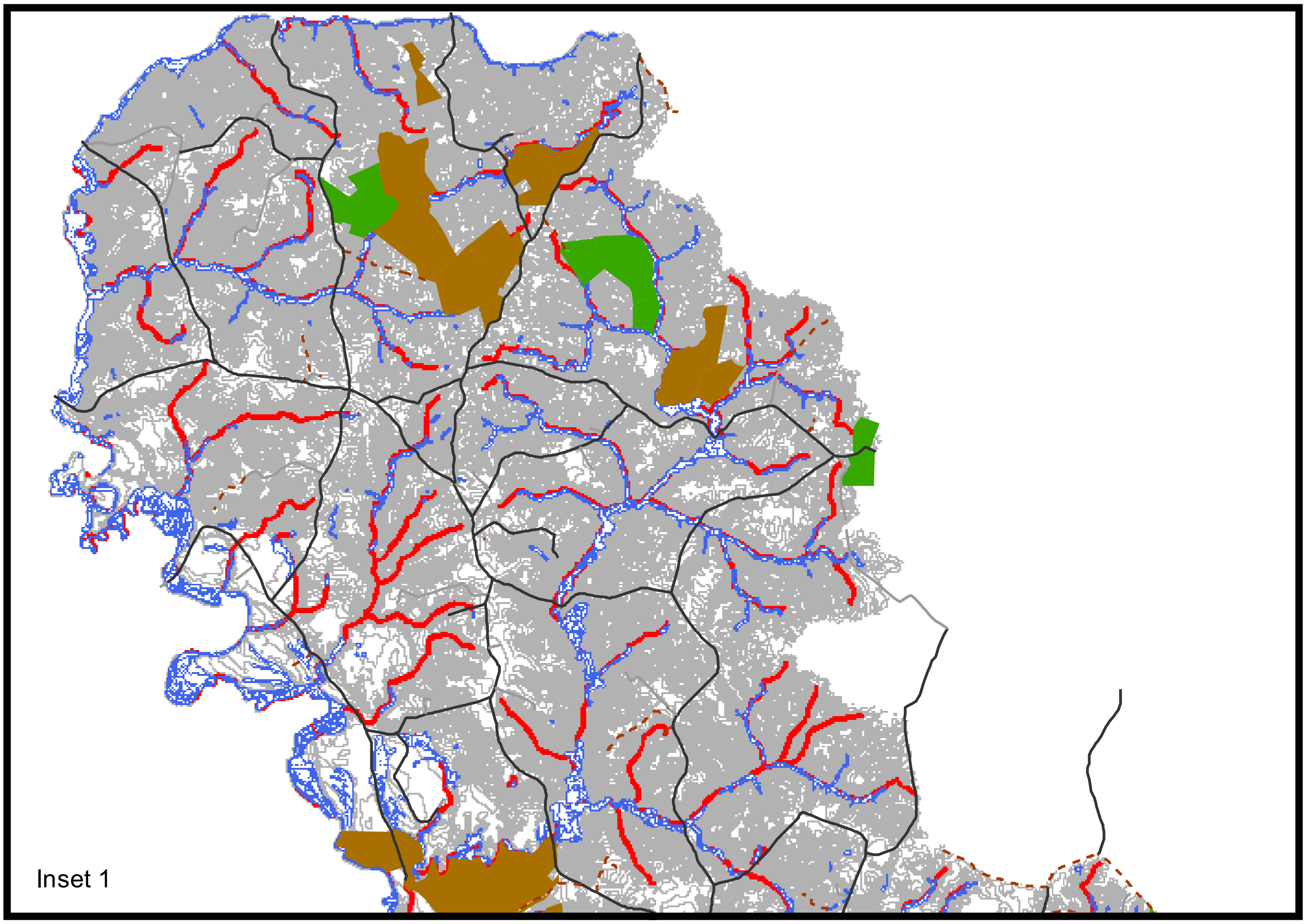
King & Queen C.H., VA 23085
(804) 785-5975

King & Queen County, Virginia

Site Impairment Areas | **Map 24a**



5' Contours

Wetlands

Resource Protection Area

Biosolid Applications

Conservation Easement

Prepared by King & Queen County GIS Department
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P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

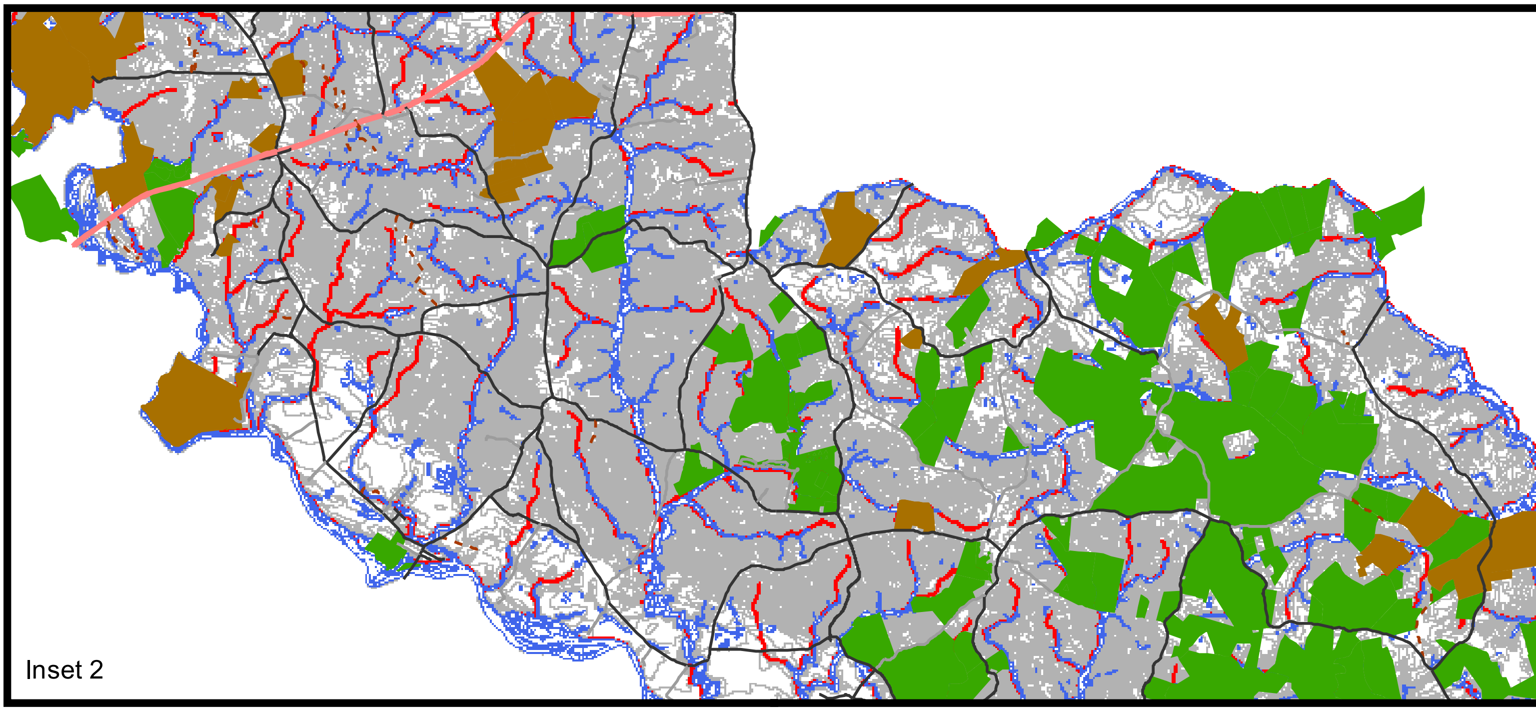
*Data Source: Synagro, Agriland, Agriservices, King and National Wetlands Inventory, Queen County GIS, VA Department of Conservation and Recreation, data derived from VA DEMs and USGS

0 0.475 0.95 1.9 2.85 3.8 Miles

N

King & Queen County, Virginia

Site Impairment Areas | **Map 24b**



5' Contours

Wetlands

Resource Protection Area

Biosolid Applications

Conservation Easement

*Data Source: Synagro, Agriland, Agriservices, King and National Wetlands Inventory, Queen County GIS, VA Department of Conservation and Recreation, data derived from VA DEMs and USGS

0 0.5 1 2 3 4 Miles

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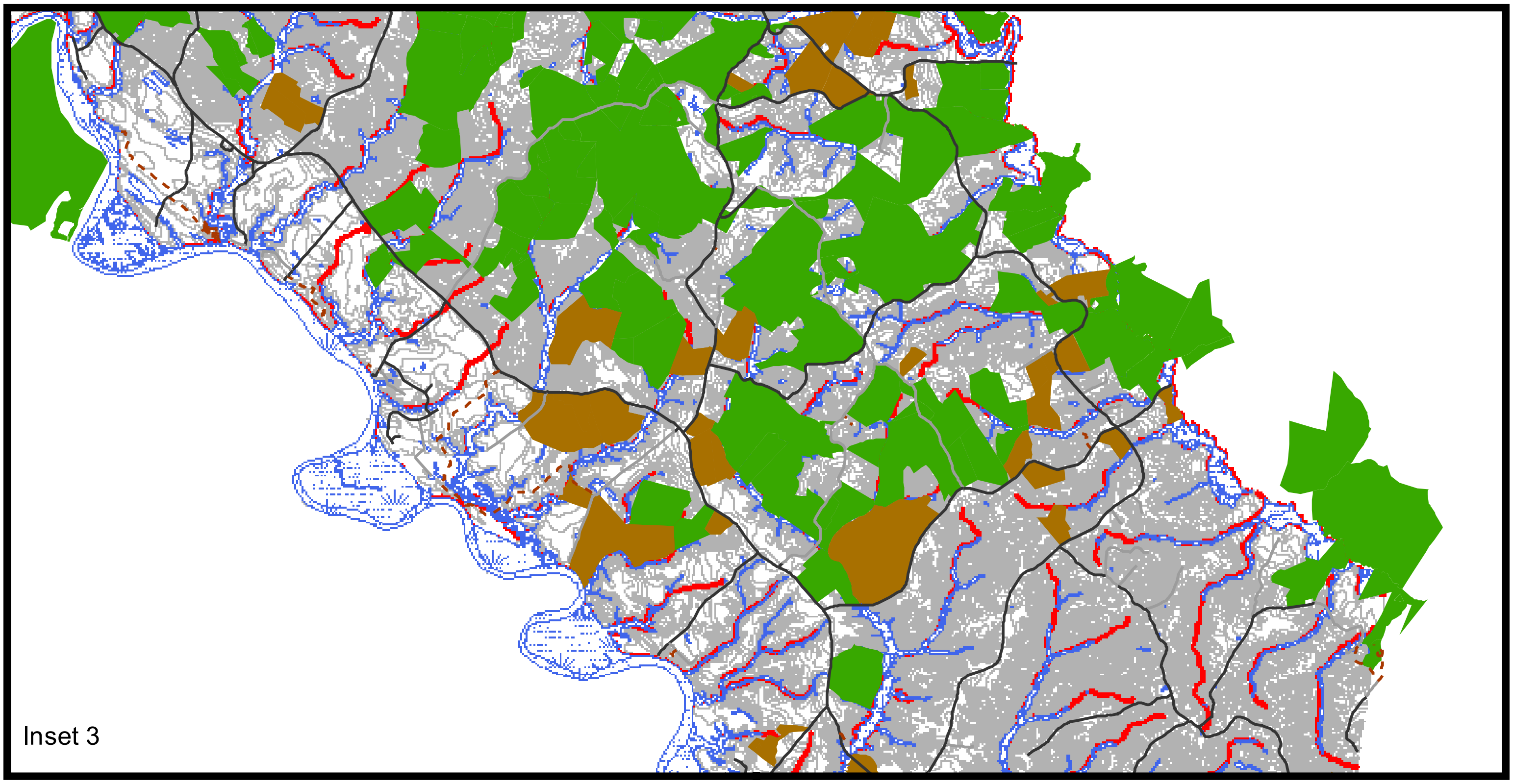
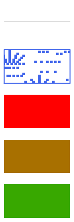
King & Queen C.H., VA 23085
(804) 785-5975

N

King & Queen County, Virginia

Site Impairment Areas | **Map 24c**



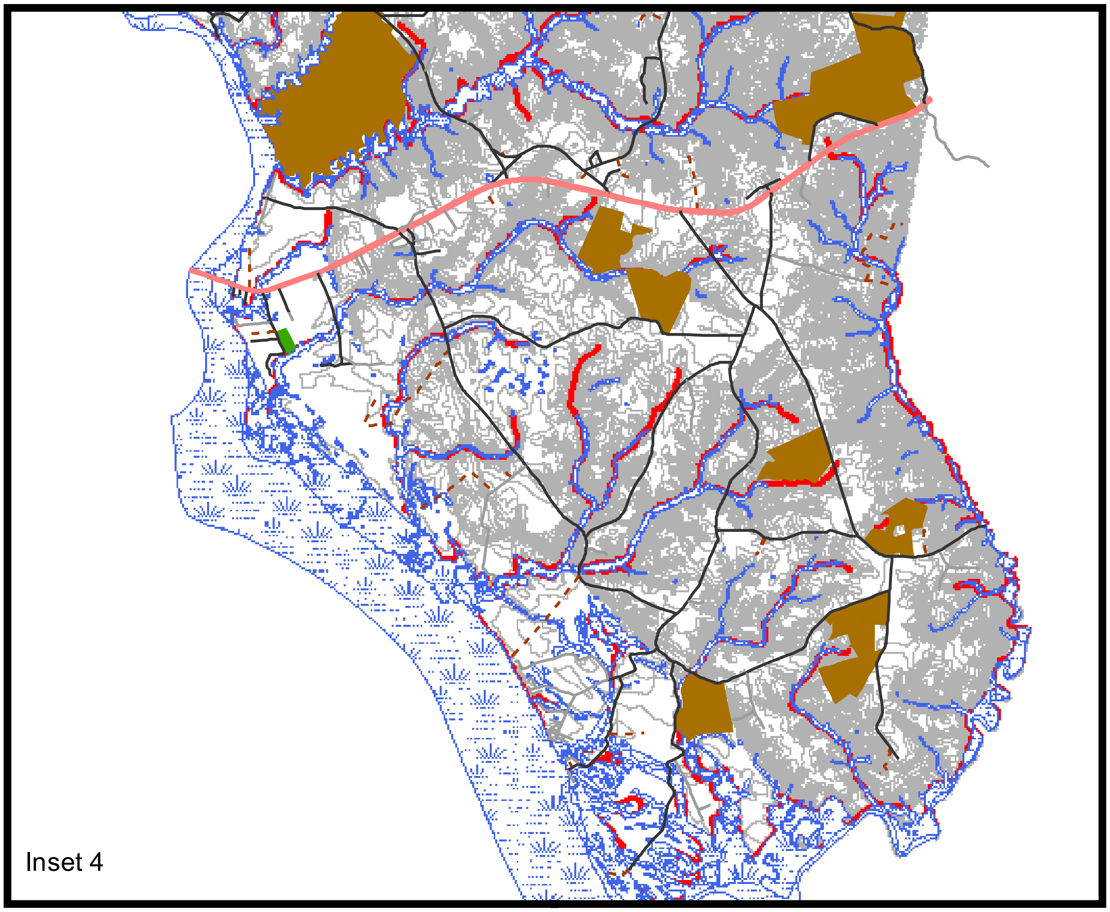


Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

*Data Source: Synagro, Agriland, Agriservices, King and National Wetlands Inventory, Queen County GIS, VA Department of Conservation and Recreation, data derived from VA DEMs and USGS

King & Queen County, Virginia

Site Impairment Areas | **Map 24d**



5' Contours

Wetlands

Resource Protection Area

Biosolid Applications

Conservation Easement

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

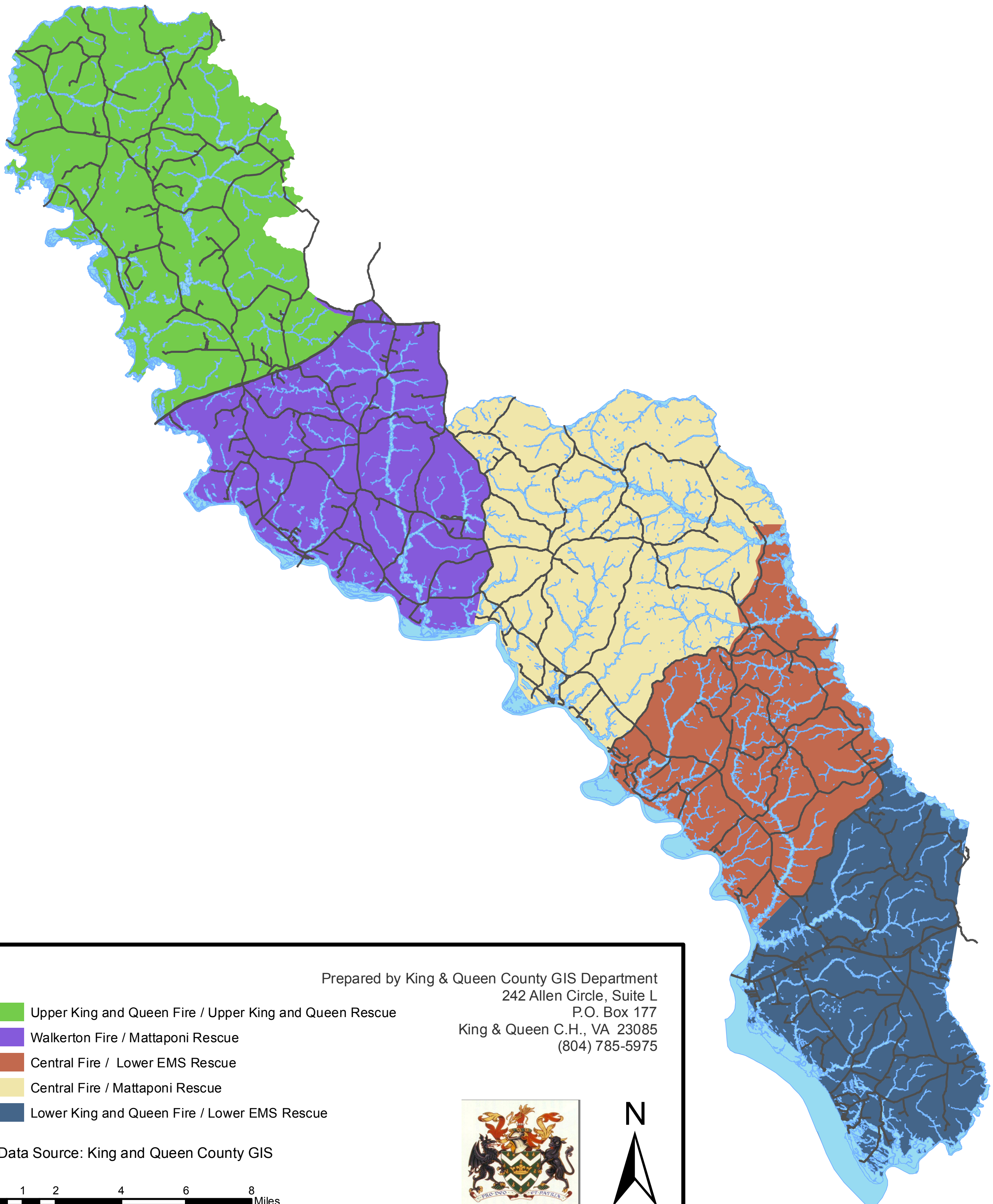
*Data Source: Synagro, Agriland, Agriservices, King and National Wetlands Inventory, Queen County GIS, VA Department of Conservation and Recreation, data derived from VA DEMs and USGS

0 0.45 0.9 1.8 2.7 3.6 Miles

N

King & Queen County, Virginia

Emergency Service Zones | **Map 25**



King & Queen County, Virginia

Communication Tower Locations | **Map 26**

Tower Owner

- AT&T
- American Tower
- Crown Castle
- SBA
- Sprint
- Virginia Power

*Data Source: King and Queen County GIS

0 1 2 4 6 8 Miles

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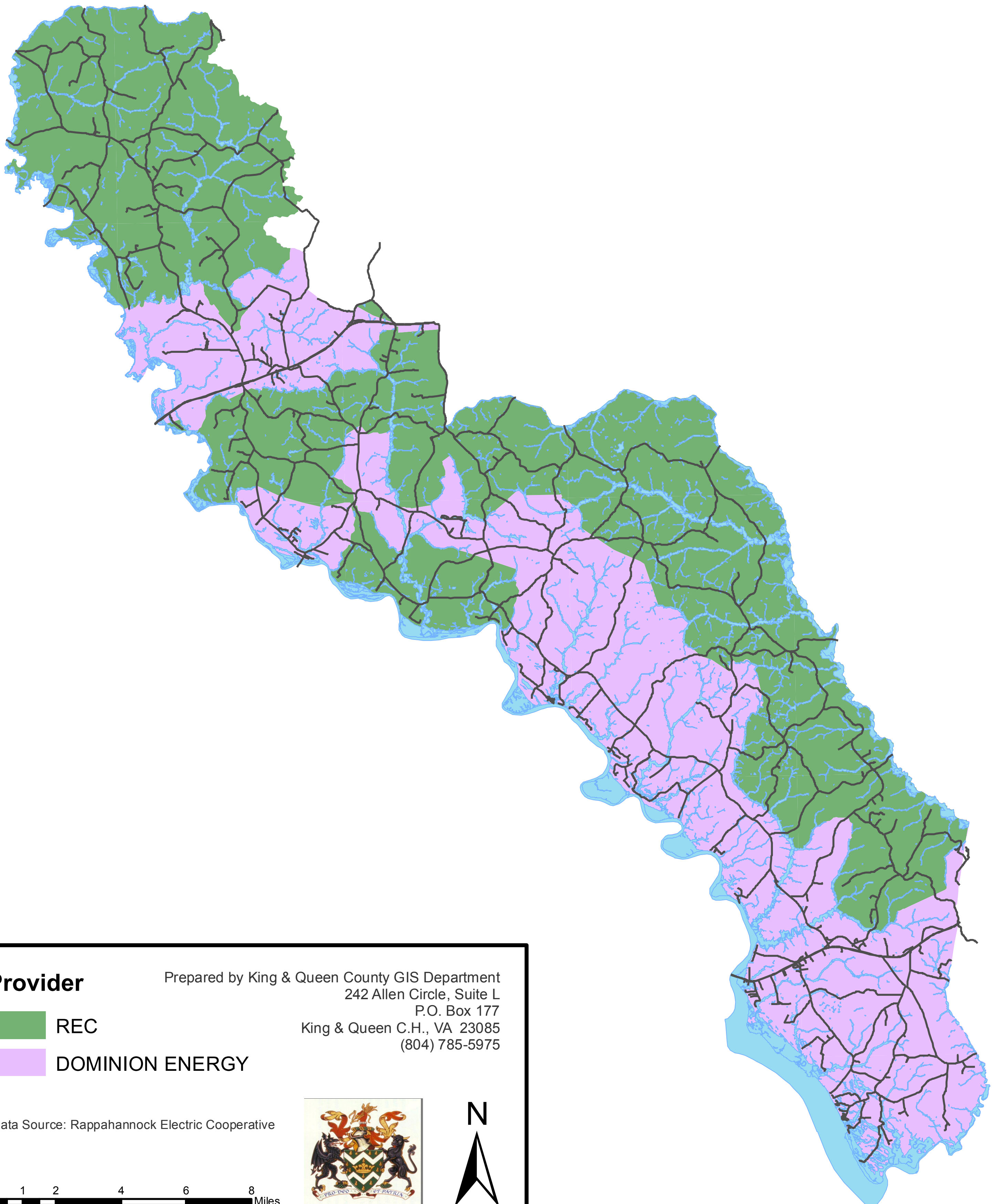
King & Queen C.H., VA 23085
(804) 785-5975

N

King & Queen County, Virginia

Electric Service Providers | **Map 27**



Provider

REC

DOMINION ENERGY

*Data Source: Rappahannock Electric Cooperative

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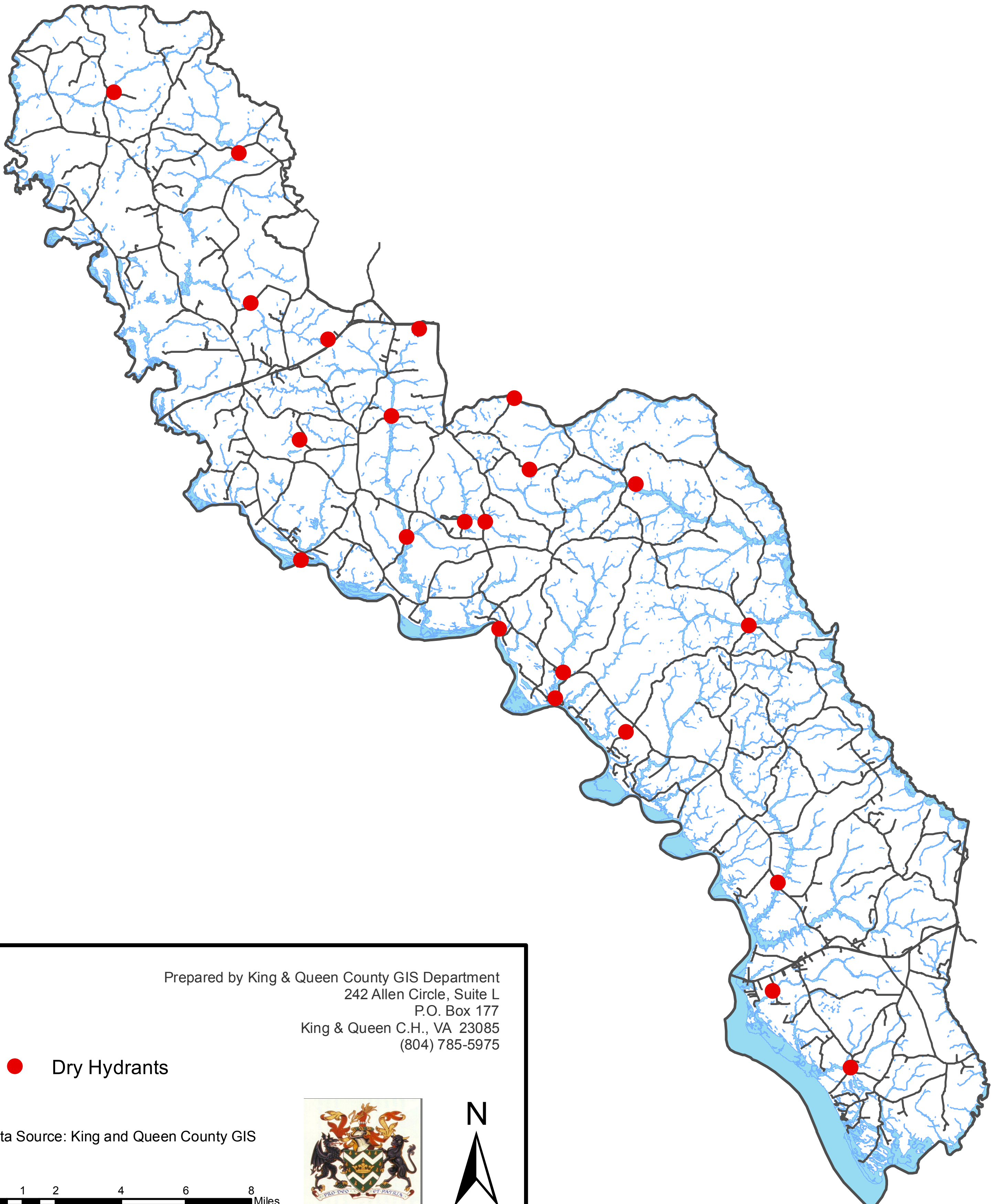
King & Queen C.H., VA 23085
(804) 785-5975

King & Queen County, Virginia

Dry Hydrant Locations | **Map 28**



Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

Dry Hydrants

*Data Source: King and Queen County GIS

0 1 2 4 6 8 Miles

N

King & Queen County, Virginia

County School Locations | **Map 29**

Schools

Prepared by King & Queen County GIS Department
242 Allen Circle, Suite L
P.O. Box 177
King & Queen C.H., VA 23085
(804) 785-5975

*Data Source: King and Queen County GIS

0 1 2 4 6 8 Miles

N

King and Queen County, Virginia

2030 Comprehensive Plan

Appendix G:
Conservation Easements MMPDC Report

Conservation Easements: Fiscal Impacts to Localities in the Middle Peninsula

Middle Peninsula Planning District Commission

Amended - December 1, 2010

While Conservation Easements and land holdings by tax-exempt entities and political subdivisions for conservation purposes support the protection of water quality, traditional uses (farming, forestry, etc), and preservation of rural character, there are unintended fiscal impacts to localities.

Conservation Easement Initiative:

PROJECT SNAPSHOT

Problems:

- How are properties with conservation easements assessed and taxed in the Middle Peninsula?
- How do conservation easements impact local tax revenues?
- How do fee simple acquisitions by political subdivisions and tax-exempt organizations impact local tax revenues?
- How does the cost of public services for eased lands compare to those that are developed (ie. residential, commercial)?
- What are the changes to land ownership patterns and what is their impact?

Key Findings:

1. The tax revenue impact of conservation easements is less than about 0.5% of any given Middle Peninsula locality's annual budget.
2. Easements lower land value and help the composite index.
3. Schools receive more state aid funding because of easements.
4. Commissioners of Revenue are inconsistent when addressing conservation easements.
5. Commissioners of Revenue have changed reporting practices because of this work.

<u>Table of Contents</u>

Report Abbreviations:

CBF – Chesapeake Bay Foundation
CoR – Commissioner of Revenue
DCR – Virginia Department of Conservation Recreation
DGIF – Virginia Department of Game and Inland Fisheries
DOF – Virginia Department of Forestry
FEMA – Federal Emergency Management Agency
FMV – Fair Market Value
FODR – Friends of Dragon Run
MPCBPAA – Middle Peninsula Chesapeake Bay Public Access Authority
MPLT – Middle Peninsula Land Trust
MPPDC – Middle Peninsula Planning District Commission
NOAA – National Ocean and Atmospheric Association
SLEAC – State Land Evaluation and Advisory Council
TNC – The Nature Conservancy
TVP – True Value of Property
TVLB – Total Value of Land Book
USFWS – United States Fish and Wildlife Service
VaTAX – Virginia Department of Taxation
VIMS – Virginia Institute of Marine Sciences
VDOE – Virginia Department of Education
VOF – Virginia Outdoors Foundation

This project was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant FY2009 NA09NOS4190163 Task 97.01 and Task 95 of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended. The views expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Department of Commerce, NOAA, or any of its sub-agencies.

I. Executive Summary

During the past several years the Dragon Run Steering Committee has recognized a conservation easement as a useful tool for private landowners to preserve rural character and promote natural resource-based economies, while protecting the natural resources that enable this way of life. As interest in conservation easements and conservation land holdings expanded in and around the Dragon Run Watershed, Middle Peninsula localities started to be concerned about intended tax revenue impacts and their effects on local economies.

As a result, Commissioners of the Middle Peninsula Planning District Commission (MPPDC) initiated a two-pronged project (Grant #NA09NOS4190163 Task 97.01 and Task 95) to address these issues. Officially kicking off the project in April 2010, Phase I of this project focused on gaining a quantitative understanding of the current fiscal impacts of conservation easements and conservation land holding by tax-exempt entities in Middle Peninsula localities. MPPDC staff met with the Commissioners of Revenue (CoR) from each County to discuss the methodology used to process conservation easements - from recordation of a conservation easement, to reducing the property's fair market value to reporting the total land book value to the Virginia Department of Taxation (VaTAX).

In particular, MPPDC staff worked to understand county approaches to conservation easements, particularly as it relates to Virginia Tax Code requirements. Taking into consideration the differences between those counties that have adopted "land use assessment" and those localities that have not, **MPPDC staff found that each county could improve current approaches in handling conservation easements within their county that could provide fiscal benefits through the Composite Index, and therefore aid State received for education**. Through the accounting of all conservation easements and the consistent devaluing of the conservation easements within their jurisdiction, each county has an opportunity to improve current practices.

II. Introduction

Within the Middle Peninsula member localities pride themselves on their rural character and heritage, which has been fundamentally rooted in the region's open-space, agricultural lands and forests, as well as the region's waterways. However as populations migrate toward the coast to enjoy the amenities of a rural and coastal lifestyle, local governments begin to grapple with how to hold onto their rural character, while balancing growth, new public service costs, and therefore county budgets and revenues.

To articulate the county vision, specific to growth and development, the County's Comprehensive Plan provides general, long-range, policy, and implementation guidelines for decisions related to land use. Within the Middle Peninsula, each county's comprehensive plan has seemingly similar visions to preserve rural character through the preservation/conservation of open space, agricultural land, and forest land (Appendix 1). In recent years, and in congruence with County Comprehensive Plans, non-profit organizations (i.e. The Nature Conservancy and local land trusts), as well as political subdivisions have focused conservation efforts within the Middle Peninsula. These entities have accomplished their conservation goals through the utilization conservation easements and fee simple land ownership as tools to protect and conserve the natural, scenic, and historic resources of the region.

A conservation easement is a legal agreement made between a landowner (grantor) and a public body (grantee) that places restrictions on both the present and the future use

Chapter Focal Points:

- *All comprehensive plans of Counties in the Middle Peninsula focus on preservation of rural character through the conservation of open space, agricultural land and forest land, especially within the Dragon Run Watershed.*
- *Economic downturn has forced local budgets to tighten, therefore drawing attention to changes in land ownership patterns (ie. conservation easement and tax exempt land holdings) and their fiscal impacts.*
- *Conservation easements are a legally binding instrument to protect natural or open space, assuring its availability for agricultural, forestal, recreation, or open-space use*
- *Assessed value of a property is the taxed value. This is value is initially determined by a real estate assessor.*
- *Commissioner of Revenue's prime objective is to maintain a land book and generate a total land book value (TVLB). This value is ultimately used as a factor in the composite index.*

of a property. While capturing the rural quality of the region in perpetuity, conservation easements also offer tax incentives to property owners.

Conservation easements have been considered regional conservation successes and few questions arose with regard to the fiscal impacts of conservation easements. However, with the economic downturn in 2008, county budgets have tightened and fiscal resources have dwindled, while local government's responsibilities have remained the same or have expanded. Therefore, in February 2010 when The Nature Conservancy's (TNC) purchased 13,350 acres of forestland within the Dragon Run and Mattaponi watersheds and then immediately sold it to The Forestland Group subject to a permanent conservation easement on the property, local elected officials began to question the impacts of conservation easements to the county revenues.

To address these concerns, MPPDC staff conducted extensive research and worked closely with Middle Peninsula Commissioners of Revenue to gain an understanding of the following:

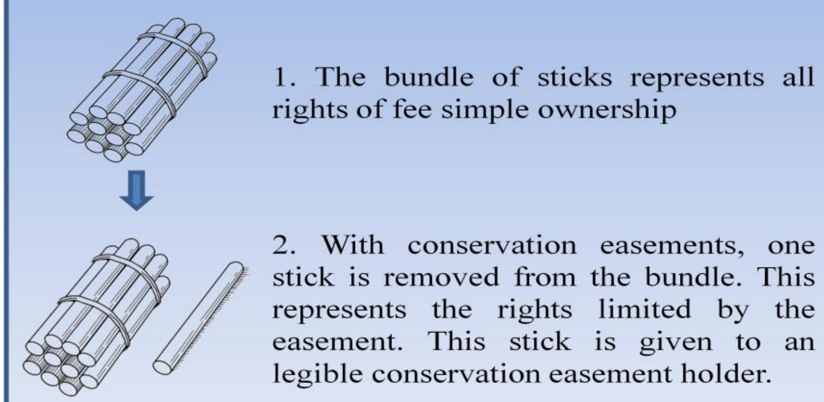
1. The impact of conservation easements on local tax revenue.
2. The loss of local tax revenue due to fee simple conservation acquisitions by political subdivisions and tax-exempt organizations.
3. The cost of public services for eased lands compared to those that are developed (ie. residential, commercial)
4. The impact of changes to land ownership patterns.

III. Property Ownership and Conservation Easements

In general there are two categories of property, (1) real property and (2) personal property. However, for the purpose of this report real property will be the focus. Thus real property may be defined as land, including the surface, whatever is attached to the surface such as buildings or trees, and whatever is beneath the surface, such as minerals, and the area above the surface.

Through ownership of real property, one gains a variety of inherent rights. To explain, ownership rights may be compared to a bundle of sticks (Figure 1). Each stick represents a distinct and separate right, which may be the

Figure 1: Bundle of Sticks Theory



right to sell, lease, subdivide, enter, or give away the property. If an individual or entity owns all rights to a parcel (ie. all the sticks) this is known as fee simple ownership. But with the discretion to choose to exercise more than one or none of these rights, a fee simple owner may voluntarily limit or restrict partial interests that are created by selling, leasing or transferring specific sticks from the bundle of rights. In the case of fee simple owners who have an interest in retaining

Chapter Focal Points:

- *Fee simple property owners have rights, including the ability to voluntarily limit or restrict interests of the property.*
- *Conservation easements perpetually protect and conserve land*
- *Property owners enjoy the tax exempt status of a conservation easement*
- *The rights restricted by the conservation easements are voluntarily sold or transferred to a qualified conservation easement holder.*
- *The assessed value is the value that is taxed.*
- *The CoR's main objective is to maintain a land book to generate a total value of land book to report to the VaTAX.*
- *The VaTAX sends the DOE a copy of the annual sales ratio study and the TVLB which will be used in calculating the composite index which reflects a county's ability to pay education costs.*
- *Conserved lands lower the composite index*
- *The lower the composite index the more state aid is received for education*

or protecting natural or open space values of real property, assuring its availability for agricultural, forestal, recreation, or open-space use, protecting natural resources, maintaining or enhancing air or water quality, or preserving historical architectural or archaeological aspects of real property (VA Code §10.1-1009), conservation easements may be used as a tool to conserve their land in perpetuity. When a property owner chooses to place his/her land in a conservation easement, one stick from the bundle, particularly the right to subdivide and/or develop, is voluntarily sold or transferred to a qualified conservation easement holder (ie. political subdivision or eligible non-profit organization). As a conservation easement places encumbrances on a property, how is the property's fair market value impacted?

Property Assessment and Land Book and Impacts to the Composite Index

Assessment of real property throughout the Commonwealth is calculated at 100% of the fair market value as required by the Constitution of Virginia. Real estate assessors are hired by the counties, with the exception of Gloucester County which has an in-house assessment office, to establish a fair market value/assessment value each property (ie. improvements or buildings and the land or site). This assessed value is then the value that the county applies the tax levy to in order generate local tax revenues.

Real estate assessment values may increase or decrease due to a variety of reasons, including changes in economic conditions, structural changes or land rezoning as well as encumbrances on property, including those set by a conservation easement and a county's participation in the Virginia's Use Value Assessment Program. Yet, regardless of the factor contributing to the change in fair market/assessed value of the property, as a real estate record keeping tool and, in accordance with VA Tax Code 58.1-3310, the Commissioner of Revenue (CoR) from each county is to maintain a land book that documents all fair market values of properties within their jurisdiction. As the premier objective, each county's CoR will generate a total value of land book (TVLB), which is the total of fair market values of all parcels within the county. Once the TVLB is calculated a completed land book is sent to the County's Treasurers Department as well as the Virginia Department of Taxation (VaTAX).

To fulfill agency missions, VaTAX will extract the TVLB value from each county's land book and send it to the Virginia Department of Education (VDOE) in conjunction with a copy of an annual sales ratio study. With this information VDOE will calculate the True Value of Property (TVP) that is needed to generate a composite index value for each county. The composite index determines a school division's ability to pay education costs based on the true value of property (weighted 50%), adjusted gross income (weighted 40%) and the taxable retail sales (weighted 10%) within the county. These three elements are computed per pupil and per capita for each school. The lower the composite index the more education State aid the county will receive.

Table 1: Regional Relevance –

Composite index: What does this mean?

Every two years a composite index value is calculated for each county. This value is ultimately the percentage that each county is expected to contribute to funding the cost of education within their county. Below are a list of the Middle Peninsula Counties and their associated composite index for 2008-2010.

County	Composite Index	Percentage that County is to spend of their education costs
Essex	.4071	40.71%
King William	.2918	29.18%
King & Queen	.3868	38.68%
Gloucester	.3456	34.56%
Mathews	.5337	53.37%
Middlesex	.6777	67.77%

As the fair market values of properties within the Middle Peninsula are reduced due to conservation easements, the county's total land book value reported to the VaTAX is also reduced. This reduction will thereby decrease the composite index. **To take advantage of the composite index benefits, the Commissioners of Revenue need to report the total fair market value of all properties, including the reduced assessed value of lands with conservation easements.** If the CoR does not report the total land book value in a way that accounts for the reduced fair market value of lands with conservation easements, then this will not be beneficial to the composite index score; and therefore will ultimately decrease the amount of State aid for education.

It is also important to mention that although Virginia Tax Code dictates that the property under easement shall reflect a reduction in fair market value of the land that results from the inability of the owner to use the property for uses terminated by the easement, the market demand is ultimately what drives the value in the property. In other words, although the value of the right(s) given up is reduced, the value of the parcel itself may decrease, stay the same, or increase depending on the demand of the market.

IV. Land Use Counties vs. Non-land Use Counties

As a legally binding instrument that restricts the actions of present and future landowners, conservation easements may be considered an encumbrance on the property. Thus, in accordance with Virginia Code § 10.1-1011 (Appendix 3), a property owner is to enjoy the tax-exempt status of a conservation easement. **Consequently the property shall reflect a reduction in fair market value of the land that results from the inability of the owner to use the property for uses terminated by the easement.** A county's participation within the Virginia Use Value Assessment Program will determine the approach to reducing in fair market value of properties under conservation easement.

Land Use Counties

Within the Commonwealth of Virginia each county has the option to adopt a land use program. This program supports the assessment and taxation of agriculture, horticulture, forest and /or open-space lands based on its use value, or the value for what the land produces, instead of the market value. To determine land use rates, the State Land Evaluation and Advisory Council (SLEAC) estimates the use value of eligible lands for each jurisdiction participating in the land use program. The SLEAC contracts annually with the Department of Agricultural and Applied Economics at Virginia Tech to develop an objective methodology for estimating the use value of land in *agricultural and horticultural uses*, with the Virginia Department of Forestry (DOF) for the use value of land in *forestry*, and with the Department of Conservation

Chapter Focal Points:

- *Virginia's Use Value Assessment Program is voluntary for counties to supports the assessment of agriculture, horticulture, forest and/or open space lands based on its use value, which is below the regular assessed value.*
- *Gloucester, Middlesex, King William and Essex Counties have adopted the land use program.*
- *According to the Virginia Use Value Assessment Program properties in the program will be taxed upon the use value, yet the CoR cannot report this reduced value in the land book.*
- *VA Code 10.1-1011 requires that properties with conservation easements in land use counties are taxed and assessed with the county's land use value.*
- *However, because the easement is perpetual in nature, the CoR should report this reduced value as the value of the easement in the land book.*
- *Once a reduction in value is given to an eased property, the total value of land books in non-land use counties inherently reflect this reduction*

and Recreation (DCR) for the use value of land in *open space.* Although the SLEAC values are distributed to each county, these values do not have be used by the county. Hence a county may consider the SLEAC values, but in accordance with VA Tax Code 58.1 -3236, the CoR or duly appointed assessor shall ultimately determine the land use rates for the county (ie. agricultural, horticultural, forestal or open space).

Counties within the Middle Peninsula that currently participate in the Land Use program include Essex, King William, Middlesex, and Gloucester. Of these counties only the Gloucester County CoR utilizes the SLEAC land use rates. In Essex and Middlesex County the CoRs use SLEAC numbers as guidance, but adjust values based on a neighborhood approach to calculate a county specific land use rate. On the contrary, King William utilizes a "budget plug" approach to generate land use rates. In other words, King William will close the county's budget gap by adjusting the land use rates as needed.

Although the land use program allows agricultural, horticultural, forestal and/or open space to be **taxed** upon the land's *use* value, this value cannot be reported by the CoR in the land book. Since VaTAX considers the land use program as voluntary and revocable at any time, the CoR must report the full assessed value/fair market value of the property in the land book to generate the total land book value (TLBV) which is then sent to VaTAX (Figure 2- Scenario #1). In conjunction with being considered a voluntary and revocable program, the CoR from land use counties do not consider the reduction of the collected taxed revenues a loss, but rather a tax deferral.

Within land use counties, and according to VA Code 10.1-1011, land subject to a perpetual conservation or open-space easements **shall be assessed and taxed** at its open space use value in jurisdictions that have adopted the land use program. Therefore, since conservation easements are perpetual, not only is the land taxed at a reduced land use value, but the CoR is to report this reduced use value in the land book (Figure 1- Scenario #2).**Consequently, by reporting a lower fair market value to the VaTAX for lands with conservation easements, the composite index should be lowered and the county should receive more State aid toward education.** Furthermore, CoR will consider the reduced taxes due to the devaluation of the fair market value based on a conservation easement as a permanent loss to the county rather than a deferral.

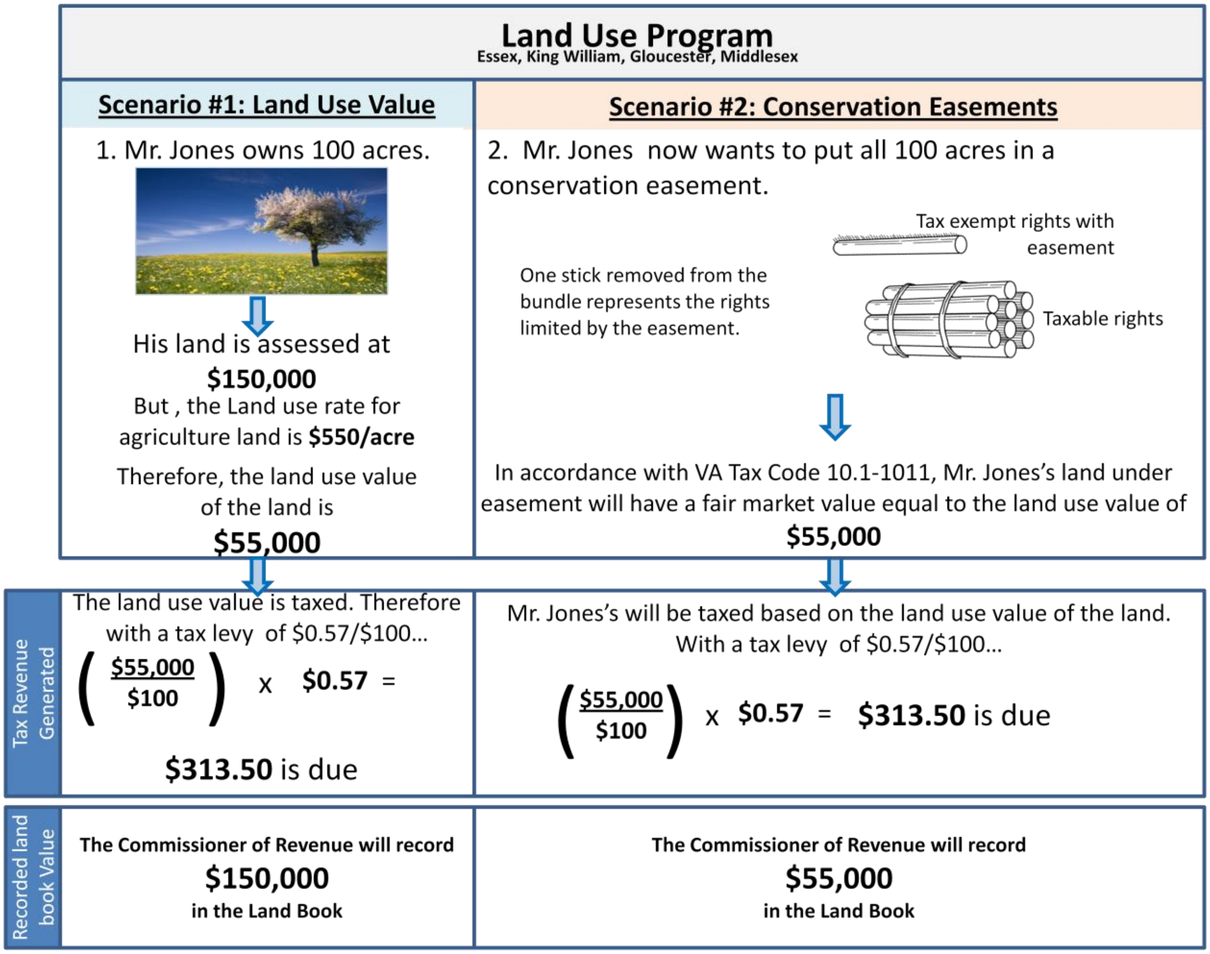


Figure 2: Scenarios within land use counties that attribute to local taxation and conservation easements.

Non-Land Use Counties

Unlike land use counties, there is no legislation that prescribes how an eased property within a non-land use county should be devalued. Yet, according to VA Code § 10.1-1011 (Appendix 3):

> *Assessments of the fee interest in land that is subject to a perpetual conservation easement held pursuant to this chapter or the Open-Space Land Act shall reflect the **reduction in the fair market value** of the land that results from the inability of the owner of the fee to use such property for uses terminated by the easement.*

In other words the fair market value of the property will be reduced due to uses terminated by the easement. Thus, in non-land use counties the reduced value of a property with a conservation easement may be determined by a qualified assessor, who establishes a "before value & after value", while the 'remainder value' is the value usually accepted by the locale as the assessed value. If that does not occur, then the assessor, if there is one, would establish a fair market value as permitted and the CoR would then have the final word as to the fair market value (Figure 3: Scenario #2).

Due to the perpetual nature of a conservation easement the taxes lost due to this transaction will be a permament loss to the county. However the reduced fair market value of the property due to the conservation easement will lower the county's TLBV and therefore the composite index.

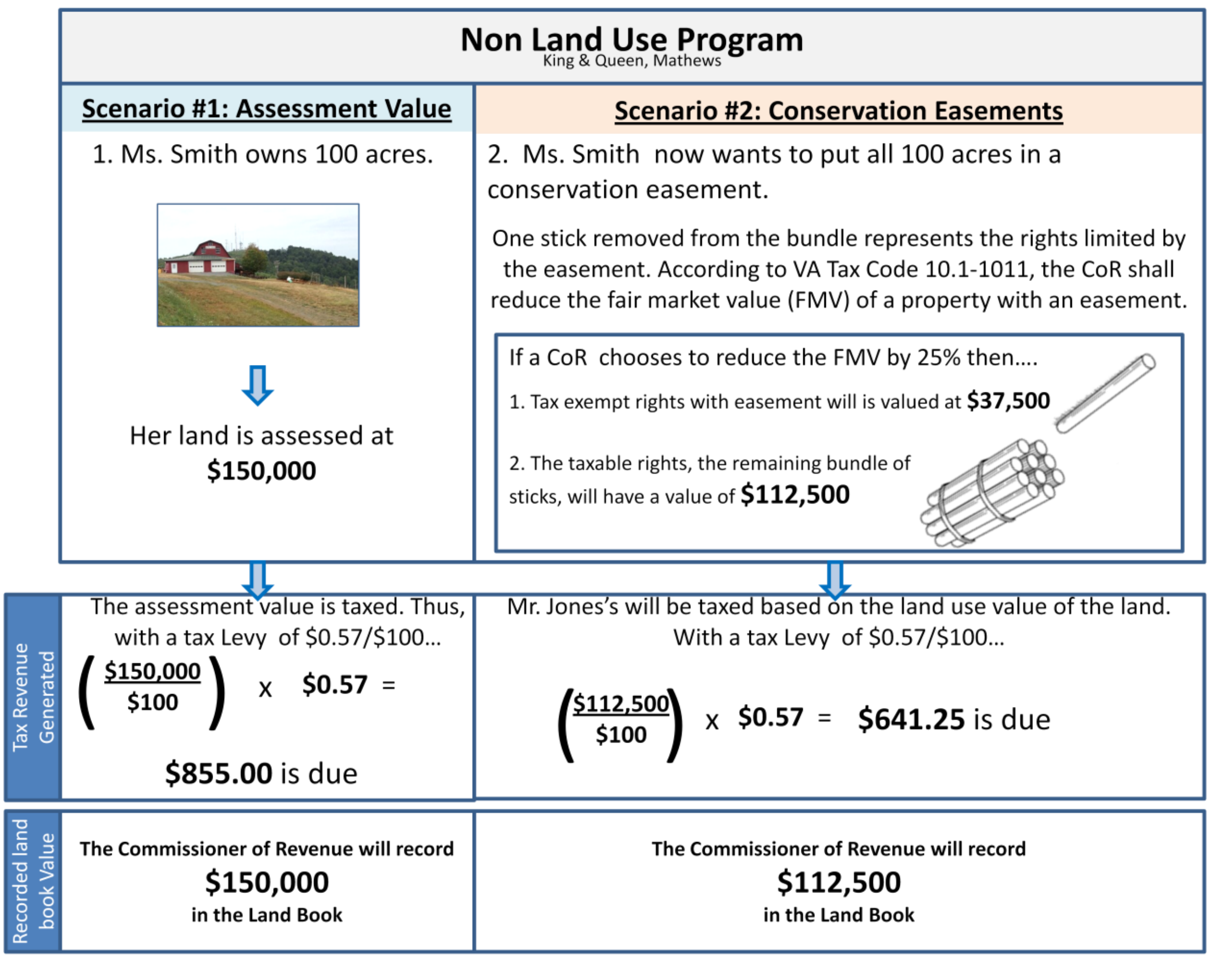


Figure 3: Scenarios within non land use counties that attribute to local taxation and conservation easements.

V. Analysis of Conservation Easements and Tax-exempt Land holdings in the Region

In April 2010, MPPDC staff began to work closely with the Commissioners of Revenue from each county within the Middle Peninsula to understand the fiscal impacts of conservation easements as well as fee simple land holdings by tax-exempt entities in the counties. Specifically, the CoRs helped to generate a list of properties which are under conservation easement or owned by tax-exempt organizations for conservation purposes. In addition to the list of parcels provided by the CoR, MPPDC staff researched grantee public records to identify additional parcels that are held by eligible conservation easement holders, including The Nature Conservancy (TNC), Virginia Outdoors Foundation (VOF), Middle Peninsula Land Trust (MPLT), Friends of Dragon Run (FODR), Virginia Department of Forestry (DOF), Chesapeake Bay Foundation (CBF), Natural Resources Conservation Service (NRCS), Virginia Department of Game and Inland Fisheries (DGIF), as well as U.S. Fish and Wildlife Services (USFWS). Finally MPPDC staff consulted with conservation easement holders (ie. TNC and VOF) and Virginia Department of Conservation and Recreation (DCR) to obtain lists of land holdings to verify research and information gathered from each CoR.

MPPDC staff also used public records to identify parcels owned by tax-exempt entities for conservation purposes. Within the Middle Peninsula, MPPDC staff focused on fee simple ownership by federal, state, and local political subdivisions (ie. USFWS, DOF, DCR, DGIF, Middle Peninsula Chesapeake Bay Public Access Authority), educational institutions (ie. VIMS), and non-profit organizations (ie. TNC). *Tax-exempt legislation may be found in Appendix 4 &5.*

The remainder of this chapter will review how each county in the Middle Peninsula considers conservation easements. From recordation, to property devaluation, to the property value reported to the VaTAX, MPPDC staff will share information gathered from each county – right, wrong, or indifferent this is the information that is known.

A. Middlesex County

Upon recordation of a conservation easement in Middlesex County, an attorney or landowner will enter the clerk's office with prepared easement documents. The clerk will scan all documents provided into the County's computer database. The attorney/landowner will then pay a recordation fee, however tax-exempt entities (ie. political subdivisions, TNC, VIMS, etc) do not pay a recordation fee. Once the recordation fee is paid, then the attorney/ landowner will receive a receipt for the transaction. The information and documents scanned into the computer will appear on the monthly land transaction sheet generated by the clerk for the CoR to review.

On the transaction sheet conservation easements are currently not flagged for special consideration by the CoR. However, along with the transaction sheet, the Middlesex CoR will receive copies of the deed and plat. According to the CoR, properties with conservation easements are automatically entered into the land use program and devalued based upon the land use program rates adopted by the County during the review of the transaction sheet. Yet, this reduced value and new tax liability will not become effective until the following January 1st. However, the landowner is informed of this change in tax liability through a validation process. In other words, an application will be filled out with the available deed information and will be sent to the landowner to make appropriate changes. The landowner is then asked to sign the application and return the completed application to the CoR.

Once all monthly land transactions are reviewed, the CoR will file the copies of the conservation easement records

Chapter Focal Points:

- *Middlesex is a land use county.*
- *CoR becomes aware of a conservation easement during the monthly review of the transaction sheet from the clerk.*
- *Devaluation of fair market value of properties with conservation easements has been inconsistent.*
- *Middlesex has approximately 4,291acres of land with conservation easements equivalent to $37,778 in total lost tax revenue.*
- *Middlesex can change the process by which they report the TVLB to increase the amount of state aid for education. Currently the CoR working to make appropriate adjustments.*
- *Middlesex has approximately 521 acres of parcels owned by tax exempt entities which equates to $5,428 in total lost tax revenue.*
- *Middlesex has a total of 4,812 acres of conserved lands which equates to a loss of approximately $43,206 in tax revenues. This represents 0.18% of the county's budget for 2009-2010.*

into a cabinet dedicated to land use. While Middlesex County has two databases for property records, following the review of a monthly transaction sheet the CoR will update one of the property databases with changes to the property value. Currently, the two databases are separate and are unable to be used together. Also the current databases do not have a query to identify conservation easements, however the CoR is planning to complete this task in the near future.

Local Findings

As a land use county, the Middlesex County CoR is to tax and assess eased lands based upon the use value of the property, as well as report the reduced value of land with the conservation easement to VaTax – according to tax code. Currently, however, this is not the case. Though taxed at the reduced value, the CoR reports the total fair market value in the total value of landbook rather than the reduced value due to the conservation easement. Therefore it can be said that the CoR treats lands with conservation easements identical to properties in land use. As a result this directly increases the TVLB, the composite index, and ultimately reduces State aid for education to the County.

In addition to reporting the improper value to the VaTAX, MPPDC staff also found that the approach to devaluing conservation easements in Middlesex County is inconsistent. The CoR is working to correct inconsistencies.

Consequently it was found that Middlesex County has approximately **4,291 acres** of land with conservation easements, and in using the current fair market value devaluation methods, Middlesex County is **losing approximately $37,778 in tax revenue due to easements**.

In conjunction with assessing the fiscal impacts of conservation easements, MPPDC staff also considered the fiscal impacts of fee simple land ownership by tax-exempt organizations for conservation purposes. With approximately **521 acres** of land in the county owned by tax-exempt organizations, this equates to approximately **$5,428 loss of tax revenue**.

Therefore when conservation easements and lands owned by tax-exempt organization are looked at together, the county consists of approximately **4,812 acres of conserved lands** which equates to a **loss of approximately $43,206 in total tax revenues** annually. This represents **only 0.18%** of the county's $24,183,505 budget for 2009-2010.

Quantitative Summary of results from Middlesex County

This provides a summary of the county's recognition of conservation easements as well as tax-exempt conservation land holdings and their fiscal impacts to the county.

Acres under Conservation Easements	4,291.00
Acres held by Tax-exempt Conservation Entities	521.00
Acres Conserved Total	4,812.00
Devaluation due to Conservation Easements	$10,793,682
Devaluation due to Tax-exempt Conservation Land Holdings	$1,550,832
Total Devaluation	$12,344,514
Tax Revenue Loss due to Conservation Easements	$37,778
Tax Revenue Loss due to Tax-exempt Conservation Land Holdings	$5,428
Total Tax Revenue Loss	$43,206
Percentage of the County's Budget	**0.18%**

B. Gloucester County

Upon recordation of a conservation easement within the Gloucester County, an attorney or the landowner will go to the clerk's office with prepared easement papers. The clerk will then scan all documents, including the easement and plat provided into the county's computer system. Once the documents are scanned, the easement documents will be stamped with an instrument number and the date of recordation. Once the recordation fee is paid (tax-exempt entities do not pay this fee), the attorney/landowner will receive a receipt for the transaction. This transaction will then appear on the monthly transaction sheet generated by the clerk's office which is sent to the CoR for further review. On the transaction sheet conservation easements are not flagged by the clerk for special consideration by the CoR.

Through conversations with the Gloucester County CoR, to-date, conservation easements are not accounted for. They are treated as any other land. Also according to the Gloucester County's Real Estate Assessment Department properties with conservation easements are not assessed differently.

Therefore to gather information with regards to conservation easements and fee simple land holding by tax-exempt entities in Gloucester County, MPPDC staff utilized the County's records office as well as the Department of Conservation and Recreation (DCR) and other easement holder data.

Chapter Focal Points:

- *Gloucester is a land use county.*
- *CoR does not currently track or account for conservation easements within the county.*
- *Gloucester County Real Estate Assessment Department does not currently assess property with conservation easements differently.*
- *According to DCR there are approximately 1028.961 acres of conservation easements within the County. If accounted for the County may loss approximately $32,406 in tax revenues*
- *Gloucester has approximately 3,114.95 acres of land owned by tax exempt entities for the purposes of conservation. This equates to approximately $16,779 of lost tax revenue.*
- *Gloucester consists of approximately 4,124.97 acres of conserved lands which equates to a loss of $49,185 in total tax revenues annually. This represents 0.0005% of the county's budget for 2009-2010.*
- *Gloucester will benefit in composite index if the CoR/assessor devalues the fair market value of land s with conservation easements.*

Local Findings

It was found that Gloucester County has approximately **1,010.02 acres** of land with conservation easements, and in using their current land use rates for lands, Gloucester County would **lose approximately $32,406 in tax revenue due to easements**. Keep in mind, that Gloucester County is not currently seeing fiscal impacts due to conservation easements since the fair market value of lands with conservation easements are not being reducing. **This suggests that with a change Gloucester's approach to accounting for conservation easements within the County, and therefore becoming compliant with VaTAX code, Gloucester will see an increase in the total tax revenue loss, but will most likely benefit in the composite index due to a reduction of fair market value.**

In conjunction with assessing the fiscal impacts of conservation easements, MPPDC staff also considered the fiscal impacts of fee simple land ownership by tax-exempt organizations for conservation purposes. With approximately **3,114.95 acres** of land in the county owned by tax-exempt organizations, this equates to approximately a **$16,779 loss of tax revenue**.

Therefore when conservation easements and lands owned by tax-exempt organization are looked at together, the county consists of approximately **4,124.97** acres of conserved lands which equates to a **loss of approximately $49,185 in total tax revenues** annually. This represents **only 0.0005%** of the county's **$107,165,062** budget for 2009-2010.

Quantitative Summary of results from Gloucester County

This provides a summary of the county's recognition of conservation easements as well as tax-exempt conservation land holdings and their fiscal impacts to the county.

Acres under Conservation Easements	1,010.02
Acres held by Tax-exempt Conservation Entities	3,114.95
Acres Conserved Total	4,124.97
Devaluation due to Conservation Easements	$5,587,222
Devaluation due to Tax-exempt Conservation Land Holdings	$2,893,000
Total Devaluation	$8,480,222
Tax Revenue Loss due to Conservation Easements	$32,406
Tax Revenue Loss due to Tax-exempt Conservation Land Holdings	$16,779
Total Tax Revenue Loss	$49,185
Percentage of the County's Budget	**0.0005%**

C. Essex County

Recordation of a conservation easement within Essex County begins when prepared easement papers are presented by an attorney or other interested party to the Clerk of the Circuit Court. The clerk then validates the document by stamping recording information (ie. date) and writing the instrument number on the original document. If applicable, a recordation fee and tax are paid, the clerk makes a copy of the original (which is kept for scanning), and the original and a receipt for the transaction are returned to the presenter. After the easement documents are scanned into the county's computer system, the transaction will appear on a monthly transfer sheet generated by the clerk and placed in the CoR's mailbox. In Essex, the clerk flags conservation easements on the monthly transfer sheet, which assists the CoR in pulling associated electronic files.

In Essex County the CoR may become aware of a conservation easement prior to recordation through minutes from Virginia Outdoors Foundation meetings or through word of mouth from the County Administrator or other interested parties. Once the documents are recorded, the CoR reviews the transfer sheet and downloads complete copies of the easement to the local computer network.

With the adoption of land use assessment and taxation in 2008, agricultural, horticultural, forest, and open space lands with conservation easements in Essex County are to be assessed using the land use values established during each reassessment year. The CoR received

Chapter Focal Points:

- *Essex is a land use county.*
- *The Clerk flags easements on the monthly transaction sheet given to the CoR.*
- *Essex CoR has made changes to his approach in devaluing conservation easements within the county. Such charges will lower the TVLB reported to the VaTAX and will therefore benefit through State aid for education.*
- *Essex County has approximately 12,343.81 acres under conservation easement. This equates to a $115,288 loss of tax revenue.*
- *Essex County has approximately 1,170.18 acres of land held by tax exempt entity for conservation purposes. This equates to approximately $14,790 in lost tax revenue.*
- *Essex consists of approximately 13,514 acres of conserved lands which equates to a loss of $130,078 in total tax revenues annually. This represents 0.44% of the county's budget for 2009-2010.*

guidance about devaluing fair market assessments for conservation easements through a certification course "Land Use Taxation" presented through the University of Virginia Weldon Cooper Center for Public Service and sponsored by the Commissioners of the Revenue Association of the Commonwealth of Virginia. The CoR also used other sources of information such as the International Association of Assessing Officers (IAAO), as well as the publication *Appraising Easements – Guidelines for Valuation of Land Conservation and Historic Preservation Easements*, Third Edition, published by the Land Trust Alliance in cooperation with the National Trust for Historic Preservation.

Local Findings

Essex County's CoR has recently documented all open-space easements, including both conservation and historic easements, and has systematically lowered the fair market values of those properties using open space use values. Because the majority of these properties were already in the land use program, the annual tax loss does not change much – it simply goes from being tax deferred to being a perpetual loss. Using the land use values significantly lowers the fair market values of perpetually eased property and has a direct influence on the total true value of the land book and hence the Composite Index. Therefore, conservation easements lower assessed values and ultimately increase the level of state aid for K-12 school funding to a locality.

It was found that Essex County has approximately **12,343.81 acres** of land with conservation easements, and in using their current land use rates for lands, Essex County would **lose approximately $115,288 in tax revenue due to easements**.

In conjunction with assessing the fiscal impacts of conservation easements, MPPDC staff also considered the fiscal impacts of fee simple land ownership by tax-exempt organizations for conservation purposes. With approximately **1,170.18 acres** of land in the county owned by tax-exempt organizations, this equates to approximately a **$14,790 loss of tax revenue**.

Therefore when conservation easements and lands owned by tax-exempt organization are looked at together, the county consists of approximately **13,514** acres of conserved lands which equates to a **loss of approximately $130,078 in total tax revenues** annually. This represents **only 0.44%** of the county's $29,289,038 budget for 2009-2010.

Quantitative Summary of results from Essex County

This provides an overview of the county's recognition of conservation easements as well as tax-exempt conservation land holdings and their fiscal impacts to the county.

Acres under Conservation Easements	12,343.81
Acres held by Tax-exempt Conservation Entities	1,170.18
Acres Conserved Total	13,514.00
Devaluation due to Conservation Easements	$18,594,806
Devaluation due to Tax-exempt Conservation Land Holdings	$2,385,480
Total Devaluation	$20,980,286
Tax Revenue Loss due to Conservation Easements	$115,288
Tax Revenue Loss due to Tax-exempt Conservation Land Holdings	$14,790
Total Tax Revenue Loss	$130,078
Percentage of the County's Budget	**0.44%**

D. King William County

Upon recordation of a conservation easement in King William County, an attorney or landowner will go to the clerk's office with prepared easement papers. The clerk will then enter and scan information into the county's computer system. Depending on how the easement papers are prepared, the clerk will label it accordingly (ie. Deed of Easement; Deed of Gift; Deed of Bargain Sale). The landowner/attorney will also provide a copy of the plat at the time of recordation which must be sign-off by the King William County Planning Department. Once signed, the plat will be recorded by the clerk. After recording, the plat is returned to the landowner but the landowner/attorney is then expected to provide one copy of the recorded plat to the planning department and another copy of the recorded plat to the CoR.

The attorney/landowner will pay a recordation fee, if applicable. The clerk will then create a receipt for the attorney/landowner. The information scanned into the computer will appear on the monthly transaction sheet generated by the clerk and is then given to the CoR. Conservation easements are not flagged on this sheet.

The CoR will review the monthly transaction sheet as well as a copy of the plat from the landowner/attorney. Reviewing the transaction sheet is typically the first time that the CoR will know that a property is going into a conservation easement and even then the transaction sheet did not give the CoR any indication of an easement. On rare occasions a landowner may call with questions

Chapter Focal Points:

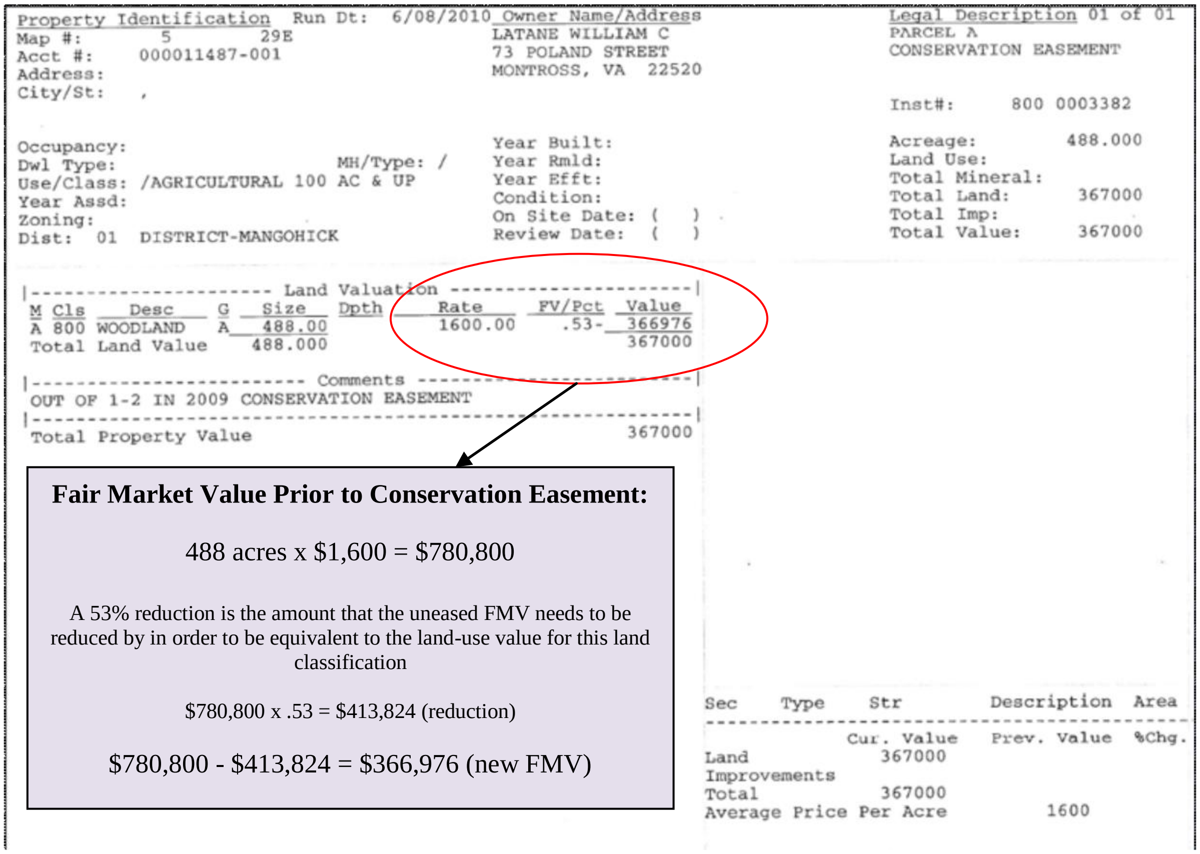
- *King William is a land use county.*
- *King William requires a plat signed by the county's planning department with easement documents.*
- *The transaction sheet is the first time the CoR becomes aware of a conservation easement.*
- *Upon review of the transaction sheet the CoR will reduce the fair market value of the property and inform the landowner of changes.*
- *King William has approximately 6,729.3 acres of land with conservation easements, which equates to a tax revenue loss of $59,893 due to easements.*
- *King William has approximately 2,630.09 acres of land in the county owned by tax exempt organizations, this equates to approximately $53,500 loss of tax revenue.*
- *King William consists of approximately 9359.39 acres of conserved lands which equates to a total tax revenue loss of $113,393 annually. This represents 0.54% of the county's budget for 2009-2010.*

regarding tax benefits of conservation easement which provides some notification of a conservation easement prior to recordation.

Local Findings

The majority of lands currently under conservation easement were previously in the use program, so there is no change in the assessed value and therefore no change in tax liability. However, when a property is in the land use program the reduced land use value is considered a deferral of tax revenues, while with conservation easements this reduction is considered a permanent loss to the county due to its perpetual nature.

As a land use county, King William reduces the fair market value of a property of the easement based on the land use rates of the county (Figure 4). The land use rates are based on the values established by SLEAC (State Land Evaluation and Advisory Council), however are adjusted through a "Budget Plug Approach." In other words the county will generate land use values that will allow King William County to meet the budgetary needs for the fiscal year.



Property Identification Run Dt: 6/08/2010
Map #: 5 29E
Acct #: 000011487-001
Address:
City/St: ,

Owner Name/Address
LATANE WILLIAM C
73 POLAND STREET
MONTROSS, VA 22520

Legal Description 01 of 01
PARCEL A
CONSERVATION EASEMENT

Inst#: 800 0003382

Occupancy:
Dwl Type: MH/Type: /
Use/Class: /AGRICULTURAL 100 AC & UP
Year Assd:
Zoning:
Dist: 01 DISTRICT-MANGOHICK

Year Built:
Year Rmld:
Year Efft:
Condition:
On Site Date: ( )
Review Date: ( )

Acreage: 488.000
Land Use:
Total Mineral:
Total Land: 367000
Total Imp:
Total Value: 367000

Land Valuation

M	Cls	Desc	G	Size	Dpth	Rate	FV/Pct	Value
A	800	WOODLAND	A	488.00		1600.00	.53-	366976
Total Land Value				488.000				367000

Comments
OUT OF 1-2 IN 2009 CONSERVATION EASEMENT

Total Property Value 367000

Fair Market Value Prior to Conservation Easement:

488 acres x $1,600 = $780,800

A 53% reduction is the amount that the uneased FMV needs to be reduced by in order to be equivalent to the land-use value for this land classification

$780,800 x .53 = $413,824 (reduction)

$780,800 - $413,824 = $366,976 (new FMV)

Sec	Type	Str	Description	Area

	Cur. Value	Prev. Value	%Chg.
Land	367000		
Improvements			
Total	367000		
Average Price Per Acre		1600	

Figure 4: Property Card for King William Parcel under conservation easement. The reduced fair market value of the land is documented on the card, however the original fair market value is not. In the blue box above a simple calculation may be complete to gather the original fair market value of the property. In this particular example there was a 53% reduction in FMV, however this percentage may vary between lands with conservation easements.

The reduction in fair market value occurs upon notice of the conservation easement through the transaction sheet, while tax liabilities due to the changes become effective the following year. The only time a landowner is informed about the change in tax liability is during the reassessment period. To date, notices have not been sent to inform landowners with conservation easements of the change in tax liability since the Commissioner believed that all these lands are in the land use program – therefore there are no changes made with regard to the reduction of fair market value. According to the CoR, she received guidance for devaluing the fair market value through a Land Use Class sponsored by the Commissioner of Revenue Association as well as from the VA Code.

Consequently it was found that King William County has approximately **6,729.3 acres** of land with conservation easements, and in using the current fair market value devaluation methods, King William County is **losing $59,893 in tax revenue due to easements.**

In conjunction with assessing the fiscal impacts of conservation easements, MPPDC staff also considered the fiscal impacts of fee simple land ownership by tax-exempt organizations for conservation purposes. With approximately **2,630.09 acres** of land in the county owned by tax-exempt organizations, this equates to approximately **$53,500 loss of tax revenue.**

Therefore when conservation easements and lands owned by tax-exempt organization are looked at together, the county consists of approximately **9359.39 acres** of conserved lands and a total tax revenue loss of approximately **$113,393 in total tax revenues** annually. This represents **only 0.54%** of the county's $20,851,240 budget for 2009-2010.

Quantitative Summary of results from King William County

This provides a summary of the county's recognition of conservation easements as well as tax-exempt conservation land holdings and their fiscal impacts to the county.

Acres under Conservation Easements	6,729.3
Acres held by Tax-exempt Conservation Entities	2,630.09
Acres Conserved Total	9,359.39
Devaluation due to Conservation Easements	$7,394,152
Devaluation due to Tax-exempt Conservation Land Holdings	$6,604,942
Total Devaluation	$13,999,094
Tax Revenue Loss due to Conservation Easements	$59,893
Tax Revenue Loss due to Tax-exempt Conservation Land Holdings	$53,500
Total Tax Revenue Loss	$113,393
Percentage of the County's Budget	**0.54%**

King & Queen County

Upon recordation of a conservation easement in King & Queen County, an attorney or landowner will go to the clerk's office with prepared easement papers. The clerk will then enter and scan easement documents into the computer. On occasion, a plat of the property being eased will supplement the conservation easement documents, but it is not required for recordation. The attorney/landowner will then pay a recordation fee, if applicable. Next the clerk will provide a receipt to the attorney/landowner for the transaction. The information scanned into the computer will appear on the monthly transaction sheet generated by the clerk. The clerk does not specifically flag conservation easements.

The CoR will receive a copy of the transaction sheet along with a folder of deeds associated with the transactions that occurred that month. In addition to the deed of easement, a survey of the property in typically included. Currently, the Commissioner has a folder dedicated to conservation easements in her office. Although this folder is not accessible by the public, it is used specifically for her own records as well as the Board of Supervisors.

The CoR reduces the fair market value of the property during the review of the transaction sheet each month. Once adjustments are made to the fair market value the CoR will send a letter to the landowner that explains the tax liability changes. To date there have been no contests.

As a non-land use county, VA Code does not prescribe an approach to reducing the fair market value of land under

Chapter Focal Points:

- *King & Queen is a non-land use county.*
- *CoR becomes aware of an easement during her review of the monthly transaction sheet.*
- *CoR reduces the FMV of lands with conservation easements by 25%. However there are some inconsistencies.*
- *King & Queen County has approximately 14,906.45 acres of land with conservation easements, which equates to a $14,953 loss in tax revenue due to easements.*
- *King & Queen has approximately 12,971.25 acres of land in the county owned by tax exempt organizations, which equates to $64,161 loss of tax revenue.*
- *King & Queen consists of approximately 27,877.7 acres of conserved lands which equates to a loss of approximately $79,114 in total tax revenues annually. This represents 0.39% of the county's budget for 2009-2010.*

conservation easement. Therefore in King & Queen County CoR has chosen to consistently and equitably reduce the fair market value of lands under conservation easement 25%. This 25% reduction is clearly shown on the property card. The CoR explained that a 25% reduction is used since this was the approach utilized by the assessor during the last reassessment in King & Queen.

Local Findings

Consequently it was found that King & Queen County has approximately **14,906.45 acres** of land with conservation easements, and in using the current fair market value devaluation methods, King & Queen County is **losing $14,953 in tax revenue due to easements.**

In conjunction with assessing the fiscal impacts of conservation easements, MPPDC staff also considered the fiscal impacts of fee simple land ownership by tax-exempt organizations for conservation purposes. With approximately **12,971.25 acres** of land in the county owned by tax-exempt organizations, this equates to approximately **$64,161 loss of tax revenue**.

Therefore when conservation easements and lands owned by tax-exempt organization are looked at together, the county consists of approximately 27,877.7 acres of conserved lands which equates to a **loss of approximately $79,114 in total tax revenues** annually. This represents **only 0.39%** of the county's $20,194,124 budget for 2009-2010.

Quantitative Summary of results from King & Queen County

This provides a summary of the county's recognition of conservation easements as well as tax-exempt conservation land holdings and their fiscal impacts to the county.

Acres under Conservation Easements	14,906.45
Acres held by Tax-exempt Conservation Entities	12,971.25
Acres Conserved Total	27,877.7
Devaluation due to Conservation Easements	$3,115,224
Devaluation due to Tax-exempt Conservation Land Holdings	$13,334,709
Total Devaluation	$16,449,933
Tax Revenue Loss due to Conservation Easements	$14,953
Tax Revenue Loss due to Tax-exempt Conservation Land Holdings	$64,161
Total Tax Revenue Loss	$79,114
Percentage of the County's Budget	**0.39%**

E. Mathews County

Upon recordation of a conservation easement in Mathews County, an attorney or landowner will go to the clerk's office with prepared easement papers. The clerk will then enter and scan information into the computer. The attorney/landowner would then pay a recordation fee, however never if the entity is tax-exempt a recordation fee is not paid. The clerk will then create a receipt for the attorney/landowner.

Since a conservation easement is not a transfer of title, it does not appear on the monthly transaction sheet from the Clerk's office. Therefore Mathews County currently does not track right-of-ways and/or easements. Prior to recordation of the easement, appraisers typically come into the CoR's office to conduct property research and at that time the CoR becomes aware that a conservation easement is being prepared. However the CoR only truly becomes aware of a conservation easement if the landowner or representative informs the CoR of the recordation. Due to the small volume of conservation easements within the county, it is more economically feasible for taxpayer to provide information for an assessment adjustment rather than the CoR to take his time to reconcile the public record.

Once CoR is informed of the recordation of a conservation easement he will look to see if a before and after appraisal was complete. He will then use this appraisal to make adjustments to the assessed value of the property. As a small community, the Mathews County CoR has a close relationship with most of the appraisers within the county

Chapter Focal Points:

- *Mathews is a non-land use county.*
- *According to the CoR, the impacts of conservation easements are negligible to Mathews.*
- *Monthly transaction sheet does not include conservation easements.*
- *Land owners with conservation easements must apply for tax incentives. This responsibility is placed on the landowner due to the small volume of easements within the county. CoR will inform the land owner of all changes to owner of the change to tax liability.*
- *Mathews County has approximately 341 acres of land with conservation easements, which equates to a $1,107 loss in tax revenue due to easements.*
- *Mathews has approximately 257.97 acres of lands in the county owned by tax exempt organizations, this equates to an approximate $1,836 loss of tax revenue.*
- *The county consists of approximately 598.97 acres of conserved lands which equates to a loss of $2,942 in total tax revenues annually. This represents 0.01% of the county's budget for 2009-2010.*

and in most cases he personally knows the appraiser. Thus he trusts the appraisals and considers them legitimate. If an appraisal comes in from unknown appraiser, outside of his knowledge base, the CoR will do some research to judge the validity of the appraisal. If the CoR does not have a copy of the appraisals he will call the easement holder/ land holder and ask for a copy of the appraisal if the landowner has requested a reduction in the tax liability. After the landowner requests a reduction in tax liability, the CoR will reduce the fair market value and will inform the landowner of the change to tax liability. To date there have been no contests.

According to the CoR, he has received limited guidance for devaluing the fair market value of a property with a conservation easement, however the current methodology for reducing the fair market value is consistent and works for Mathews County; therefore it is supported by the VaTAX.

Local Findings

According to the CoR, the impacts of conservation easements are negligible to Mathews. Since most of the currently eased lands are wetlands this does not have a significant impact to county revenues. Eased lands may, however, have an impact on future revenues if the ability to develop marginal lands changes.

Consequently it was found that Mathews County has approximately **341 acres** of land with conservation easements, and in using the current devaluation methods, Mathews is **losing approximately $1,107 in tax revenue due to easements**.

In conjunction with assessing the fiscal impacts of conservation easements, MPPDC staff also considered the fiscal impacts of fee simple land ownership by tax-exempt organizations for conservation purposes. With approximately **257.97 acres** of land in the county owned by tax-exempt organizations, this equates to an approximate **$1,836 loss of tax revenue**.

Therefore when conservation easements and lands owned by tax-exempt organization are looked at together, the county consists of approximately **598.97 acres** of conserved lands which equates to a **loss of approximately $2,942 in total tax revenues** annually. This represents **only 0.01%** of the county's $22,206,678 budget for 2009-2010.

Quantitative Summary of results from Mathews County

This provides a summary of the county's recognition of conservation easements as well as tax-exempt conservation land holdings and their fiscal impacts to the county.

Acres under Conservation Easements	341.00
Acres held by Tax-exempt Conservation Entities	257.97
Acres Conserved Total	598.97
Devaluation due to Conservation Easements	$197,600
Devaluation due to Tax-exempt Conservation Land Holdings	$327,800
Total Devaluation	$525,400
Tax Revenue Loss due to Conservation Easements	$1,107
Tax Revenue Loss due to Tax-exempt Conservation Land Holdings	$1,836
Total Tax Revenue Loss	$2,942
Percentage of the County's Budget	0.01%

VI. Regional Summary

Overall, each county within the Middle Peninsula had a different approach to addressing conservation easements – from recordation, to reducing the property's fair market value to reporting the total land book value to the VaTAX. In working with each CoR, MPPDC staff were able educate CoRs as to the implications of current practices and presented opportunities to fiscally benefit from conservation easements.

Middle Peninsula localities that have adopted the land use program, including Gloucester, Middlesex, King William and Essex Counties, are prescribed by Va Code to assess and tax lands under conservation easements based on county land use rates. While non land use counties, including Mathews and King & Queen Counties have less guidance regarding the assessment of eased lands and seem to utilize practices that are applied consistently (eg. such as using land use value in an adjacent county with a land use program or using the value determined in the appraisal conducted during the easement process, or doing a flat 25% reduction).

During the first phase of this project to understand how counties consider conservation easements, MPPDC staff found that each county could improve in two areas:

1. Accounting for all conservation easements within their jurisdiction, and
2. Consistently reduce the fair market value of conservation easements.

Table 2 provides a comprehensive overview of conservation easements, tax-exempt land holdings for conservation purposes and their fiscal impacts to each county within the Middle Peninsula.

In working with each CoR, each county has either made changes in the manner they address conservation easements, or are aware of the changes that need to be made that will benefit the county in the composite index and therefore State aid for education.

Table 2: This provides a summary of the all the Middle Peninsula counties' recognition of conservation easements as well as tax-exempt conservation land holdings and their fiscal impacts to the county.

	Acres under Conservation Easements	Acres held by Tax-exempt Conservation Entities	Acres Conserved Total	Devaluation due to Conservation Easements	Devaluation due to Tax-exempt Conservation Land Holdings	Total Devaluation	Tax Revenue Loss due to Conservation Easements	Tax Revenue Loss due to Tax-exempt Conservation Land Holdings	Total Tax Revenue Loss	Percentage of the County's Budget
Middlesex	4,291.00	521.00	4,812.00	$10,793,682	$1,550,832	$12,344,514	$37,778	$5,428	$43,206	.18%
Gloucester	1,010.02	3,114.95	4,124.97	$5,587,222	$2,893,000	$8,480,222	$32,406	$16,779	$49,185	.0005%
Essex	12,343.81	1,170.18	13,514.00	$18,594,806	$2,385,480	$20,980,286	$115,288	$14,790	$130,078	.44%
King William	6,729.3	2,630.09	9,359.39	$7,394,152	$6,604,942	$13,999,094	$59,893	$53,500	$113,393	.54%
King and Queen	14,156.45	12,971.25	27,127.70	$3,115,224	$13,334,709	$16,449,933	$14,953	$64,007	$78,960	.39%
Mathews	341.00	257.97	598.97	$197,600	$327,800	$525,400	$1,107	$1,836	$2,942	.01%
Regional Total	38,872	20,665	59,537	$45,959,290	$27,096,763	$73,056,053	$262,974	$156,340	$419,313	-

VII. Fiscal Impacts and Community Benefits of Conservation Efforts

Within the Middle Peninsula, each county's comprehensive plan has seemingly similar visions to preserve rural character through the preservation/conservation of open space, agricultural land, and forest land (Appendix 1). To promote this goal conservation easements and fee simple land acquisitions become a viable land management tool. Although such tools have fiscal impacts to localities, conservation efforts and preservation of rural character have social, economic and environmental benefits to the region.

Social Benefits

Historically the Middle Peninsula has had a rich natural resource based economy, focused on silviculture and agriculture. However through recent decades, as the region transitions from being rural to more suburban, development threatens agriculture fields and timber lots. Therefore conservation efforts have preserved regionally significant lands ideal to continue forestry and agriculture practices, thus supporting traditional natural resource based industries. In particular conservation easements, which provide landowners tax benefits, also afford farmers the opportunity to keep family farms within the family. Residents of the region may also enjoy the assets of conservation efforts, including scenic vistas and outdoor spaces, which have been known to contribute to the physical and mental well-being of individuals, and the development of social communities.

Environmental Benefits

In maintaining open space and conserving agriculture and forestry lands, the ecological integrity is preserved. Besides providing wildlife habitat, these lands are buffers to the waterways (ie. Dragon Run and the Chesapeake Bay) throughout the region, thereby acting as a best management practice in helping to promote water quality.

Economic Benefits

As previously discussed in this report, the amount of state aid for education that a locality receives is highly dependent upon the total fair market value of its real estate.

Commissioners of Revenue that begin to account and consistently reduce the fair market value of **all** lands under conservation easements within their jurisdictions will observe a reduction in the true value of land book (TVLB) reported to VaTAX which will directly impact and reduce the True Value of Property (TVP) for the Composite Index. Consequently with a reduction of the TVP the composite index will decrease which represents an increase in the amount of state aid received for education by the locality. In particular, by comprehensively accounting and consistently reducing the total fair market value of land under conservation easements, Middle Peninsula localities will potentially have additional reductions in their TVLB (Table 4).

Table 4: Potential additional reductions in the Total Value of Land book (TVLB) due to conservation easements and tax-exempt land holdings, and the impact to True Value of Property for Middle Peninsula Localities.

County	Devaluation due to easements	VaTAX Sales Study Ratio	True Value of Property
		*NOTE: the VaTAX Sales Study Ratio is applied to the TVLB in order to generate the True Value of Property	
Middlesex	$10,793,682	79.53%	$13,571,837
Gloucester	$5,587,222	85.11%	$6,564,707
Essex	$18,594,806	95.23%	$19,526,206
King and Queen	$3,115,224	70.00%	$4,124,491
King William	$7,394,152	89.89%	$10,563,074
Mathews	$197,600	62.56%	$123,619

Local government may also receive "Payments in Lieu of Taxes" (or PILT) are Federal payments that help offset losses in property taxes due to nontaxable Federal lands within their jurisdiction. The payments are made annually for tax-exempt Federal lands administered by the BLM, the National Park Service, the U.S. Fish and Wildlife Service (all agencies of the Interior Department), the U.S. Forest service (part of the U.S. Department of Agriculture), and for Federal water projects and some military installations. PILT payments may be used for any governmental purpose relative to public safety, environment, housing, social series and transportation. According to the formula established by the PILT law, there are three categories of entitlement lands:

- Federal lands in the National Forest System and the National Park System, lands administered by BLM, lands in Federal water resource projects, dredge areas maintained by the U.S. Corps of Engineers, inactive and semi-active Army installations, and some lands donated to the Federal government (section 6902 payments)
- Federal lands acquired after December 30, 1970, as additions to lands in the National Park System or National Forest Wilderness Areas (section 6904 payments)
- Federal lands in the Redwood National Park or lands acquired in the Lake Tahoe Basin near Lake Tahoe under the Act of December 23, 1980, (Section 6904 or 6905 payments).

For example Essex County receives approximately $7,000 annually in PILT from US Fish and Wildlife Services for the Rappahannock River Valley Natural Wildlife Refuge. In addition to the federal government, within the Commonwealth of Virginia the Virginia Department of Forestry (DOF) will make payments in lieu of taxes to counties. Every 10 years DOF inventories forests throughout the state and develops plans that establish harvest levels, which determine income. Twenty-five percent of the gross income is returned to the county where the forest is located. More specifically in 2009-2010 King & Queen County received $11,317.93 from DOF, while King William County received $31,101.84. Now when taking into consideration the tax revenue losses accrued due to the fee-simple land ownership of lands by tax-exempt entities for conservation purposes, DOF revenues to the county reduces the overall loss of taxes due to conserved lands (Table 6).

Table 6: Revenues received by King & Queen and King William County from DOF for timber sales (DOF, 2009).

County	Taxes lost due to fee simple land ownership by tax-exempt entities	Revenues Received from DOF	Net Tax Loss
King & Queen	$64,161	$11,317.93	$52,843.07
King William	$53,500	$31,101.84	$22,398.16

Furthermore when considering a community's future land use, local elected official must weigh the social, fiscal and environmental implications of their choices that fit best into their community. Yet with each type of land use there is a price of public services that must be provided (Table 7). In 2006, the American Farmland Trust Conducted a study that focused on the cost of community services to three types of land uses: (1) residential including farm houses, (2) Commercial and Industrial, and (3) Working and open land. According to the study,

> "While it is true that an acre of land with a new house generates more total revenue than an acre of hay or corn, this tells us little about a community's bottom line. In areas where agriculture or forestry are major industries, it is especially important to consider the real property tax contribution of privately owned working lands. Working and other open land may generate less revenue than residential, commercial or industrial properties, but they require little public infrastructure and few services."

Overall working lands generate more public revenues over a 20 year period than they receive back in public services, whereas on average residential and land uses do not cover their costs, and must be subsidized by other community land uses. Therefore conserving farms and forest is one of the strategies a county can use to reduce the pressure on their budget and tax rate from the increasing costs of resident development. Table 7 presents average costs of services to residential (ie. farm houses), commercial and industrial, and working and open land uses in Virginia. These numbers suggest that the cost of servicing residential land uses is 69% higher than servicing working and open land.

Table 7: Revenue-to-Expenditure ratios in Dollars for average costs of services to residential, commercial and industrial, and working and open land uses in Virginia (American Farmland Trust, 2006).

Residential including farm houses	Commercial & Industrial	Working & Open Land
$1.00 : $1.19	**$1.00 : $0.29**	**$1.00 : $0.37**
For every dollar of revenue the county will spend "x" amount of money		

Other Easements and Public Holdings

Beyond conservation easements localities may be fiscally impacted by a variety of other easements. Through the Virginia Historic Preservation Easement Program landowners have the option of utilizing historic easements to protect historic landmarks to enjoy long-term legal protection while remaining in private ownership. Private landowners that take advantage of this program are provided the same tax benefits as landowners with conservation easements. For instance, in King William County is one particular 581.56 acre historic easement that had its fair market value reduced by 52%, which equates to a loss of $5,922 in tax revenue annually. Table 6 lists the total number of acres with historic easements in each Middle Peninsula County.

Table 3: Total number of acres under historic easements within each Middle Peninsula County (Department of Historic Resources, 2010).

County	Acreage
Gloucester	442.55
Mathews	.85
King & Queen	.11
King William	2120.2
Middlesex	25.70
Essex	525.8
Total Acreage	3115.21

Another example of an easement that may impact the value of a property is a utility easement. Utility easements are strips of land used by utility companies to construct and maintain overhead electric, telephone and cable television lines and underground electric, water, and sewer, telephone, and cable television lines. The type of use and frequency of this right-of-way use will determine the impact to property value, if at all.

Additionally many of the tax-exempt entities that own lands for conservation purposes are external to the county, including DCR, TNC, DGIF, etc, each county has its fair share of exempt entities that ultimately have an impact on county revenues. For example county buildings, including the courthouses, schools, office buildings and post offices, are all exempt from taxes. Also churches and civic groups are tax-exempt. Additionally since much of the Tidewater, Virginia area is flat and borders the Chesapeake Bay, numerous rivers, inlets, marshes, and creeks as well as located in the floodplain. It is important to help provide protection from the flooding. Therefore the Federal Emergency Management Agency (FEMA) offer financial assistance to qualified local governments to acquire parcels of lands that will help mitigate local flooding. For instance in Gloucester County owns approximately 62.1266 acres of multiple parcels. As a political subdivision, Gloucester County is tax-exempt and therefore fiscally impacts the county. For a complete list of tax-exempt entities please refer to Article X. Sec, 2, Par. 6 of Virginia Constitution (Appendix 4). Within each county however, a community group/entity may also request tax-exempt status through the County's Board of Supervisors who has ability to grant tax exemption to a group they deem qualified.

VIII. Reported Needs

Through phase I of this project, MPPDC staff were able to work with Middle Peninsula Commissioners of Revenue to develop recommendations that (1) promote consistency between counties regarding assessment of easements/land holdings by tax-exempt organizations and (2) promote consistency between counties regarding easements/land holdings by a tax-exempt organization and their impact to the composite index. Consistent methodologies between counties present an equitable opportunity to receive appropriate state educational funding by accurately accounting for all land management tools (ie. conservation easements) and transactions utilized within their jurisdiction as well as their fiscal impacts. Additionally localities will gain a uniform understanding and knowledge base pertinent to address conservation easements and tax-exempt land holdings for conservation in the future.

Recommendations and Considerations:

1. To promote consistency between counties regarding assessment of easements/land holdings by a tax-exempt organization:
   - When localities are hiring an assessment firm, a locality should require a provision within the assessment firm's contract that focuses on how easements will be addressed and valued during reassessment of the property.

   - The Commissioners of Revenue recommend that continuing education classes to introduce and educate elected officials, county staff, and Commissioners of Revenues about Conservation Easements. Particularly, describe what are they, their fiscal impacts, relationship to State Funding for education (ie. composite index), and relative legislation;

   - Commissioners of Revenue need information on various types of easements and associated encumbrances that will aid to streamline property assessment approaches across the region and/or throughout the Commonwealth;

   - This report has provided a list of all easements through September 30, 2010, however there is a need to maintain and update this list in order to provide to county assessors. This list will inform the assessment of the encumbered property and aid in the consistent accountability and devaluation of lands with conservation easements.

- Local conservation organizations should work closely the with Commissioners of Revenue to become aware of local conservation easement initiatives or fee simple acquisitions that have fiscal impacts. This will assist in future fiscal planning and budgeting for the locality.

- The Virginia State Supreme Court should consider adding Conservation Easements to the transaction category list for recording purposes that will improve accountability and searchability of easement documents throughout the Commonwealth;

- Clerk of the Circuit Court from localities should flag conservation easements on monthly transaction sheets to inform the Commissioner of Revenue of this transaction and to reduce the fair market value of the property due to the encumbrance. Once flagged the Commissioner and the Clerk of Court should develop and/or improve the tracking/labeling of digital records that clearly identifies easements to improve accountability and searchablilty of easement documents for county staff and constituents;

2. To promote consistency between counties regarding easements/ land holdings by a tax-exempt organization and their impact on the composite index:
   - The Virginia Association of Assessing Officers should develop educational activities for Commissioner of Revenue to address the fiscal impacts of easements and land holdings by tax-exempt organizations. Particular with regards to the composite index;

   - The Virginia Association of Assessing Officers should develop outreach material directed to Commissioners of Revenues and County Administrators that focus on how the total value of land book reported to the VaTAX impacts the Composite Index generated by Virginia Department of Education to provide consistent information.

IX. Conclusions

As land conservation efforts, through the utilization of conservation easements and/or fee simple land acquisitions become more commonly used, localities need to refine approaches and methodologies in handling these land management/ownership changes. MPPDC staff continues to work with Middle Peninsula Commissioners of Revenue to improve current practices in approaching conservation easements –from recordation of a conservation easement, to reducing the property's fair market value to reporting the total land book value the Virginia Department of Taxation. Finding of this project will become the foundation for phase II of this project.

During phase II, which will begin in October 2010, MPPDC staff will focus on the generating dialog and facilitating discussion amongst a variety of stakeholders on the relationship between land conservation, land use policy, and fiscal impacts to the localities. The quantitative results generated during Phase 1 will supplement and support the discussions during Phase 2 with hopes of developing a matrix of policy options and recommendations to address land conservation and its local fiscal impact.

PROJECT FINDINGS -

- The tax revenue impact of conservation easements is less than 0.54% of any given Middle Peninsula locality's annual budget.
- Easements lower land value and help the composite index.
- Schools receive more state aid funding because of easements.
- Localities receive revenues from timbered lands on state forests.
- Working and other open land may generate less revenue than residential, commercial or industrial properties, but they require little public infrastructure and few services.
- Rural character is preserved through the conservation of open space, forestal, and agricultural lands that also support the region's traditional natural resource based economy.
- Commissioners of Revenue are inconsistent when addressing conservation easements.
- Commissioners of Revenue have changed reporting practices because of this work.

Appendix 1 - County Comprehensive Plan Language Relevant to land conservation and preservation

MIDDLESEX County

County Wide:
-The citizens will continue to place high priority on maintaining the rural nature of the territory while accommodating desirable new development. (pg. 17)

-The rural nature of the County, which combines watercourses, forests, and fields, provides ideal circumstances for quality wildlife habitats and biological diversity (pg. 55)

-to preserve agricultural/open space land or release it to unrestrained development. Agriculture is a land use activity which has supported Middlesex economically for generations. Furthermore, it may be even more important to recognize that agricultural lands are a major element of the open space which defines the rural nature of the County. This particularly visible component of the country scene contributes directly to the quality of life and satisfaction its residents enjoy.(pg.104)

-First, highest priority must be placed on the preservation of the rural character of the County. As defined, the rural character includes natural and open spaces between concentrations of activities. (pg. 105)

-the County should adopt and or promote additional methods of land conservation.(pg. 123)

-Enhance the rural and environmental character of the County through the preservation of agricultural and forestall lands, wetlands, flood hazard areas, and Chesapeake Bay Resource Protection Areas (pg. 136)

Within the Dragon Run Watershed:
-Low intensity land uses that are consistent with the conservation of the area's natural resources should be the dominant land uses in the Watershed and new development should be compatible with surrounding rural areas as well as incorporate development standards and management practices that ensure protection of the area's natural resources (pg.111)

*- The County should consider implementation strategies that preserve existing land uses and protect the natural resources in the Watershed such as conservation zoning and subdivision approaches, additional stream buffers and setbacks, the purchase of development rights, donation of private **easements**, landowner compacts, and land use taxation (pg. 112)*

-The County should protect the key natural resources in the Watershed, including the ground and surface water quality, wetlands, and sensitive environmental features; native plant and animal species and their natural habitats; and the productive soils that support farming and forestry uses. (pg.112)

GLOUCESTER County

-To protect the unique character and identity of Gloucester County careful management of the natural resources (pg. 17)

-To project and enhance the environmental quality and the Chesapeake Bay for present and future residents (pg. 17)

-To conserve and manage Gloucester's natural resources and community assets. Objectives: (3)to conserve prime agricultural and forested land sand guide residential, commercial and industrial development to areas suitable for urban growth, (4) to cooperate and actively work with local, regional, state, and federal environmental agencies to implement safe and effective programs and policies to protect Gloucester's natural resources and (5) to update and revise local ordinances as needed in order to protect and enhance the County's natural resources (pg.20)

- To place high priority on selective acquisition, preservation, and recreational uses of areas with natural resources.(pg. 21)

-special emphasis should be placed on the preservation of natural resources, sensitive natural areas, and waterfront areas (pg. 45)

-To protect our wetlands and natural resources from unnecessary destruction due to increased drainage, filling or construction that would hamper vegetation, water storage, erosion control, or support for plant and wildlife (pg. 71)

- balance population growth with the ability or capacity of the County to provide adequate public facilities and services while maintaining the rural nature and quality of the County. inherent to the quality of life in Gloucester county is its abundant natural environmental assets including an extensive shoreline, broad estuarine rives, forested areas, rural landscapes and waterfront vistas. (Appendix B- pg.3)

-Protect open space and groundwater recharge areas through use of existing ordinances, development and implementation of an open space plan, consideration of conservation subdivisions and incentives for open space preservation through the land use tax assessment program. (Appendix B- pg. 69)

-Use existing land use regulations and incentives to protect existing habitat for wildlife and preserve potential habitat areas for future use to preserve biodiversity in technologies and protect the County's recreation opportunities for hunting, fishing and wildlife observation. (Appendix B – pg. 71)

-Prepare a Countywide open space inventory and evaluation as baseline for an open space plan. The concept of the plan would be to evaluate as baseline for an open space plan. The concept of the plan would be to evaluate existing open space resources and provide the basis for to develop future County goals for preservation of environmentally sensitive lands and planning for the sustainable development use of the County's existing land resources consistent with the County's growth management goals. Preserve and protect open space resources as ground water recharge areas and to reduce non-point source pollution. (Appendix B – pg. 71)

ESSEX County

- Conserve farmland, forested areas, open space and rural character (pg.71)

-Protect and enhance the natural resources and environmental quality of the County through measures which protect the County's natural resources and environmentally sensitive lands and waters (pg. 74):

- *Conserve forest resources while supporting the timber harvesting industry as an important component of the County economy*
- *Protect the important natural function of floodplains within the County by limiting disturbances caused by development activity*
- *Protect important plan and wildlife habitats within the county*
- *Coordinate environmental quality protection efforts with future opportunities to establish public parks, natural recreation areas, and open spaces*

-Protect the land resources necessary to support the County's agricultural and timber harvesting industries and maintain and enhance its rural character (pg. 78):

- *Preserve the land base of productive agricultural soils in rural areas for a farming*
- *Manage and maintaining forestland resources in the County*
- *Minimize the conflicts which can occur between farm activities and residential development. Establish provisions in the Zone Ordinance which support the farmers "right to farm" in the Agricultural Preservation and country-side plan districts*
- *Encourage the implementation of soil conservation and water quality management plans, nutrient management plans and integrated pest management on all farms in the county*

-Preserve and enhance the County's rich cultural and historic heritage (ie. significant and important historic sites, properties, and structures) (pg. 79)

-Two guiding objectives of the Essex County Land Use Plan are the preservation of the County's rural character and protection of its natural resources. (pg. 87)

-The County's natural environment, its wildlife, steep slopes, masses of forest cover, riverfront and tributaries all literally define the county. As such they reflect the character and culture of the County. (pg. 118)

KING WILLIAM County

-The preservation and protection of the County's forests are of prime concern based on survey responses and comments made by citizens at public meetings. (pg. II-9)

-To minimize the reduction of vegetative cover caused by development (pg. VIIi-4)

-To preserve the large forested areas of the County (pg. VIII-5)

-To maintain and preserve rural, agricultural, environmental and historic qualities of the County (pg. VIII-5)

-To ensure that sound land use and development practices are employed and guide future development in an efficient and serviceable manner which is protective of King William County's predominantly rural and ecologically sensitive character. (pg. VIII-5)

- To ensure the continuation of forestry as an industry and the preservation and establishment of woodlands for their aesthetic and ecological value. (pg. VIII-10)

-Support programs and efforts to protect the County's prime agricultural lands from conversion to non-compatible land uses (pg. VIII-10)

- Evaluate alternative tax structures such as land use taxation as tools
to promote agricultural land preservation. (pg. VIII-11)

- Support programs and efforts to promote woodlands as one of the best preventions of soil and pollutants from entering the Bay. (pg. VIII-11)

-Support programs and efforts to preserve woodlands. (pg. VIII-11)

-Establish incentives which encourage sensitive areas to be avoided while preserving the owner's development rights of the property. Some tools that may be pursued include cluster development, protective **easements**, and limited density transfers.(pg. VIII-23)

-To protect natural wetlands and habitat areas and other environmentally-sensitive areas from loss or degradation as a result of development.(pg. VIII-27)

-To ensure that critical and unique environmental areas are protected and preserved for the general welfare of King William County citizens and marine and wildlife populations, and the enjoyment of visitors (pg. VIII-27)

-Study incentives to encourage conservation **easements**. (pg. VIII-28)

KING & QUEEN County

<u>Countywide:</u>

-Rural Atmosphere: It is the general policy of the County to maintain and preserve the rural atmosphere and scenic beauty of the County while allowing moderate and carefully managed growth. The preservation of existing agricultural and forest lands by protecting them from excessive fragmentation, development, and incompatible uses is essential, as is innovative and attractive design and thoughtful placement of both residential and commercial development. Cluster housing, village development, open space requirements, attractive landscaping, vegetative buffers, conservation ***easements****, and effective outdoor lighting and sign policy are among the tools and concepts which can make this possible. Preservation of the rural atmosphere and beauty was a major theme of both the citizen survey responses and the citizen committee reports.(pg. 2)*

- Continuation of land uses customarily associated with farming and forestry is to be permitted and encouraged in these areas. (pg.3)

- The use of conservation or similar ***easements*** *to preserve open spaces and limit fragmentation is encouraged. Land use taxation or a program for purchase of development rights would be helpful in preserving farm and forest land if economically feasible, and should be investigated.(pg.3)*

- This [Cluster and Planned Unit Development] method of development enables the owner of a large tract of agricultural or woodland to use only part of the land for development as residential lots while preserving the majority of the land for agriculture, woodland, or conservation areas. (pg.6)

<u>Within the Dragon Run Watershed</u>

-Adoption of Dragon Run Special Area Management Plan (Appendix C)

-The Mission of the Plan is to support and promote community-based efforts to preserve the cultural, historic and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed (Appendix A – pg. 13)

-A variety of tools (ie. Conservation ***easements****, PDR, Agricultural and Forestall Districts, etc) exist with which to preserve forest and farmland (Figure 3) and unique natural resources within the Dragon Run watershed. (Appendix C - pg. 18)*

MATHEWS County

-Committed leadership to managing future growth and development in a way that balances development, jobs, revenues, and public services while sustaining the rural character and special natural features of Mathews County (pg. 2)

-Increased conservation and management of large tract agriculture and forests (pg. 4)

-Preserve and protect the natural environment and resources of Mathews County, which are fundamental to the community's quality of life and prosperity. (pg. 7)

- Environmental conservation - wetlands, forests, water, soils, etc.; rising sea levels (pg. 14)

-Encourage grouped development for new housing subdivisions to preserve open space and the environment.

-Of particular importance worthy of greater conservation efforts are the maritime forests of Mathews County. These forests are important coastal habitats that are now challenged by climate change and rising sea levels (pg. 104)

- Protect the environment by promoting and encouraging the use of best management practices and riparian buffers in agriculture and forestal operations. Promote environmental stewardship among landowners and operators by actively working with them in educational efforts and incentive or recognition programs. Tie reduced land use taxation to use of effective environmental practices. Encourage landowners to consider conservation ***easements*** *for their properties. (pg. 144)*

-Where possible, conservation measures should be employed to protect natural communities and prevent investment losses in the future. (pg. 146)

-In addition, Mathews County supports preservation of land through conservation or open-space ***easements*** *(pg.151)*

-Rural Preservation/Conservation areas include public open space, natural preserves, and areas that should have carefully managed development or be conserved because of special ecosystems or natural conditions. (pg. 156)

-Amend the County Zoning Ordinance to increase lot sizes for rural agriculture and forested lands. Consider using agricultural and forestal districts to preserve the lands for production. (pg. 208)

MATHEWS COUNTY VIRGINIA

Appendix 2 – Cumulative List of Conservation Easements and Tax-exempt Land Holdings within each Middle Peninsula County

Middlesex County *(through September 2010)*

Conservation Easements		
Tax Map Number	**Easement Holder**	**Acres**
6 12	The Nature Conservancy	325.611
6 15	The Nature Conservancy	30
6 56	The Nature Conservancy	134
11 1	The Nature Conservancy	45.1
11 2	The Nature Conservancy	141.1
11 2A	The Nature Conservancy	5.8
11 29A	Virginia Outdoors Foundation-Friends of Dragon Run	203
13 6 1	Middle Peninsula Land Trust	30.91
13 6 2	Middle Peninsula Land Trust	6.8
13 6 3	Middle Peninsula Land Trust	9.6
13 6 4	Middle Peninsula Land Trust	8.9
13 6 5	Middle Peninsula Land Trust	8.5
13 6 6	Middle Peninsula Land Trust	11.5
17 53	Friends of Dragon Run	6.38
17 54	Chesapeake Bay Foundation	32.4
25 4	The Nature Conservancy	1052.87
26 75	Virginia Outdoors Foundation	399
27 63	Virginia Outdoors Foundation	171.187
27 71A	Virginia Outdoors Foundation	95.8311
29 135	Middle Peninsula Land Trust /VOF	399.79
30 128	Virginia Outdoors Foundation	37.9
30 52, 50, 51 and 47	Virginia Outdoors Foundation	32.3
35 3 and 35 3A	Virginia Outdoors Foundation	202
37 39	Middle Peninsula Land Trust	120.47
37 60	Virginia Outdoors Foundation	727.608
40 8C	Middle Peninsula Land Trust	52.38

Tax-exempt Land Holdings *(lands held without easement)*		
Tax Map Number	**Holder**	**Acres**
17 7	The Nature Conservancy	110
17 8	The Nature Conservancy	222.57
17 9	The Nature Conservancy	57.64
17 10	The Nature Conservancy	71.05
17 10B	The Nature Conservancy	186.055
17 51	The Nature Conservancy	42
42 2	The Nature Conservancy	70.1

Gloucester County *(through September 2010)*

Conservation Easements		
Tax Map Number	**Easement Holder**	**Acres**
19F(1)-A	Gloucester County - Pinebrook	2.79
19F(1)-B	Gloucester County - Pinebrook	3
19F(1)-C	Gloucester County - Pinebrook	15.28
19F(1)-D	Gloucester County - Pinebrook	58.39
19F(1)-E	Gloucester County - Pinebrook	0.31
19F(1)-F	Gloucester County - Pinebrook	7.21
19F(1)-G	Gloucester County - Pinebrook	1.28
19F(1)-H	Gloucester County – Pinebrook	47.64
19F(1)-I	Gloucester County – Pinebrook	2.68
19F(1)-J	Gloucester County – Pinebrook	3.21
19F(1)-K	Gloucester County – Pinebrook	8.8
19F(1)-L	Gloucester County – Pinebrook	0.33
19F(1)-M	Gloucester County - Pinebrook	12.29
19F(1)-N	Gloucester County – Pinebrook	1.8
19F(1)-O	Gloucester County – Pinebrook	8.11
19F(1)-p	Gloucester County – Pinebrook	1.06
19F(1)-Q	Gloucester County - Pinebrook	1.69
26(D)1-A	Gloucester County - Patriots Walk Preservation	4.82
26(D)1-B	Gloucester County - Patriots Walk Preservation	4.67
26(D)1-C	Gloucester County - Patriots Walk Preservation	16.7
26(D)1-D	Gloucester County - Patriots Walk Preservation	21.11
26(D)1-E	Gloucester County - Patriots Walk Preservation	2.77
26(D)1-F	Gloucester County - Patriots Walk Preservation	4.13
26(D)1-G	Gloucester County - Patriots Walk Preservation	4.24
26(D)1-H	Gloucester County - Patriots Walk Preservation	1.1
26(D)1-I	Gloucester County - Patriots Walk Preservation	6.07
26(D)1-J	Gloucester County - Patriots Walk Preservation	16.23
26(D)1-K	Gloucester County - Patriots Walk Preservation	108.66
26(D)1-L	Gloucester County - Patriots Walk Preservation	5.86
26(D)1-M	Gloucester County - Patriots Walk Preservation	25.44
26-96	Middle Peninsula Land Trust	10.983
26-96A	Middle Peninsula Land Trust	4.17
26-96B	Middle Peninsula Land Trust	6.84
32 92A	Virginia Outdoors Foundation	2.33
33 240	Virginia Outdoors Foundation	3.33
33 241	Virginia Outdoors Foundation	7.38
33 243	Virginia Outdoors Foundation	342.57
37-32	Virginia Outdoors Foundation	23.57
37-32A	Virginia Outdoors Foundation	1.03
37H(1)-5	Virginia Outdoors Foundation	5.07
37H(1)-6	Virginia Outdoors Foundation	5.07
37H(2)10	Virginia Outdoors Foundation	3
37H(2)9	Virginia Outdoors Foundation	5.18
40 46	Middle Peninsula Land Trust	37.24
40 48	Middle Peninsula Land Trust	28.35

40 49	Middle Peninsula Land Trust	2
40 51	Middle Peninsula Land Trust	0.25
40 52	Middle Peninsula Land Trust	5
40 53	Middle Peninsula Land Trust	2
40 54	Middle Peninsula Land Trust	3.37
40-43	Middle Peninsula Land Trust	3
40-48A	Middle Peninsula Land Trust	62.73
40-55	Middle Peninsula Land Trust	1.91
44-14	Virginia Outdoors Foundation	15.42
44-8D	Virginia Outdoors Foundation	5.52
44-9	Virginia Outdoors Foundation	4.04
53 63	Virginia Outdoors Foundation	15.34
53 63A	Virginia Outdoors Foundation	5.66
Tax-exempt Land Holdings ***(lands held without easement)***		
Tax Map Number	**Holder**	**Acres**
17 32	Gloucester County - Beaver Dam Reservoir	1472.14
38 87	Department of Conservation and Recreation	173.3
38 87A	Department of Conservation and Recreation	97.59
44 3	Department of Conservation and Recreation	159.92
45 515	Gloucester County- Woodville park	100
45 65; -64 and 44 90; -89; -88; -87	College of William & Mary - CATLETTS ISLAND	1033
46 128	Middle Peninsula Chesapeake Bay Public Access Authority	14
53 258	Virginia Institute of Marine Science (Oak Island)	30
54 2	The Nature Conservancy	194.25

Essex County *(through September 2010)*

Conservation Easements		
Tax Map Number	**Easement Holder**	**Acres**
1-1 (portion)	Virginia Outdoors Foundation	1809.46
3-30	Virginia Outdoors Foundation	90.6
4-1F	Virginia Outdoors Foundation	54.26
4-2	Virginia Outdoors Foundation	1402.3
4-2A	Virginia Outdoors Foundation	133.3
4-2B	Virginia Outdoors Foundation	165.02
4-2C	Virginia Outdoors Foundation	92.15
4-2D	Virginia Outdoors Foundation	301
4-2E	Virginia Outdoors Foundation	5
4-2F	Virginia Outdoors Foundation	110
4-2G	Virginia Outdoors Foundation	852
4-2H	Virginia Outdoors Foundation	10.092
4-3	Virginia Outdoors Foundation	954.02
4-3 (portion)	Virginia Outdoors Foundation	0
6-1F	Department of Historic Resources	46.89
9-38	Virginia Outdoors Foundation	57.5
9-40	Virginia Outdoors Foundation	19.33
9-46	Virginia Outdoors Foundation	57.5
9-28	Virginia Outdoors Foundation	59.22
10-17	Virginia Outdoors Foundation	0.52
11-17	Virginia Outdoors Foundation	173.58
12-1	Virginia Outdoors Foundation	249.76
12-1A	Virginia Outdoors Foundation	65.3
12-1-E	Virginia Outdoors Foundation	449.497
12-1-E (portion)	Virginia Outdoors Foundation	0
12-1-E (portion)	Virginia Outdoors Foundation	0
12-1-E (portion)	Department of Historic Resources	0
12-25A	Department of Historic Resources	2.614
12-25B	Department of Historic Resources	60.503
13-1C (portion)	Virginia Outdoors Foundation	98
13-1D	Virginia Outdoors Foundation	31.5
13-1E	Virginia Outdoors Foundation	76.09
13-11	Virginia Outdoors Foundation	148.25
13-18	Virginia Outdoors Foundation	278.838
13-28	Virginia Outdoors Foundation	261.85
14-1 (portion)	Virginia Outdoors Foundation	911.4
14-1A	Virginia Outdoors Foundation	393
14-1B	Virginia Outdoors Foundation	84.3
14-1C	Virginia Outdoors Foundation	80.9
14-1D (portion)	Virginia Outdoors Foundation	42
14-1E	Virginia Outdoors Foundation	249
14-3	Virginia Outdoors Foundation	419.2
14-4	The Nature Conservancy	208.5
14-4A	The Nature Conservancy	12.5
17-30	Virginia Outdoors Foundation	173.5

18-9	Virginia Outdoors Foundation	189
19-1	Virginia Outdoors Foundation	129
19-2	Virginia Outdoors Foundation	548.132
19-2A	Virginia Outdoors Foundation	123.5
19-79	Virginia Outdoors Foundation	76.67
19-80	Virginia Outdoors Foundation	136.7
20-3	Virginia Outdoors Foundation	454.79
20-3C	Virginia Outdoors Foundation	9.4
20-5 (portion)	The Nature Conservancy	177.5
42-16	Virginia Outdoors Foundation	56.43
42-17	Virginia Outdoors Foundation	37.7
42-21	Virginia Outdoors Foundation	41.25
42-22	Virginia Outdoors Foundation	20
42-34	Virginia Outdoors Foundation	269.6
43-6	Department of Historic Resources	95.095
43-11A	Virginia Outdoors Foundation	53.5
48-1	Middle Peninsula Land Trust	51.694
55-1-1	Friends of Dragon Run	32.02
57-3	Virginia Outdoors Foundation	46.54
61-26	US Fish and Wildlife Service	117
61-5	US Fish and Wildlife Service	101
63-2	The Nature Conservancy	35.23
63-3	The Nature Conservancy	26.18
63-5	The Nature Conservancy	342
63-6	The Nature Conservancy	16.95
Tax-exempt Land Holdings ***(lands held without easement)***		
Tax Map Number	**Holder**	**Acres**
31-5	US Fish and Wildlife Service	7.545
31-61	US Fish and Wildlife Service	719.8
37-168	US Fish and Wildlife Service	244.57
37G-1-12	US Fish and Wildlife Service	1.273
37G-1-13	US Fish and Wildlife Service	1.473
37G-1-14	US Fish and Wildlife Service	1.323
59 1	Middle Peninsula Chesapeake Bay Public Access Authority	65.6
59 1B	Department of Forestry	128.6

King William County *(through September 2010)*

Conservation Easements		
Tax Map Number	**Easement Holder**	**Acres**
52 7, 52 8, 52 9; 52 67	Virginia Outdoors Foundation	907.3
1 2	Virginia Outdoors Foundation	1070
12 24A	Virginia Outdoors Foundation	151.95
12 24G	Virginia Outdoors Foundation	10
12 24H	Virginia Outdoors Foundation	68.9
12 27A	Virginia Outdoors Foundation	5
12 28	Virginia Outdoors Foundation	25
14 11 1	Virginia Outdoors Foundation	5
14 11 3	Virginia Outdoors Foundation	5.64
14 25 and 26	Virginia Outdoors Foundation	496.51
14 25A	Virginia Outdoors Foundation	12.28
14 26A	Virginia Outdoors Foundation	15
3 2A	The Nature Conservancy	72.5
30 22	Virginia Outdoors Foundation	136.96
34 18E	Virginia Outdoors Foundation	117.3
34 8	Virginia Outdoors Foundation	378.87
37 63	Middle Peninsula Land Trust/ Chesapeake Bay Foundation	1.63
44 129A; 52 15; 52 1A-6-22-67	Virginia Outdoors Foundation	1567.24
48 32, -32A, &11A	Department of Forestry	122.71
48 33 &33B	Department of Forestry	61.92
48 34A	Department of Forestry	4.84
48 4	Department of Forestry	408.64
48 4A	Department of Forestry	1.43
5 29E	Virginia Outdoors Foundation	488
52 1A	Virginia Outdoors Foundation	46.54
53 2	The Nature Conservancy	20.64
7 24	Department of Historic Resources	581.56
7 32 A	The Nature Conservancy	97.52
part of 32 4	Natural Resource Conservation Services	430
Tax-exempt Land Holdings ***(lands held without easement)***		
Tax Map Number	**Holder**	**Acres**
15 2A	Department of Forestry - Zoars	51.5
15 6	Department of Forestry - Zoars	311.5
22 51	Department of Forestry (Zoar)	3.25
22 55	Department of Forestry (Zoar)	1
38 30	The Nature Conservancy	12.5
39 10	Department of Forestry	34.37
39 14	Department of Forestry	18.75
39 18	Department of Forestry	75
39 21	Department of Forestry/The Nature Conservancy	1090.02
39 21A	Department of Forestry	143.1
39 21B	Department of Forestry	300.9
39 7	Department of Forestry	412.9
39 9	Department of Forestry	20.3
47 42	Department of Forestry	155

King & Queen County *(through September 2010)*

Conservation Easements		
Tax Map Number	**Easement Holder**	**Acres**
1623-138L 1357	PHASE II_ The Nature Conservancy	210.5
1623-158L 765	PHASE II_ The Nature Conservancy	420
1623-158L 767	PHASE II_ The Nature Conservancy	77.75
1623-158L 771	PHASE II_ The Nature Conservancy	22.5
1623-158L 773A	PHASE II_ The Nature Conservancy	17
1623-159L 760A	PHASE II_ The Nature Conservancy	50
1623-159L 762	PHASE II_ The Nature Conservancy	91.5
1623-159L 813	PHASE II_ The Nature Conservancy	100
1623-159R 748A	PHASE II_ The Nature Conservancy	30.5
1623-159R 749	PHASE II_ The Nature Conservancy	209.25
1623-160R 706	PHASE II_ The Nature Conservancy	844.5
1623-160R 713	PHASE II_ The Nature Conservancy	12.25
1623-162L 921	PHASE II_ The Nature Conservancy	71.25
1623-162L 929	PHASE II_ The Nature Conservancy	177
1624-31L 7	PHASE II_ The Nature Conservancy	49.25
1624-31L 944	PHASE II_ The Nature Conservancy	198.75
1624-31L 961	PHASE II_ The Nature Conservancy	115.2
1624-32L 918	PHASE II_ The Nature Conservancy	58.5
1624-33L 1057	PHASE II_ The Nature Conservancy	53.5
1624-33L 1059	PHASE II_ The Nature Conservancy	23
1624-33R 809	PHASE II_ The Nature Conservancy	51.75
1624-33R 822	PHASE II_ The Nature Conservancy	68.5
1624-34L 349	PHASE II_ The Nature Conservancy	3,928.25
1624-34R 783	PHASE II_ The Nature Conservancy	151.5
1624-34R 789	PHASE II_ The Nature Conservancy	98
1624-34R 794	PHASE II_ The Nature Conservancy	102.5
1624-34R 795	PHASE II_ The Nature Conservancy	102.75
1624-35L 318A	PHASE II_ The Nature Conservancy	38.25
1624-35L 600	PHASE II_ The Nature Conservancy	624.75
1624-35L 608	PHASE II_ The Nature Conservancy	81.5
1624-35L 610	PHASE II_ The Nature Conservancy	86
1624-35R 616	PHASE II_ The Nature Conservancy	482.5
1624-35R 627	PHASE II_ The Nature Conservancy	103.5
1624-35R 628	PHASE II_ The Nature Conservancy	90
1624-35R 629	PHASE II_ The Nature Conservancy	102
1624-35R 630	PHASE II_ The Nature Conservancy	50
1624-35R 801A	PHASE II_ The Nature Conservancy	3.5
1624-50R 309	PHASE II_ The Nature Conservancy	223
1624-51R 404	PHASE II_ The Nature Conservancy	97.75
1624-51R 405	PHASE II_ The Nature Conservancy	267
1624-51R 411B	PHASE II_ The Nature Conservancy	45.75

1624-52R 547	PHASE II_ The Nature Conservancy	83.5
1624-52R 548	PHASE II_ The Nature Conservancy	25.5
1624-52R 570	PHASE II_ The Nature Conservancy	122
1624-52R 991	PHASE II_ The Nature Conservancy	242
1624-53L-72	PHASE II_ The Nature Conservancy	750
1624-53R 1000	PHASE II_ The Nature Conservancy	101.25
1624-53R 1016A	PHASE II_ The Nature Conservancy	29.5
1624-53R 547A	PHASE II_ The Nature Conservancy	48.75
1624-53R 571	PHASE II_ The Nature Conservancy	115.75
1624-53R 998	PHASE II_ The Nature Conservancy	30.25
1624-53R 999	PHASE II_ The Nature Conservancy	45
23-138L-1289	Virginia Outdoors Foundation	59.75
23-138L-1291A	Virginia Outdoors Foundation –Friends of Dragon Run	73.75
23-138L-1292	Virginia Outdoors Foundation	105.5
23-138R 1284	Virginia Outdoors Foundation –Friends of Dragon Run	47
23-138R-1281	*Transferred- current holder unknown*	251
23-139L-1302	Virginia Outdoors Foundation	54.75
23-159R-748	Virginia Outdoors Foundation	52.5
24-35R-625A	Virginia Outdoors Foundation	101
24-50L-470	Department of Game and Inland Fisheries	52
24-51L 473	Department of Game and Inland Fisheries	89.75
24-51L 475	Department of Game and Inland Fisheries	85.5
24-51L-441	Department of Game and Inland Fisheries	66.5
24-51L-441C	Department of Game and Inland Fisheries	16.75
24-51L-482A	Department of Game and Inland Fisheries	66
24-51L-489	Department of Game and Inland Fisheries	2.75
24-51L-490	Department of Game and Inland Fisheries	47
24-51L-491	Department of Game and Inland Fisheries	10
24-51L-492	Department of Game and Inland Fisheries	68
24-51L-493	Department of Game and Inland Fisheries	5.5
24-51L-494	Department of Game and Inland Fisheries	22
24-51L-495	Department of Game and Inland Fisheries	35.5
24-51L-496	Department of Game and Inland Fisheries	5
24-51L-497	Department of Game and Inland Fisheries	53.5
24-51L-498	Department of Game and Inland Fisheries	2
24-51R-372	Department of Game and Inland Fisheries	123.5
25-41R 175	Virginia Outdoors Foundation	123.25
25-41R-483	Department of Game and Inland Fisheries	369.5
25-41R-485A	Department of Game and Inland Fisheries	20
25-42L-207B	Virginia Outdoors Foundation	152.75
25-42L-313	Virginia Outdoors Foundation	192.5
25-42L-313A	Virginia Outdoors Foundation	20
25-42R-458	Department of Game and Inland Fisheries	151.5
25-44L-341	Middle Peninsula Land Trust	5.5
32-11R-244B	Virginia Outdoors Foundation	32.5

32-11R-527A	Virginia Outdoors Foundation	37.5
32-11R-528	Virginia Outdoors Foundation	35
32-11R-528A	Virginia Outdoors Foundation	21.25
32-12L-246B	Virginia Outdoors Foundation	3.5
32-12R-244	Virginia Outdoors Foundation	181.5
32-12R-245A	Virginia Outdoors Foundation	75
32-52R 145	The Nature Conservancy	50
32-58L 1060	Middle Peninsula Land Trust/Chesapeake Bay Foundation - Indian neck	113.5
32-76R-1160	*Transferred- current holder unknown*	32.75
32-76R-1161	*Transferred- current holder unknown*	35
32-76R-1162	Virginia Outdoors Foundation	156
32-76R-1162A	Virginia Outdoors Foundation	3
32-7R-1005	Virginia Outdoors Foundation	115
32-7R-1016	Virginia Outdoors Foundation	60
32-7R-1020	Virginia Outdoors Foundation	199
Tax-exempt Land Holdings ***(lands held without easement)***		
Tax Map Number	**Holder**	**Acres**
23 133L 411	Department of Forestry	120
23 133L 412	Department of Forestry	200
23 137L 1247	Department of Forestry- Dragon Run State Forest	115.5
23 137L 1249	Department of Forestry- Dragon Run State Forest	45.2
23 137L 1360	Department of Forestry- Dragon Run State Forest	159.25
23 137R 1263	Virginia Institute of Marine Sciences	121.5
23 139L 1302A	Middle Peninsula Chesapeake Bay Public Access Authority	1
23 139L 1302A1	Middle Peninsula Chesapeake Bay Public Access Authority	1
23 159L 836	Department of Forestry	24.75
23 159L 841	Department of Forestry	130.5
23 160L 1313	Department of Forestry- Dragon Run State Forest	25.75
23 160L 1314	Department of Forestry- Dragon Run State Forest	20
23 160L 1315	Department of Forestry- Dragon Run State Forest	51.75
23 160L 1372	Department of Forestry- Dragon Run State Forest	43
23 161L 1321	Department of Forestry- Dragon Run State Forest	79.75
23 161L 1427	Department of Forestry- Dragon Run State Forest	861.25
23 161L 1437	Department of Forestry- Dragon Run State Forest	220
23 161L 1437A	Department of Forestry	16.75
23 161L 1467	Department of Forestry- Dragon Run State Forest	69.75
23 161L 1468D	Department of Forestry	10.25
23 161R 1296A	Department of Forestry- Dragon Run State Forest	1616.5
23 161R 1303	Department of Forestry- Dragon Run State Forest	790.5
23 162L 1436	Department of Forestry- Dragon Run State Forest	149.75
23 162R 1241	Department of Forestry- Dragon Run State Forest	402.25
23 162R 1244	Department of Forestry- Dragon Run State Forest	162.5

23 162R 1366	Department of Forestry- Dragon Run State Forest	182.5
23 162R 1377	Department of Forestry- Dragon Run State Forest	794.25
23 32L 933	The Nature Conservancy	104.5
23 32R 828	Department of Forestry	415.25
23 63L 1147C	The Nature Conservancy	51
23 63L 1147D	The Nature Conservancy	57.25
23-139L 1297	Virginia Outdoors Foundation - Middle Peninsula Chesapeake Bay Public Access Authority	232
23-139L 1302B	Middle Peninsula Chesapeake Bay Public Access Authority	212.11
23-157L-645	Middle Peninsula Chesapeake Bay Public Access Authority -Brown Tract	62.75
23-160L 861	Virginia Outdoor Foundation- Department of Forestry- Dragon Run State Forest	17.5
23-160L 871	Virginia Outdoor Foundation- Department of Forestry- Dragon Run State Forest	37.25
23-160L-1468C	Virginia Outdoor Foundation- Department of Forestry- Dragon Run State Forest	40.5
23-160L-731	Department of Forestry- Dragon Run State Forest	42
23-160L-853	Virginia Outdoor Foundation- Department of Forestry- Dragon Run State Forest	167
23-160L-854	Virginia Outdoor Foundation- Department of Forestry- Dragon Run State Forest	273
23-160L-858	Virginia Outdoor Foundation- Department of Forestry- Dragon Run State Forest	360.25
23-160L-860	Virginia Outdoor Foundation- Department of Forestry- Dragon Run State Forest	14.75
23-63L 1138	Middle Peninsula Chesapeake Bay Public Access Authority	167.19
24 31R 1451	Department of Forestry- Dragon Run State Forest	142.5
24 31R 1452	Department of Forestry	23
24 31R 1453	Department of Forestry- Dragon Run State Forest	89
24 31R 1455	Department of Forestry- Dragon Run State Forest	279
24 31R 1457	Department of Forestry	23
24 31R 1459	Department of Forestry- Dragon Run State Forest	30
24 31R 1460	Department of Forestry- Dragon Run State Forest	91
24 31R 1462	Department of Forestry	10.5
24 31R 1463	Department of Forestry	9
24 31R 1465	Department of Forestry- Dragon Run State Forest	69
24 31R 1468A	Department of Forestry- Dragon Run State Forest	93.75
24 31R 944A	Department of Forestry	5
24 31R 961	Department of Forestry- Dragon Run State Forest	118
24 31R 969	Department of Forestry- Dragon Run State Forest	143.75
24 32R 1458A	Department of Forestry	20
24 32R 877	Department of Forestry	197.5

24 32R 933A	Department of Forestry	21
24 33R 827	Department of Forestry	37.5
24 32R 882	The Nature Conservancy	27.5
24 33L 576	The Nature Conservancy	67.25
24-32R 880	The Nature Conservancy	479
24-32R 916	The Nature Conservancy	537
24-32R -921	The Nature Conservancy	62
24-32R -924	The Nature Conservancy	12.5
24-32R -925	The Nature Conservancy	102
24-32R-863	Virginia Outdoor Foundation- Department of Forestry- Dragon Run State Forest	700
24-32R-865	Department of Forestry- Dragon Run State Forest	2.75
24-32R-868	Virginia Outdoor Foundation- Department of Forestry- Dragon Run State Forest	85.5
24-33L -1062	The Nature Conservancy	210
24-33L-975	The Nature Conservancy	175
25 41R 484A	Department of Forestry	325
25- 41R 486	Department of Game and Inland Fisheries - Fish Hatchery	111.75
32-52X 137B	The Nature Conservancy	2

Mathews County *(through September 2010)*

Conservation Easements		
Tax Map Number	**Easement Holder**	**Acres**
24 A 112	Virginia Outdoors Foundation	36.25
24B 5 2	Virginia Outdoors Foundation	1.01
3 1 A	Middle Peninsula Land Trust	38.08
31 A 116B; 31 A 200	Middle Peninsula Land Trust	21
35 8 18	Middle Peninsula Land Trust /The Nature Conservancy	39.33
35 A 40	Virginia Outdoors Foundation	17.29
36 16 1	Middle Peninsula Land Trust /The Nature Conservancy	4.7
36 16 2	Middle Peninsula Land Trust /The Nature Conservancy	18.65
36 16 3	Middle Peninsula Land Trust /The Nature Conservancy	14.85
40 A 119	Middle Peninsula Land Trust /Chesapeake Bay Foundation	40
40 A 120	Middle Peninsula Land Trust /Chesapeake Bay Foundation	40
40 A 121	Middle Peninsula Land Trust /Chesapeake Bay Foundation	12.6
40 A 125	Middle Peninsula Land Trust /Chesapeake Bay Foundation	28
40 A 125A	Middle Peninsula Land Trust /Chesapeake Bay Foundation	6.7
40B 1 2	Middle Peninsula Land Trust /Chesapeake Bay Foundation	8.5
40B 1 3	Middle Peninsula Land Trust /Chesapeake Bay Foundation	3.7
40B 1 4	Middle Peninsula Land Trust /Chesapeake Bay Foundation	2.4
40B 1 5	Middle Peninsula Land Trust /Chesapeake Bay Foundation	1.6
43 A 42	Middle Peninsula Land Trust	9.6
43 A 43	Middle Peninsula Land Trust	14.94
Tax-exempt Land Holdings ***(lands held without easement)***		
Tax Map Number	**Holder**	**Acres**
13 10 1	Mathews County Land Conservancy	8.1
31 A 167	Department of Conservation and Recreation - Bethel Beach	21.25
31 A 205	Department of Conservation and Recreation - Bethel Beach	43
31 A 207	Department of Conservation and Recreation - Bethel Beach	35.62
36 14 3	Middle Peninsula Land Trust	2.52
36 14 4	Middle Peninsula Land Trust	2.53
44 A 16	The Nature Conservancy	78.45
44 A 19	The Nature Conservancy	16.5
44 A 28; 44 A 30; 44 1 3; 44 A 9	The Nature Conservancy	35.28
44 A 28; 44 A 30; 44 1 3; 44 A 9	The Nature Conservancy	35.28
44B 6 5 65, to -68	The Nature Conservancy	3.25
44B 6 5 72	The Nature Conservancy	0.5
44B 6 5 72	The Nature Conservancy	0.5
44B 6 6 59 to -62	The Nature Conservancy	2
44B 6 8 100, -101, -102	The Nature Conservancy	3.25
44B 6 8 100, -101, -102	The Nature Conservancy	3.25
44B 6 A 1 A; 44 B 6 7 76, to -81 and -84 to -90, -91, -93, -94; 44B 6 6 66, -55, -54, -57, -58; 44B 610 127, -128, -130; 44B 6 9 120, - 119, -118, -106, -107, -108, -115; 44B 611 135, to -139	The Nature Conservancy	10.25

44B 6 A 1 A; 44 B 6 7 76, to -81 and -84 to -90, -91, -93, -94; 44B 6 6 66, -55, -54, -57, -58; 44B 610 127, -128, -130; 44B 6 9 120, - 119, -118, -106, -107, - 108, -115; 44B 611 135, to -139	The Nature Conservancy	10.25
45 A 2; -3	Mathews County	50

Appendix 3 – Virginia Conservation Easement Act: Taxation Section

§ 10.1-1011. Taxation.

A. Where an easement held pursuant to this chapter or the Open-Space Land Act (§ 10.1-1700 et seq.) by its terms is perpetual, neither the interest of the holder of a conservation easement nor a third-party right of enforcement of such an easement shall be subject to state or local taxation nor shall the owner of the fee be taxed for the interest of the holder of the easement.

B. Assessments of the fee interest in land that is subject to a perpetual conservation easement held pursuant to this chapter or the Open-Space Land Act (§ 10.1-1700 et seq.) shall reflect the reduction in the fair market value of the land that results from the inability of the owner of the fee to use such property for uses terminated by the easement. To ensure that the owner of the fee is not taxed on the value of the interest of the holder of the easement, the fair market value of such land (i) shall be based only on uses of the land that are permitted under the terms of the easement and (ii) shall not include any value attributable to the uses or potential uses of the land that have been terminated by the easement.

C. Notwithstanding the provisions of subsection B, land which is (i) subject to a perpetual conservation easement held pursuant to this chapter or the Open-Space Land Act (§ 10.1-1700 et seq.), (ii) devoted to open-space use as defined in § 58.1-3230, and (iii) in any county, city or town which has provided for land use assessment and taxation of any class of land within its jurisdiction pursuant to § 58.1-3231 or § 58.1-3232, shall be assessed and taxed at the use value for open space, if the land otherwise qualifies for such assessment at the time the easement is dedicated. If an easement is in existence at the time the locality enacts land use assessment, the easement shall qualify for such assessment. Once the land with the easement qualifies for land use assessment, it shall continue to qualify so long as the locality has land use assessment.

(1988, cc. 720, 891; 1993, c. 390; 1998, c. 487.)

Appendix 4 – Tax-exempt Legislation

§ 6. Exempt property

(a) Except as otherwise provided in this Constitution, the following property and no other shall be exempt from taxation, State and local, including inheritance taxes: (1) Property owned directly or indirectly by the Commonwealth or any political subdivision thereof, and obligations of the Commonwealth or any political subdivision thereof exempt by law. (2) Real estate and personal property owned and exclusively occupied or used by churches or religious bodies for religious worship or for the residences of their ministers. (3) Private or public burying grounds or cemeteries, provided the same are not operated for profit. (4) Property owned by public libraries or by institutions of learning not conducted for profit, so long as such property is primarily used for literary, scientific, or educational purposes or purposes incidental thereto. This provision may also apply to leasehold interests in such property as may be provided by general law. (5) Intangible personal property, or any class or classes thereof, as may be exempted in whole or in part by general law. (6) Property used by its owner for religious, charitable, patriotic, historical, benevolent, cultural, or public park and playground purposes, as may be provided by classification or designation by an ordinance adopted by the local governing body and subject to such restrictions and conditions as provided by general law. (7) Land subject to a perpetual easement permitting inundation by water as may be exempted in whole or in part by general law. (b) The General Assembly may by general law authorize the governing body of any county, city, town, or regional government to provide for the exemption from local property taxation, or a portion thereof, within such restrictions and upon such conditions as may be prescribed, of real estate and personal property designed for continuous habitation owned by, and occupied as the sole dwelling of, persons not less than sixty-five years of age or persons permanently and totally disabled as established by general law who are deemed by the General Assembly to be bearing an extraordinary tax burden on said property in relation to their income and financial worth. (c) Except as to property of the Commonwealth, the General Assembly by general law may restrict or condition, in whole or in part, but not extend, any or all of the above exemptions. (d) The General Assembly may define as a separate subject of taxation any property, including real or personal property, equipment, facilities, or devices, used primarily for the purpose of abating or preventing pollution of the atmosphere or waters of the Commonwealth or for the purpose of transferring or storing solar energy, and by general law may allow the governing body of any county, city, town, or regional government to exempt or partially exempt such property from taxation, or by general law may directly exempt or partially exempt such property from taxation. (e) The General Assembly may define as a separate subject of taxation household goods, personal effects and tangible farm property and products, and by general law may allow the governing body of any county, city, town, or regional government to exempt or partially exempt such property from taxation, or by general law may directly exempt or partially exempt such property from taxation. (f) Exemptions of property from taxation as established or authorized hereby shall be strictly construed; provided, however, that all property exempt from taxation on the effective date of this section shall continue to be exempt until otherwise provided by the General Assembly as herein set forth. (g) The General Assembly may by general law authorize any county, city, town, or regional government to impose a service charge upon the owners of a class or classes of exempt property for services provided by such governments. (h) The General Assembly may by general law authorize the governing body of any county, city, town, or regional government to provide for a partial exemption from local real property taxation, within such restrictions and upon such conditions as may be prescribed, of real estate whose improvements, by virtue of age and use, have undergone substantial renovation, rehabilitation or replacement. (i) The General Assembly may by general law allow the governing body of any county, city, or town to exempt or partially exempt from taxation any generating equipment installed after December thirty-one, nineteen hundred seventy-four, for the purpose of converting from oil or natural gas to coal or to wood, wood bark, wood residue, or to any other alternate energy source for manufacturing, and any co-generation equipment installed since such date for use in manufacturing. (j) The General Assembly may by general law allow the governing body of any county, city, or town to have the option to exempt or partially exempt from taxation any business, occupational or professional license or any merchants' capital, or both.

§ 58.1-3606. Property exempt from taxation by classification

A. Pursuant to the authority granted in Article X, Section 6 (a) (6) of the Constitution of Virginia to exempt property from taxation by classification, the following classes of real and personal property shall be exempt from taxation: 1. Property owned directly or indirectly by the Commonwealth, or any political subdivision thereof. 2. Buildings with land they actually occupy, and the furniture and furnishings therein owned by churches or religious bodies and exclusively occupied or used for religious worship or for the residence of the minister of any church or religious body, and such additional adjacent land reasonably necessary for the convenient use of any such building. 3. Nonprofit private or public burying grounds or cemeteries. 4. Property owned by public libraries, law libraries of local bar associations when the same are used or available for use by a state court or courts or the judge or judges thereof, medical libraries of local medical associations when the same are used or available for use by state health officials, incorporated colleges or other institutions of learning not conducted for profit. This paragraph shall apply only to property primarily used for literary, scientific or educational purposes or purposes incidental thereto and shall not apply to industrial schools which sell their products to other than their own employees or students. 5. Property belonging to and actually and exclusively occupied and used by the Young Men's Christian Associations and similar religious associations, including religious mission boards and associations, orphan or other asylums, reformatories, hospitals and nunneries, conducted not for profit but exclusively as charities (which shall include hospitals operated by nonstock corporations not organized or conducted for profit but which may charge persons able to pay in whole or in part for their care and treatment). 6. Parks or playgrounds held by trustees for the perpetual use of the general public. 7. Buildings with the land they actually occupy, and the furniture and furnishings therein belonging to any benevolent or charitable organization and used by it exclusively for lodge purposes or meeting rooms, together with such additional adjacent land as may be necessary for the convenient use of the buildings for such purposes. 8. Property of any nonprofit corporation organized to establish and maintain a museum. B. Property, belonging in one of the classes listed in subsection A of this section, which was exempt from taxation on July 1, 1971, shall continue to be exempt from taxation under the rules of statutory construction applicable to exempt property prior to such date.

§ 58.1-3607. Property exempt from taxation by designation

A. Pursuant to the authority granted in Article X, Section 6 (a) (6) of the Constitution of Virginia to exempt property from taxation by designation, and notwithstanding the provisions of § 30-19.04, the real and personal property of the following organizations, corporations and associations shall be exempt from taxation: 1. Property of the Association for the Preservation of Virginia Antiquities, the Association for the Preservation of Petersburg Antiquities, Historic Richmond Foundation, the Confederate Memorial Literary Society, the Mount Vernon Ladies' Association of the Union, the Virginia Historical Society, the Thomas Jefferson Memorial Foundation, Incorporated, the Patrick Henry Memorial Foundation, Incorporated, the Stonewall Jackson Memorial, Incorporated, George Washington's Fredericksburg Foundation, Home Demonstration Clubs, 4-H Clubs, the Future Farmers of America, Incorporated, the posts of the American Legion, posts of United Spanish War Veterans, branches of the Fleet Reserve Association, posts of Veterans of Foreign Wars, posts of the Disabled American Veterans, Veterans of World War I, USA, Incorporated, the Society of the Cincinnati in the State of Virginia, the Manassas Battlefield Confederate Park, Incorporated, the Robert E. Lee Memorial Foundation, Incorporated, the Virginia Division of the United Daughters of the Confederacy, the General Organization of the United Daughters of the Confederacy, the Memorial Foundation of the Germanna Colonies in Virginia, Incorporated, the Lynchburg Fine Arts Centers, Incorporated, Norfolk Historic Foundation, National Trust for Historic Preservation in the United States, Historic Alexandria Foundation, and the Lynchburg Historical Foundation. 2. Property of Colonial Williamsburg, Incorporated, used for museum, historical, municipal, benevolent or charitable purposes, as long as such corporation continues to be organized and operated not for profit. 3. Property owned by the Virginia Home (previously Virginia Home for

Incurables), incorporated by Chapter 533 of the Acts of Assembly of 1893-4, approved March 1, 1894. 4. The property owned by the Waterford Foundation, Incorporated, so long as it continues to be a nonprofit corporation to encourage and assist in restoration work in Waterford and to stimulate the revival of local arts and crafts. 5. Property of Historic Fredericksburg, Incorporated, and of the Clarke County Historical Association, used by such organizations for historical, benevolent or charitable purposes, as long as such corporation continues to be organized and operated not for profit.

6. Property of the Westmoreland Davis Foundation, Inc., so long as it continues to be a nonprofit corporation. 7. Property owned by the Women's Home Incorporated, in Arlington County and used for the rehabilitation of alcoholic women, so long as it continues to be operated not for profit. B. Property designated to be exempt from taxation in subsection A of this section which was exempt on July 1, 1971, shall continue to be exempt under the rules of statutory construction applicable to exempt property prior to such date.

§ 58.1-3609. Post-1971 property exempt from taxation by classification

A. The real and personal property of an organization classified in §§ 58.1-3610 through 58.1-3621 and used by such organization for a religious, charitable, patriotic, historical, benevolent, cultural, or public park and playground purpose as set forth in Article X, Section 6 (a) (6) of the Constitution of Virginia, the particular purpose for which such organization is classified being specifically set forth within each section, shall be exempt from taxation, so long as such organization is operated not for profit and the property so exempt is used in accordance with the purpose for which the organization is classified. The real and personal property of an organization classified in § 58.1-3622 and used by such organization for charitable and benevolent purposes as set forth in Article X, Section 6 (a) (6) of the Constitution of Virginia shall be exempt from taxation so long as the local governing body in which the property is located passes a resolution approving such exemption and the organization satisfies the other requirements in this subsection. B. Exemptions of property from taxation under this article shall be strictly construed in accordance with Article X, Section 6 (f) of the Constitution of Virginia.

§ 58.1-3610. Volunteer fire departments and rescue squads

Volunteer fire departments and volunteer rescue squads which operate exclusively for the benefit of the general public without charge are hereby classified as charitable organizations.

§ 58.1-3611. Certain boys and girls clubs

Boys clubs affiliated with the Boys Clubs of America, Inc., and girls clubs affiliated with the Girls Club of America, Inc., are hereby classified as charitable organizations.

§ 58.1-3612. Auxiliaries of the Veterans of World War I

Auxiliaries of the Veterans of World War I, USA, Incorporated, are hereby classified as patriotic, historical and benevolent organizations.

§ 58.1-3613. Societies for the Prevention of Cruelty to Animals

Societies for the Prevention of Cruelty to Animals are hereby classified as charitable organizations.

§ 58.1-3614. Boy Scouts and Girl Scouts of America

The Boy Scouts of America, Girl Scouts of the United States of America, and their subsidiaries are hereby classified as charitable and benevolent organizations.

§ 58.1-3615. Home Demonstration Clubs, 4-H Clubs and Future Farmers of America, Inc

The Home Demonstration Clubs, 4-H Clubs, and the Future Farmers of America, Incorporated, are hereby classified as patriotic and benevolent organizations.

§ 58.1-3616. American National Red Cross

The American National Red Cross and local chapters thereof are hereby classified as charitable organizations.

§ 58.1-3617. Churches, religious associations or denominations

Any church, religious association or religious denomination operated exclusively on a nonprofit basis for charitable, religious or educational purposes is hereby classified as a religious and charitable organization. Notwithstanding § 58.1-3609, only property of such association or denomination used exclusively for charitable, religious or educational purposes shall be so exempt from taxation. Motor vehicles owned or leased by churches and used predominantly for church purposes, are hereby classified as property used by its owner for religious purposes. For purposes of this section, property of a church, religious association or religious denomination owned or leased in the name of a duly designated ecclesiastical officer or of a trustee shall be deemed to be owned by such church, association or denomination.

§ 58.1-3618. College alumni associations and foundations

Incorporated alumni associations operated exclusively on a nonprofit basis for the benefit of colleges or other institutions of learning located in Virginia, and incorporated charitable foundations conducted not for profit, the total income from which is used exclusively for literary, scientific or educational purposes, are hereby classified as charitable and cultural organizations.

§ 58.1-3619. The State Future Farmers of America, Future Homemakers of America and Future Business Leaders of America

A. The Future Farmers of America, the Future Homemakers of America, and local affiliates or subsidiaries thereof, located throughout the Commonwealth, are hereby classified as benevolent organizations. The tax exemption provided in this subsection shall be limited to the J. R. Thomas Camp, located in Chesterfield County and owned by the Future Farmers of America, the Future Homemakers of America and the local affiliates or subsidiaries thereof. B. The Future Business Leaders of America, the Future Homemakers of America, and local affiliates or subsidiaries thereof, located throughout the Commonwealth, are hereby classified as benevolent organizations. Except as otherwise may be provided by this article, the tax exemption provided herein shall be limited to property owned by either the Future Business Leaders of America or the Future Homemakers of America which is located in Fairfax County.

§ 58.1-3621. Farm club associations

Incorporated associations operated for the purpose of sponsoring and operating a county fair for the display of agricultural products, the display and grading of farm animals and the enjoyment of the general public in Virginia are hereby classified as charitable associations.

§ 58.1-3622. Habitat for Humanity and local affiliates or subsidiaries thereof

Habitat for Humanity and local affiliates or subsidiaries thereof are hereby classified as charitable and benevolent organizations.

§ 58.1-3650. Post-1971 property exempt from taxation by designation

A. The real and personal property of an organization designated by a section within this article and used by such organization exclusively for a religious, charitable, patriotic, historical, benevolent, cultural or public park and playground purpose as set forth in Article X, Section 6 (a) (6) of the Constitution of Virginia, the particular purpose for which such organization is classified being specifically set forth within each section, shall be exempt from taxation so long as such organization is operated not for profit and the property so exempt is used in accordance with the purpose for which the organization is classified. In addition, such exemption may be revoked in accordance with the provisions of § 58.1-3605. B. Exemptions of property from taxation under this article shall be strictly construed in accordance with the provisions of Article X, Section 6 (f) of the Constitution of Virginia.

§§ 58.1-3650.1 through 58.1-3650.1000

NOTE: These sections, which exempt various individually designated properties from taxation, are not set out.

§ 58.1-3651. Property exempt from taxation by classification or designation by ordinance adopted by local governing body on or after January 1, 2003 [as amended; 2004]

A. Pursuant to subsection 6 (a) (6) of Article X of the Constitution of Virginia, on and after January 1, 2003, any county, city, or town may by designation or classification exempt from real or personal property taxes, or both, by ordinance adopted by the local governing body, the real or personal property, or both, owned by a nonprofit organization that uses such property for religious, charitable, patriotic, historical, benevolent, cultural, or public park and playground purposes. The ordinance shall state the specific use on which the exemption is based, and continuance of the exemption shall be contingent on the continued use of the property in accordance with the purpose for which the organization is classified or designated. No exemption shall be provided to any organization that has any rule, regulation, policy, or practice that unlawfully discriminates on the basis of religious conviction, race, color, sex, or national origin.

B. Any ordinance exempting property by designation pursuant to subsection A shall be adopted only after holding a public hearing with respect thereto, at which citizens shall have an opportunity to be heard. The local governing body shall publish notice of the hearing once in a newspaper of general circulation in the county, city, or town where the real property is located. The notice shall include the assessed value of the real and tangible personal property for which an exemption is requested as well as the property taxes assessed against such property. The public hearing shall not be held until at least five days after the notice is published in the newspaper. The local governing body shall collect the cost of publication from the organization requesting the property tax exemption. Before adopting any such ordinance the governing body shall consider the following questions:

1. Whether the organization is exempt from taxation pursuant to § 501 (c) of the Internal Revenue Code of 1954;

2. Whether a current annual alcoholic beverage license for serving alcoholic beverages has been issued by the Virginia Alcoholic Beverage Control Board to such organization, for use on such property;

3. Whether any director, officer, or employee of the organization is paid compensation in excess of a reasonable allowance for salaries or other compensation for personal services which such director, officer, or employee actually renders;

4. Whether any part of the net earnings of such organization inures to the benefit of any individual, and whether any significant portion of the service provided by such organization is generated by funds received from donations, contributions, or local, state or federal grants. As used in this subsection, donations shall include the providing of personal services or the contribution of in-kind or other material services;

5. Whether the organization provides services for the common good of the public;

6. Whether a substantial part of the activities of the organization involves carrying on propaganda, or otherwise attempting to influence legislation and whether the organization participates in, or intervenes in, any political campaign on behalf of any candidate for public office;

7. The revenue impact to the locality and its taxpayers of exempting the property; and

8. Any other criteria, facts and circumstances that the governing body deems pertinent to the adoption of such ordinance.

C. Any ordinance exempting property by classification pursuant to subsection A shall be adopted only after holding a public hearing with respect thereto, at which citizens shall have an opportunity to be heard. The local governing body shall publish notice of the hearing once in a newspaper of general circulation in the county, city, or town. The public hearing shall not be held until at least five days after the notice is published in the newspaper.

D. Exemptions of property from taxation under this article shall be strictly construed in accordance with Article X, Section 6 (f) of the Constitution of Virginia.

E. Nothing in this section or in any ordinance adopted pursuant to this section shall affect the validity of either a classification exemption or a designation exemption granted by the General Assembly prior to January 1, 2003, pursuant to Article 2 (§ 58.1-3606 et seq.), 3 (§ 58.1-3609 et seq.) or 4 (§ 58.1-3650 et seq.) of this chapter. An exemption granted pursuant to Article 4 (§ 58.1-3650 et seq.) of this chapter may be revoked in accordance with the provisions of § 58.1-3605.

Appendix 5 - Middle Peninsula Chesapeake Bay Public Access Authority (MPCBPAA) Enabling Legislation: Tax Liability

§ 15.2-6617. Taxation.

The exercise of the powers granted by this act shall in all respects be presumed to be for the benefit of the inhabitants of the Commonwealth, for the increase of their commerce, and for the promotion of their health, safety, welfare, convenience and prosperity, and as the operation and maintenance of any project that the Authority is authorized to undertake will constitute the performance of an essential governmental function, the Authority shall not be required to pay any taxes or assessments upon any facilities acquired and constructed by it under the provisions of this act and the bonds issued under the provisions of this act, their transfer and the income therefrom including any profit made on the sale thereof, shall at all times be free and exempt from taxation by the Commonwealth and by any political subdivision thereof. Persons, firms, partnerships, associations, corporations, and organizations leasing property of the Authority or doing business on property of the Authority shall be subject to and liable for payment of all applicable taxes of the political subdivision in which such leased property lies or in which business is conducted including, but not limited to, any leasehold tax on real property and taxes on hotel and motel rooms, taxes on the sale of tobacco products, taxes on the sale of meals and beverages, privilege taxes and local general retail sales and use taxes, taxes to be paid on licenses in respect to any business, profession, vocation or calling, and taxes upon consumers of gas, electricity, telephone, and other public utility services.

King and Queen County, Virginia

2030 Comprehensive Plan

Appendix H:
General Attorney Opinion on Fracking

COMMONWEALTH of VIRGINIA

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May 5, 2015

The Honorable Richard H. Stuart
Member, Senate of Virginia
Post Office Box 1146
Montross, Virginia 22520

Dear Senator Stuart:

I am responding to your request for an official advisory Opinion in accordance with § 2.2-505 of the *Code of Virginia*.

Issues Presented

You inquire whether a locality may use its zoning authority to prohibit "unconventional gas and oil drilling," commonly known as "fracking" (short for hydraulic fracturing). You also ask whether a locality may use zoning to regulate certain aspects of fracking, such as the timing of drilling operations, traffic, or noise.[1] This Opinion addresses only fracking, and not any other type of activity involving the exploration for, mining of, or transportation of any natural resource.

Applicable Law and Discussion

Fracking is a method of retrieving oil or natural gas by injecting fluid into underground shale beds at high pressure.[2] As noted in your Opinion request, fracking has the potential to greatly increase domestic production of oil and gas and to spur economic development in localities located on or near shale beds. Fracking can also be an intensive land use, and the recent expansion of this industry has raised significant environmental and safety concerns. The potential dangers arising from this still-evolving technology include the depletion of fresh water from aquifers, contamination of groundwater, earthquakes, and surface problems such as air pollution and industrial truck traffic.[3] Fundamental land use questions are thus presented about fracking's compatibility with existing and planned uses of nearby lands.

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[1] I assume for the purpose of this Opinion that any zoning ordinance relating to fracking is adopted in full compliance with all procedural and substantive requirements imposed by applicable laws.

[2] *See* MERRIAM-WEBSTER, *Definition of "Fracking,"* http://www.merriam-webster.com/dictionary/fracking (last visited March 25, 2015).

[3] *See, e.g.*, Robert B. Jackson et al., *The Environmental Costs and Benefits of Fracking*, 39 ANNUAL REV. OF ENV'T & RES. 327 (2014), *available at* http://www.annualreviews.org/doi/abs/10.1146/annurev-environ-031113-144051; Nicholas Schroeck & Stephanie Karisny, *Hydraulic Fracturing and Water Management in the Great Lakes*, 63 CASE W. RES. L. REV. 1167, 1169 (2013); U.S. GEOLOGICAL SURVEY'S EARTHQUAKE HAZARDS PROGRAM, *Induced Earthquakes*, http://earthquake.usgs.gov/research/induced (last visited April 20, 2015).

Two steps are involved in determining the extent of local zoning authority over fracking. First, it is necessary to determine whether localities in Virginia have general authority under law to prohibit or otherwise to regulate fracking within their boundaries. If that question is answered in the affirmative, it is then necessary to determine whether the power to prohibit or regulate fracking is nevertheless preempted in whole or part by other applicable state law.

Dillon Rule Analysis

Virginia follows the Dillon Rule of strict construction, which provides that "municipal corporations have only those powers that are expressly granted, those necessarily or fairly implied from expressly granted powers, and those that are essential and indispensable."[4] A corollary to the Dillon Rule provides that the powers of local governing bodies are "fixed by statute and are limited to those conferred expressly or by necessary implication."[5] Consistent with the Dillon Rule, a local governing body may prohibit fracking only if the legislature has expressly granted it the authority to do so, or if that power is necessarily implied from an express grant of power.

The General Assembly has delegated to localities the authority to control land use within their jurisdictions through zoning.[6] The extent of local zoning powers is broad.[7] Indeed, the Supreme Court of Virginia has stated that "[t]he legislative branch of a local government possesses wide discretion in the enactment and amendment of zoning ordinances," and its actions in doing so are presumed valid absent express limitations to the contrary.[8] In addition, "[t]he mere fact that the state, in the exercise of the police power, has made certain regulations . . . does not prohibit a municipality from exacting additional requirements" through the use of its zoning powers.[9]

As part of the broad zoning authority granted to them by the General Assembly, localities in the Commonwealth are permitted to prohibit certain land uses within their boundaries. Pursuant to § 15.2-2280, a locality "may, by ordinance . . . regulate, restrict, permit, *prohibit*, and determine" a variety of land uses within its jurisdiction.[10] The Supreme Court of Virginia has confirmed that "by this language, the governing body of a locality is expressly authorized to prohibit a specific use of land."[11]

While § 15.2-2280 contains an exemplary list of land uses that may be prohibited, the list is not exhaustive, and a specific mention of fracking would not be necessary for the use to fall within the

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[4] Bd. of Zoning Appeals v. Bd. of Supvrs., 276 Va. 550, 553-54 (2008).

[5] Bd. of Supvrs. v. Horne, 216 Va. 113, 117 (1975) (citations omitted); *see also* Bd. of Supvrs. v. Countryside Inv. Co., 258 Va. 497, 503 (1999).

[6] *See* VA. CODE ANN. § 15.2-2280 (2012); Byrum v. Bd. of Supvrs., 217 Va. 37, 39 (1976) ("The governing body of a county in Virginia is authorized by statute to enact local zoning ordinances."). Zoning ordinances relate to the use of real property such as "existing use and character of property," "the suitability of property for various uses," and "the encouragement of the most appropriate use of land throughout the locality." Section 15.2-2284 (2012).

[7] *See* VA. CODE ANN. §§ 15.2-2280 to 15.2-2316 (2012 & Supp. 2014) (establishing the extent of localities' zoning powers).

[8] Bd. of Cnty. Supvrs. v. Carper, 200 Va. 653, 660 (1959).

[9] *See* King v. Cnty. of Arlington, 195 Va. 1084, 1090 (1954).

[10] Section 15.2-2280 (emphasis added); *see also* Cnty. of Chesterfield v. Windy Hill, Ltd., 263 Va. 197, 206 (2002) (stating that, by granting localities zoning powers, the General Assembly vested them with the authority "to prevent the use of land in a manner the City has deemed detrimental to the general welfare of its inhabitants and deemed as having a deleterious effect on the community").

[11] *See* Resource Conservation Mgmt., Inc. v. Bd. of Supvrs., 238 Va. 15, 20 (1989).

purview of the statute.[12] In any case, however, fracking falls within the plain language of the fourth example listed in the statute – "[t]he excavation or mining of soil or other natural resources."[13] Given the plain language of the statute, the Virginia Supreme Court's acknowledgment of the broad zoning authority the statute grants to localities,[14] and the lack of any intervening change to the statute,[15] I conclude that the General Assembly has authorized localities to pass zoning ordinances prohibiting fracking. The plain language of the statute also authorizes localities to regulate fracking in instances where it is permitted.

What remains to be discussed is whether, and to what extent, the authority of localities to prohibit or otherwise to regulate fracking is preempted by state law.[16]

Preemption Analysis

The question of preemption turns on whether a local ordinance regulating or prohibiting fracking is inconsistent with state law. "Any ordinance, resolution, bylaw, rule, regulation, or order of any governing body . . . shall not be inconsistent with the Constitution and laws of . . . the Commonwealth."[17] Accordingly, any local zoning ordinance is preempted if it conflicts with state law.

Here, the potential source of state preemption is the Virginia Gas and Oil Act (the "Act").[18] This Act creates a state permitting process for oil and gas operations.[19] Fracking is an oil and gas operation within the scope of the Act.[20] The purposes of the Act include "[protecting] the citizens and the environment of the Commonwealth from the public safety and environmental risks associated with the development and production of gas or oil."[21] The Act creates the Virginia Gas and Oil Board (the

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[12] *See Resource Conservation*, 238 Va. at 20 ("While the language does not specify a landfill as one of the uses that may be prohibited, such specificity is not necessary even under the Dillon Rule of strict construction.").

[13] Section 15.2-2280(4).

[14] *Resource Conservation*, 238 Va. at 20.

[15] *See* Vansant & Gusler, Inc. v. Washington, 245 Va. 356, 361 (1993) (following a previous decision of the Virginia Supreme Court interpreting a statutory provision, and noting that in light of the passage of "many sessions of the General Assembly," "the construction given to the statute is presumed to be sanctioned by the legislature and therefore becomes obligatory upon the courts").

[16] There may exist federal statutes or regulations that could, to one degree or another, preempt the local regulation of fracking, local eminent domain actions, or other local mechanisms – including those that might affect the siting or operation of fracking facilities. Those possible federal laws, if and to the extent that they exist, are outside the scope of this Opinion, which discusses only state law. Additionally, this Opinion does not address constitutional concerns that may arise from a ban on fracking, such as takings or due process claims. Those concerns, if they occur, will be dependent on the particular facts at issue.

[17] VA. CODE ANN. § 1-248 (2014).

[18] VA. CODE ANN. §§ 45.1-361.1 to 45.1-361.44 (2013 & Supp. 2014).

[19] Sections 45.1-361.27 to 45.1-361.42 (2013).

[20] The Act, in relevant part, states that "[t]he Director [of the Department of Mines, Minerals and Energy ("DMME")] shall have the power and duty to regulate gas, oil, or geophysical operations." Section 45.1-361.4(A). DMME regulations governing fracking are found in the Virginia Administrative Code. *See* 4 VA. ADMIN. CODE §§ 25-150-10 to 25-150-750. Also, the Act contains a definition of the term "injection well" as being "any well used to inject or otherwise place any substance associated with gas and oil operations into the earth or underground strata for disposal, storage or enhanced recovery." Section § 45.1-361.1 (2013). This definition describes the principal process used in fracking.

[21] Section 45.1-361.3(6) (2013).

"Board"),[22] which has "the specific power to issue rules, regulations or orders" (collectively, "regulations").[23] The permissible scope of these regulations is broad.[24] Current regulations of the Board address a wide range of subjects relating to oil and gas development within the Commonwealth.[25] Some subjects within the purview of these regulations involve issues that could also be addressed by local zoning ordinances.[26]

The issue of regulatory preemption was addressed by the Supreme Court of Virginia in *Blanton v. Amelia County*.[27] In that case, the Court held that localities could not prohibit the land application of biosolids in their communities through zoning because "a local government may not 'forbid what the legislature has expressly licensed, authorized, or required.'"[28] The state law at issue in *Blanton* directed the State Board of Health to regulate the use of biosolids, leading the Court to conclude that localities could not subsequently ban such land use activity.[29] In a 2013 Opinion addressed to Delegate Terry Kilgore (the "2013 Opinion"), this Office cited *Blanton* in concluding that localities may not pass zoning ordinances banning the exploration for, and drilling of, oil and natural gas.[30]

However, there is a key difference between the statute that was at issue in *Blanton* and the Act. Section 45.1-361.5 of the Act expressly retains the authority of local land use ordinances, while the statute at issue in *Blanton* did not.[31] While § 45.1-361.5 of the Act states that no locality "shall impose any condition, or require any other local license, permit, fee or bond to perform any gas, oil, or

[22] Section 45.1-361.13 (2013).

[23] Section 45.1-361.15 (2013).

[24] In relevant part, the Board may issue regulations in order to "[p]revent waste through the design spacing, or unitization of wells, pools, or fields"; "[e]nter spacing and pooling orders," "[e]stablish drilling units," "[e]stablish maximum allowable production rates for the prevention of waste and for the protection of correlative rights," and "[c]lassify pools and wells as gas, oil, gas and oil, or coalbed methane gas." Section 45.1-361.15. In addition, it may "[t]ake such actions as are reasonably necessary to carry out the provisions of [the Act]." *Id.*

[25] The Act and its attendant regulations include a consideration of the potential impact that drilling in certain geographic locations may have on the Chesapeake Bay. *See* § 45.1-361.29(G) (2013) (prohibiting drilling in the waters, tributaries, Resource Protection Areas, and within 500 feet from the shorelines of the waters and tributaries of the Chesapeake Bay entirely, and prohibiting such drilling anywhere in the Tidewater region of Virginia unless the environmental assessment required by VA. CODE ANN. §§ 62.1-195.1 has been completed); *see also* 4 VA. ADMIN. CODE §§ 25-150-10 to 25-150-750; 4 VA. ADMIN. CODE §§ 25-160-10 to 25-160-200; §§ 25-165-10 to 25-165-130.

[26] *See* the Board's regulations dealing with "the design, spacing, or utilization of wells, pools, or fields," its "spacing and pooling orders," and its authority to "carry out the provisions of [the Act]" with respect to the protection of citizens and the environment and *compare with* the legislative intent of zoning and land use regulation, which includes the intent "to improve public health, safety, and convenience of . . . citizens [and to ensure] that residential areas be provided with healthy surroundings." VA. CODE ANN. §§ 15.2-2200; 45.1-361.15.

[27] Blanton v. Amelia Cnty., 261 Va. 55, 64 (2001).

[28] *Id.* (quoting *King*, 195 Va. at 1090-91); *see also* Dail v. York Cnty., 259 Va. 577, 585 (2000) ("A local ordinance may be invalid because it conflicts with a state regulation if the state regulation has 'the force and effect of law.'") (quoting Loudoun Cnty. v. Pumphrey, 221 Va. 205, 206-207 (1980)).

[29] *Blanton*, 261 Va. at 62, 65-66.

[30] 2013 Op. Va. Att'y Gen. 231.

[31] *See* former VA. CODE ANN. § 32.1-164.5 (now repealed, which vested the Board of Health, with the assistance of the Departments of Environmental Quality and Conservation and Recreation, with authority to promulgate regulations concerning use of sewage sludge. No part of that statute could reasonably be interpreted to be a savings clause, and the statute granted no regulatory powers over placing sewage sludge to localities).

geophysical operations which varies from or is in addition to the requirements of this chapter," this same statute also includes a savings clause stating that the Act does not "limit or supersede the jurisdiction and requirements of . . . local land-use ordinances." While these two components of § 45.1-361.5 may be to some degree inconsistent, they can be reconciled in part by concluding that the only authority localities retain over fracking is land use or zoning authority. All other possible local powers over fracking operations are totally preempted, but zoning authority is not. And, as explained above, local land use authority includes the authority to prohibit certain uses, including fracking.

When the General Assembly passed the current Act in 1990, it included the savings clause that appears in § 45.1-361.5.[32] It must be presumed this was done intentionally and that the amendment was "purposeful and not in vain."[33] Furthermore, it must be presumed "the legislature acted with full knowledge of the law as it stood bearing on the subject" of the amendment.[34] The 1990 enactment of the Act occurred approximately a year after a key 1989 decision of the Supreme Court of Virginia. That case was *Resource Conservation Management, Inc. v. Board of Supervisors of Prince William County*.[35] There, the Court held that a locality could exercise its zoning authority to prohibit landfills from certain zoning districts, even though there was a statutory framework in place for regulating and permitting landfills. In essence, the Court in *Resource Conservation Management* held that local zoning authority was not necessarily preempted by a state regulatory program. With this fresh judicial reminder that any intent to preempt zoning powers must be made clear,[36] the General Assembly chose not to entirely preempt local land use powers in the Act. Instead, it did the opposite: it expressed in clear and unmistakable terms its intent that local land use powers were to be left generally undisturbed. This stands in marked contrast to the absence of a savings clause for zoning in other portions of the *Code of Virginia*,[37] including the statute relied on in *Blanton*.

Because the language of the savings clause in § 45.1-361.5 is clear, because it was enacted approximately a year after the Virginia Supreme Court's decision in *Resource Conservation Management* holding that local zoning authority is not necessarily preempted by a statutorily-authorized framework of regulations, and because statutory authority exists for localities to prohibit certain land uses through zoning, I must conclude that the General Assembly intended for localities to retain their authority to

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[32] *See* 1993 Op. Va. Att'y Gen. 173 (discussing passage of the Act). The 1993 Opinion of this Office interpreted § 45.1-361.5 to allow a locality to require special use permits for gas drilling and made no distinction between special use permits and a locality's power to prohibit gas wells. "The legislature is presumed to have had knowledge of the Attorney General's interpretation of . . . statutes, and its failure to make corrective amendments evinces legislative acquiescence in the Attorney General's view" of legislative language. Richard L. Deal & Assocs., Inc. v. Commonwealth, 224 Va. 618, 622 (1983) (citations omitted). Had the General Assembly disagreed with the view of this Office expressed in 1993, it has enjoyed many opportunities to amend the law. That it made no changes to the Act's language for over 20 years may be seen as acquiescence with the 1993 Opinion.

[33] *See* Cape Henry Towers, Inc. v. Nat'l Gypsum Co., 229 Va. 596, 600 (1985) (citations omitted).

[34] *Id.*

[35] 238 Va. 15 (1989).

[36] *Id.* at 23.

[37] *Id.* at 23 ("Furthermore, when the General Assembly intends to preempt a field, it knows how to express its intention.") (citation omitted); *see also, e.g.*, VA. CODE ANN. § 3.2-301 (Supp. 2014) (limiting what zoning ordinances may be used to regulate agricultural operations); VA. CODE ANN. § 36-98 (2014) (providing that the Uniform Statewide Building Code will supersede local building codes and certain other local ordinances); VA. CODE ANN. § 55-79.43(A) (2012) (prohibiting zoning ordinances from barring condominium ownership).

prohibit fracking through duly enacted zoning ordinances.[38] Other types of local control over fracking that do not relate to zoning, such as license or fee requirements, are entirely preempted by the Act. To the extent that the 2013 Opinion conflicts with this conclusion, it is overruled.[39]

I now turn to your second inquiry as to whether a locality, in the absence of a total prohibition on fracking, has the authority to control aspects of fracking such as the timing of drilling operations, traffic, or noise. As noted above, § 15.2-2280 provides localities with broad powers over zoning, including the ability to "regulate" and to "restrict" a variety of uses, which the Act generally preserves through its savings clause. Nevertheless, the Act also provides that no locality "shall impose any condition, or require any other local license, permit, fee or bond to perform any gas, oil, or geophysical operations which varies from or is in addition to the requirements of this chapter."[40] As noted previously, it is clear under § 1-248 of the *Code of Virginia* that local ordinances may not conflict with the provisions of state statute or regulation.

Based upon the statutory framework, it is my duty to harmonize, where reasonably possible, differing statutes and differing portions of a single statute.[41] As discussed above, there may be some degree of overlap between the regulations the Board is authorized to enact and local zoning ordinances. I conclude that a duly enacted local zoning restriction on fracking operations is valid only if, and to the extent that, it does not conflict with such a regulation, provided the regulation is within the scope of permissible regulations the Board may enact. Any local zoning ordinance must also be consistent with any statutory requirements for fracking operations set forth in the Act. Determining the extent to which particular zoning restrictions on fracking may possibly be preempted by state law will be governed by the particular facts, restrictions, and regulations at issue. Consequently, I can express no opinion on whether any particular zoning restriction has been preempted. I do note that the 2013 Opinion concludes in part that "a local governing body may adopt a zoning ordinance that places restrictions on the location and siting of oil and gas wells that are reasonable in scope and consistent with the Virginia Gas and Oil Act."[42] That portion of the 2013 Opinion, as it may apply to fracking, is generally reaffirmed.

Conclusion

It is my opinion that the General Assembly intended to permit localities to prohibit fracking operations through duly enacted land use or zoning ordinances, and the *Code of Virginia* so provides. With respect to your second inquiry, localities may enact zoning restrictions on fracking only if and to the

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[38] "When construing a statute, our primary objective is 'to ascertain and give effect to legislative intent' as expressed by the language used in the statute." Cuccinelli v. Rector & Visitors of the Univ. of Virginia, 283 Va. 420, 425 (2012).

[39] The 2013 Opinion, which incorrectly relied on the *Blanton* opinion, for the reasons discussed, and which failed to note the statutory authority of localities to prohibit particular land uses, also relied in part on the Commonwealth Energy Policy (the "Policy"), as set forth in § 67-102. *See* 2013 Op. Va. Att'y Gen. 231, 234. However, the Policy has a savings clause. It states that the Policy "is intended to provide guidance to the agencies and political subdivisions of the Commonwealth in taking discretionary action with regard to energy issues, *and shall not be construed to amend, repeal, or override any contrary provision of applicable law.*" VA. CODE ANN. § 67-102(D) (2012) (emphasis added). In short, the Policy is precatory and not mandatory where local zoning is concerned.

[40] Section 45.1-361.5.

[41] "Where two statutes are in apparent conflict, they should be construed, if reasonably possible, in such manner that both may stand together." 1977-78 Op. Va. Att'y Gen. 351, 353, and citations therein.

[42] 2013 Op. Va. Att'y Gen. 231, 236.

extent that the restrictions are reasonable in scope and are not inconsistent with the Act or regulations properly enacted pursuant to the Act.

With kindest regards, I am

Very truly yours,

Mark R. Herring

Mark R. Herring
Attorney General

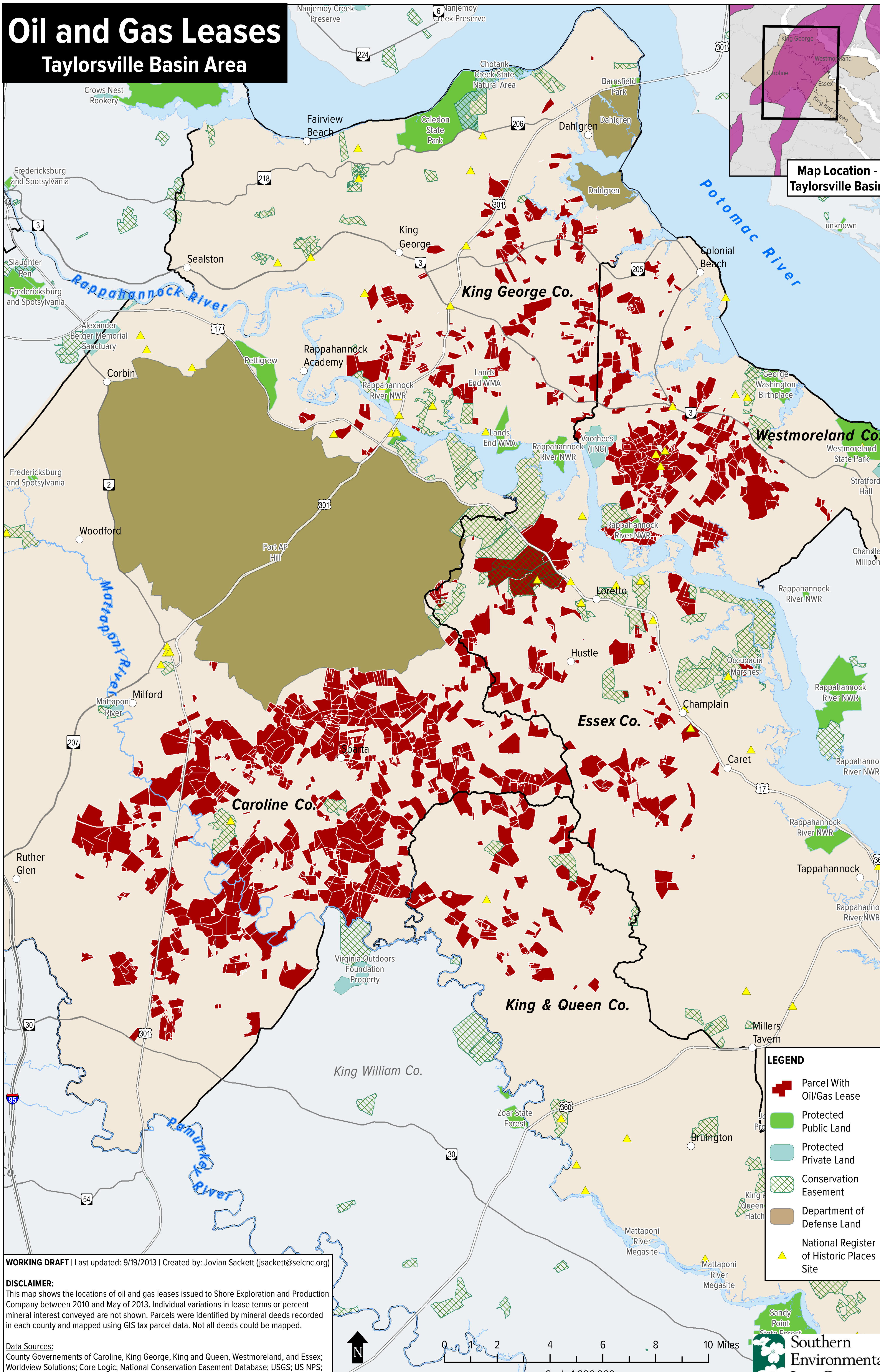
King and Queen County, Virginia

2030 Comprehensive Plan

Appendix I:
Taylorsville Shale Basin Leases

Oil and Gas Leases

Taylorsville Basin Area



WORKING DRAFT | Last updated: 9/19/2013 | Created by: Jovian Sackett (jsackett@selcnc.org)

DISCLAIMER:
This map shows the locations of oil and gas leases issued to Shore Exploration and Production Company between 2010 and May of 2013. Individual variations in lease terms or percent mineral interest conveyed are not shown. Parcels were identified by mineral deeds recorded in each county and mapped using GIS tax parcel data. Not all deeds could be mapped.

Data Sources:
County Governements of Caroline, King George, King and Queen, Westmoreland, and Essex; Worldview Solutions; Core Logic; National Conservation Easement Database; USGS; US NPS; Tele Atlas; US Census Bureau

King and Queen County, Virginia

2030 Comprehensive Plan

Appendix J:
Shoreline Situation Report

6-2000

King and Queen County Shoreline Situation Report

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Supported By:
Virginia Institute of Marine Science, and King and Queen County
through Grant No 99-1-039 with the Chesapeake Bay Local Assistance Department.

Special Report in Applied Marine Science and Ocean Engineering
SRAMSOE No.363

June, 2000

Comprehensive Coastal Inventory
Center for Coastal Resources Management
Virginia Institute of Marine Science

King and Queen
Shoreline Situation Report

Supported by the Virginia Institute of Marine Science Comprehensive Coastal Inventory Program, and King and Queen County through Grant No 99-1-039 with the Chesapeake Bay Local Assistance Department.

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June, 2000

CHAPTER I - Introduction

1.1 Background

In the 1970s, the Virginia Institute of Marine Science (VIMS) received a grant through the National Science Foundation's Research Applied to National Needs Program to develop a series of reports which would describe the condition of tidal shorelines in the Commonwealth of Virginia. These reports became known as the Shoreline Situation Reports. They were published on a county by county basis with additional resources provided by the National Oceanic and Atmospheric Administration's Office of Coastal Zone Management (Hobbs et.al., 1979).

The Shoreline Situation Reports quickly became a common desktop reference for nearly all shoreline managers, regulators, and planners within the Tidewater region. They provided useful information to address the common management questions and dilemmas of the time. Despite their age, these reports remain a desk top reference for many today.

The CCI Program is committed to developing a revised series of Shoreline Situation Reports which are aimed at addressing the management questions of today. The series reports shoreline conditions on a county by county basis. Reports are distributed in hardcopy, but are also available after publication as pdf files on the CCI web site at www.vims.edu/ccrm/publications.html.
The digital GIS coverages developed for the report are also available on the web at www.vims.edu/ccrm/gis/gisdata.html .

1.2 Description of the Locality

King and Queen County includes approximately 318 square miles of land area, and another 9 square miles of water on the Middle Peninsula of Virginia (Figure 1). Primary waterways within the county are the Mattaponi, York, and the Poropotank Rivers. Small headwater streams within the county drain into the Rappahannock River watershed along the east boundary. These non-navigable waterways are not included in this situation report. The county borders Caroline County to the northwest, Essex and Middlesex Counties to the east - northeast, and Gloucester County to the southeast. The York River separates King and Queen from New Kent county, and the Mattaponi River divides the land mass between King and Queen and King William county.

King and Queen County is rural in character. The 1994 Comprehensive Plan for the county reports that three fourths of the land area is forested, with one-third of that land holding owned by forest industries. Population densities estimated in that report for 1990 were 20 persons per square mile (King and Queen County Planning Commission, 1994). A few housing developments are located along the Mattaponi River.

Tidal shoreline protection is afforded through regulations established by the Clean Water Act, and the Chesapeake Bay Preservation Act. King and Queen county established Resource Protection Areas (RPAs) in accordance with the Chesapeake Bay Preservation Act (100 foot buffers landward of all streams, adjoining wetlands, and related sensitive areas). Resource Management areas (RMAs) extend an additional 250 feet landward of the inland limit of the RPA buffer (King and Queen County Planning Commission, 1994).

1.3 Purpose and Goals

This shoreline inventory has been developed as a tool for assessing conditions along the tidal shoreline of the rivers and tributaries in King and Queen County. Recent conditions are reported for three zones within the immediate riparian river area: riparian land use, bank and buffers, and the shoreline. A series of maps and tabular data are published to illustrate and quantify results of an extensive shoreline survey. The survey extends from the mouth of the Poropotank River to just below the Rt 628 crossing over the Mattaponi (Figure 1). The shorelines of the Poropotank, Mattaponi, and York rivers were surveyed, along with some of their smaller contiguous creeks.

1.4 Report Organization

This report is divided into several sections. Chapter 2 describes methods used to develop this inventory, along with conditions and attributes considered in the survey. Chapter 3 identifies potential applications for the data, with a focus on current management issues. From existing literature and the current survey, Chapter 4 reports the general state of the county's shoreline, and integrates a series of maps which illustrate current conditions.

1.5 Acknowledgments

This report has been primarily funded by the Comprehensive Coastal Inventory Program with monies appropriated by the General Assembly. A component of the field work was collected with monies provided by King and Queen County through Grant No 99-1-039 with the Chesapeake Bay Local Assistance Department.

This work was completed entirely with staff support and management from the Virginia Institute of Marine Science's Comprehensive Coastal Inventory Program (CCI). A host of individuals are acknowledged. In addition to those listed as preparers, the project directors would like to thank Dave Weiss of CCI, graduate students Donna Bilkovic and Julie Herman, the VIMS Vessel Center, and the VIMS Publication Center for their support.

Headwaters of the Mattaponi, photo courtesy of MPRA

CHAPTER 2 - The Shoreline Assessment: Approach and Considerations

2.1 Introduction

The Comprehensive Coastal Inventory Program (CCI) has developed a set of protocols for describing shoreline conditions along Virginia's tidal shoreline. The assessment approach uses state of the art Global Positioning Systems (GPS), and Geographic Information Systems (GIS) to collect, analyze, and display shoreline conditions. These protocols and techniques have been developed over several years, incorporating suggestions and data needs conveyed by state agency and local government professionals.

Three separate activities embody the development of a Shoreline Situation Report: data collection, data processing and analysis, and map generation. Data collection follows a three tiered shoreline assessment approach described below.

2.2 Three Tiered Shoreline Assessment

The data inventory developed for the Shoreline Situation Reports is based on a three-tiered shoreline assessment approach. This assessment characterizes conditions in the shorezone, which extends from a narrow portion of the riparian zone seaward to the shoreline. This assessment approach was developed to use observations which could be made from a moving boat. To that end, the survey is a collection of descriptive measurements which characterize conditions. GPS units log location of observed conditions observed from a boat. No other field measurements are performed.

The three tiered shoreline assessment approach divides the shorezone into three regions: 1) the immediate riparian zone, evaluated for land use; 2) the bank, evaluated for height, stability and natural protection; and 3) the shoreline, describing the presence of shoreline structures for shore protection and recreational purposes. Each tier is described in detail below.

2.2a. Riparian Land Use: Land use adjacent to the bank is classified into one of eight categories (Table 1). The categories provide a simple assessment of land use, and give rise to land management practices which could be anticipated. GPS is used to measure the linear extent along shore where the practice is observed. The width of this zone is not measured. Riparian forest buffers are considered the primary land use if the buffer width equals or exceeds 30 feet. This width is calculated from digital imagery as part of the quality control in data processing.

2.2b. Bank Condition: The bank extends off the fastland, and serves as an interface between the upland and the shore. It is a source of sediment and nutrient fluxes from the fastland, and bears many of the upland soil characteristics which determine water quality in receiving waters. Bank stability is important for several reasons. The bank protects the upland from wave energy during storm activity. The faster the bank erodes, the sooner the upland will be at risk. Bank erosion can contribute high sediment loads to the receiving waters. Stability of the bank depends on several factors: height, slope, sediment composition, vegetative cover, and the presence of buffers to absorb energy impact to the bank itself.

The bank assessments in this inventory address three major bank characteristics: bank height, bank stability, and the presence of stable or unstable natural buffers at the toe of the bank (Table 2). Conditions are recorded continuously using GPS as the boat moves along the shoreline. The GPS log reflects any changes in conditions observed.

Bank height is described as a range, measured from the toe of the bank to the top. Bank stability characterizes the condition of the bank face. Banks which are undercut, have exposed root systems, or exhibit slumping of vegetation or other material qualify as a "high erosion". At the toe of the bank, natural marsh vegetation and/or beach material may be present. These features offer protection to the bank and enhance water quality. Their presence is noted in the field, and a general assessment (stable/unstable) describes whether they are experiencing any erosion. Sediment composition and bank slope cannot be surveyed from a boat, and are not included. Bank cover was added as a feature to be surveyed subsequent to data collection for this inventory. Other Shoreline Situation Reports will include bank cover as a descriptive attribute.

Trimble's Geo Explorer GPS unit is used to collect data in the field

Table 1. Tier One - Riparian Land Use Classes

Forest	stands greater than 18 feet / width greater than 30 feet
Scrub-shrub	stands less than 18 feet
Grass	includes grass fields, pasture land, and crop land
Residential	includes single or multi family dwellings
Commercial	includes industrial, small business, recreational facilities
Bare	lot cleared to bare soil
Timbered	clear-cuts
Unknown	land use undetectable from the vessel

Table 2. Tier 2 - Bank Conditions

Bank Attribute	Range	Description
bank height	0-5 ft	from the toe to the edge of the fastland
	5-10 ft	from the toe to the edge of the fastland
	> 10 ft	from the toe to the edge of the fastland
bank stability	low erosion	minimal erosion on bank face or toe
	high erosion	includes slumping, scarps, exposed roots
marsh buffer	no	no marsh vegetation along the bank toe
	yes	fringe or pocket marsh present at bank toe
marsh stability (if present)	stable	no obvious signs of erosion
	unstable	marsh edge is eroding or vegetation loss
beach buffer	no	no sand beach present
	yes	sand beach present
beach stability (if present)	stable	accreting beach
	unstable	eroding beach or non emergent at low tide

2.2c. Shoreline Features: Features added to the shoreline by property owners are recorded as a combination of points or lines. These features include defense structures, which are constructed to protect shorelines from erosion; offense structures, designed to accumulate sand in longshore transport; and recreational structures, built to enhance recreational use of the water. The locations of these features along the shore are surveyed with a GPS unit. Linear features are surveyed without stopping the boat. Structures such as docks, and boat ramps are point features, and a static ten-second GPS observation is collected at the site. Table 3 summarizes shoreline features surveyed. Linear features are denoted with an "L" and point features are denoted by a "P." The glossary describes these features, and their functional utility along a shore.

Table 3. Tier 3 - Shoreline Features

Feature	Feature Type	Comments
Control Structures		
riprap	L	
bulkhead	L	
breakwaters	L	first and last of a series is surveyed
groinfield	L	first and last of a series is surveyed
miscellaneous	L	can include tires, rubble, tubes, etc.
Recreational Structures		
pier/wharf	P	includes private and public
boat ramp	P	includes private and public
boat house	P	all covered structures, assumes a pier
marina	L	includes piers, bulkheads, wharfs

2.3 Data Collection/Survey Techniques

Data collection is performed in the field, from a small, shoal draft vessel, navigating at slow speeds parallel to the shoreline. To the extent possible, surveys take place on a rising tide, allowing the boat to be as close to shore as possible. The field crew consists of a boat operator, and two data surveyors. The boat operator navigates the boat to follow the shoreline geometry. One surveyor collects information pertinent to land use and bank condition. The second surveyor logs information relevant to shoreline structures.

Data is logged using the handheld Trimble GeoExplorer GPS unit. GeoExplorers are accurate to within 4 inches of true position with extended observations, and differential correction. Both static and kinematic data collection is performed. Kinematic data collection is a collection technique where data is collected continuously along a pathway (in this case along the shoreline). The GPS units are programmed to collect information at a rate sufficient to compute a position anywhere along the course. The shoreline survey collects kinematic data at a rate of one observation every five seconds. The land use, bank condition, and linear shoreline structures are collected using this technique.

Static surveys are used to pin-point fixed locations which occur at very short intervals. The boat actually stops to collect these data, and the boat operator must hold the boat against the tidal current, and surface wind waves. Static surveys collect 10 observations recorded at a rate of one observation per second at the fixed station. The GPS unit computes one position, in part, using an averaging technique of the 10 static observations. Static surveys are used to position point features like piers, boat ramps, and boat houses.

The GPS units are preprogramed with the complete suite of shoreline features described in section 2.2. These features are stored in a "data dictionary" prepared specifically for this project. As features are observed in the field, the GPS unit tags each geographic coordinate pair with the attribute's code. The survey, therefore, is a complete set of geographically referenced shoreline features.

Collecting data with Trimble's Geo Explorer GPS unit

2.4 Data Processing

Data processing occurs in two parts. Part one processes the raw GPS field data, and converts the data to GIS coverages. Part two corrects the GIS coverages to reflect true shoreline geometry.

2.4a. GPS Processing: Differential correction improves the accuracy of GPS data by correcting for erroneous errors introduced by "selective availability", a process in which the government scrambles satellite signals to degrade positional data. Differential correction is the first step to processing GPS data. Trimble's Pathfinder Office GPS software is used. The software reviews simultaneously the GPS data logged in the field and data from a selected base station. Data from GPS base stations established by the United States Coast Guard can be used. Data from the VIMS base station can be used for differential correction if the site is within 124 miles of the base station. Differential correction improves the position of the GPS field data based on the known location of the base station, the satellites, and the satellite geometry.

Although the Trimble Geo-Explorers are capable of decimeter accuracy (~ 4 inches), the short occupation of sites in the field reduces the accuracy to 5 meters (~16 feet). In many cases the accuracy achieved is better, but the overall limits established by the CCI program are set at 5 meters. This means that features are mapped to within 5 meters (~16 feet) (or better) of their true position on the earth's surface.

An editing function is used to clean the GPS data. Cleaning corrects for breaks in the data which occur when satellite lock is lost during data collection. Editing also eliminates erroneous data collected when the boat circles off track, and the GPS unit is not switched to "pause" mode.

The final step in GPS processing converts the files to three separate ArcInfo GIS coverages. The three coverages are: a land use and bank condition coverage, a shoreline structure coverage (lines only), and a shoreline structure coverage (points only).

2.4b. GIS Processing: GIS processing uses ESRI's ArcInfo® GIS software, and ERDAS' Imagine ® software. Several data sets are integrated to develop the final inventory products: the shoreline conditions surveyed and processed using GPS, a digital baseline shoreline coverage defining the high water shoreline, and digital imagery for collateral information.

The base shoreline is derived from a digitized record of the high water shoreline illustrated on 7.5 minute USGS topographic maps for the study area. Since it is available for the entire Tidewater area, this shoreline has been selected as the baseline shoreline for development of all Shoreline Situation Reports. The digital coverage was developed by the CCI program in the early 1990s using the most recent topographic maps available. These maps range from the late 1960s to the early 1980s. As USGS updates these maps, revisions to the digital basemap series can be made.

Color infra-red Digital Ortho Quarter Quadrangles (DOQQs) are digital image products circulated by the USGS. DOQQs are fully rectified digital imagery representing one quarter of a USGS quadrangle. They were released in

1997, and use imagery flown in1994. The imagery are used as background during data processing and map production. They are an important quality control tool for verifying the location of certain landscape attributes, and provide users with additional information about the coastal landscape.

GIS processing includes two separate activities. Part one checks the relative accuracy of the shoreline coverage. Since this coverage was developed from topographic maps dating back to the 1960s, significant changes in the shoreline orientation may have occurred. While this process does not attempt to re-compute a shoreline position relative to a vertical tidal datum, it adjusts the horizontal geographic position to reflect the present shoreline geometry. Using ERDAS' Imagine software, the 1994 imagery is displayed onscreen behind the digitized shoreline coverage. The operator looks for areas where the digitized shoreline departs greatly from the land water interface illustrated in the background image. The digitized shoreline coverage is then corrected using Imagine's onscreen digitizing techniques to align more closely with the land water interface displayed. This revised shoreline coverage is used in all subsequent inventory steps and products.

Step two corrects the coverages generated from the field data to the shoreline record. These coverages, having been processed through GPS software, are geographically coincident with the path of the boat, from where observations are made. They are, therefore, located somewhere in the waterway. Step two transfers these data back to the corrected shoreline record so the data more precisely reflects the location being described along the shore.

The majority of data processing takes place in step two, which uses all three data sets simultaneously. The corrected shoreline record, and the processed GPS field data are displayed onscreen in ArcInfo together. The imagery is used in the background for reference. The corrected shoreline is the base coverage. The remaining processing re-codes the base shoreline coverage for the shoreline attributes mapped along the boat track. Each time the boat track data indicates a change in attribute type or condition, the digital shoreline arc is split, and coded for the attribute using ArcInfo techniques.

This step endures a rigorous sequence of checks to insure the positional translation is as accurate as possible. The major features and attributes; land use, bank condition, and shoreline condition, are processed separately. The final products are three new coded shoreline coverages. Each coverage has been checked twice onscreen by different GIS personnel. A final review is done on hardcopy printouts.

2.4c. Maps and Tables: Large format, color maps are generated to illustrate the attributes surveyed along the shore. A three-part map series illustrates the three tiers individually. Plate A describes the riparian land use as color coded bars along the shore. A legend keys the color to the type of land use.

Plate B depicts conditions of the bank and natural buffers following criteria in Table 2. A combination of color and pattern symbology gives rise to a vast amount of bank and buffer information. Erosional conditions are illustrated in red for both bank and buffer. Stable, or low erosion conditions are illustrated in green. Bank height varies with the thickness of the line; where the thickest lines designate the highest banks (> 10 feet). Open circles just seaward of the line indicate a natural fringe marsh along the base of the bank. Solid circles indicate a sand beach buffer at the base of the bank. It is possible to have both. Red circles indicate the buffer is eroding. Green circles indicate the buffer is stable. Along portions of King and Queen County, no erosional data was collected for the buffer. This is illustrated by tan circles. The length of the symbology along the shore reflects the length alongshore that the features persist. The symbology changes as conditions change.

Plate C combines recreational and shoreline protection structures in a composition called Shoreline Features (Table 3). Linear features, described previously, are mapped using color coded bar symbols which follow the orientation of the shoreline. Point features use a combination of colors and symbols to plot the positions on the map.

DOQQ imagery is used as a backdrop, upon which the shoreline data is superimposed. The original color infra-red image is used as a backdrop to Plate A. A gray scale version of this same image is used for Plates B and C.

For publication purposes the county is divided into a series of plates set at a scale of 1:12,000. The number of plates was determined by the geographic size and shape of the locality. An index is provided which illustrates the orientation of plates to each other. The three map compositions (A,B, and C) described above are presented for each plate. The county is divided into nineteen plates (plate 1a, 1b, 1c, etc.), for a total of 57 map compositions.

Tables 4 quantifies features mapped along the rivers using frequency analysis techniques in ArcInfo. The values quantify features on a plate by plate basis. For linear features, values are reported in actual miles surveyed. The number of point features surveyed are also listed on a plate by plate basis. The total miles of shoreline surveyed for each plate is reported. The total river miles surveyed, 76.64 miles, can not be reached by adding the shoreline miles for each plate since there is some plate overlap. The last row of Table 4 gives the total value for each feature computed along the entire surveyed shoreline.

Walkerton, photo by Dwight Dyke

Chapter 3. Applications for Management

3.1 Introduction

There are a number of different management applications for which the Shoreline Situation Reports (SSRs) support. This section discusses four of them which are currently high profile issues within the Commonwealth or Chesapeake Bay watershed. The SSRs are data reports, and do not necessarily provide interpretation beyond the characteristics of the nearshore landscape. However, the ability to interpret and integrate these data into other programs is key to gleaming the full benefits of the product. This chapter offers some examples for how the data within the SSRs can be integrated and synthesized to support current state management programs.

3.2 Shoreline Management

The first uses for SSRs were to prepare decision makers to bring about well informed decisions regarding shoreline management. This need continues today, and perhaps with more urgency. In many areas, undisturbed shoreline miles are almost nonexistent. Development continues to encroach on remaining pristine reaches, and threatens the natural ecosystems which have prevailed. At the same time, the value of waterfront property has escalated, and the exigency to protect shorelines through stabilization has increased. Generally speaking, this has been an accepted management practice. However, protection of tidal shorelines does not occur without incidence.

Management decisions must consider the current state of the shoreline, and understand what actions and processes have occurred to bring the shoreline to its current state. This includes evaluating existing management practices, assessing shore stability in an area, and determining future uses of the shore. The SSRs provide data to perform these evaluations.

Plate A defines the land use adjacent to the shoreline. To the extent that land use directs the type of management practices found, these maps can predict shoreline strategies which may be expected in the future. Residential areas are prone to shoreline alterations. Commercial areas my require structures along the shore for their daily operations. Others frequently seek structural alternatives to address shoreline stability problems. Forested riparian zones, and large tracts of grass or agricultural areas are frequently unmanaged even if chronic erosion problems persist.

Stability at the shore is described in Plate B. The bank is characterized by its height, its state of erosion, and the presence or absence of natural buffers at the bank toe. Upland adjacent to high, stable banks with a stable natural buffer at the base are less prone to flooding or erosion problems resulting from storm activity. Upland adjacent to banks of lesser height (< 5feet) are at greater risk of flooding, but if the banks are stable with marshes or beaches present, erosion may not be a significant concern. Survey data reveals a strong correlation between banks of high erosion, and the absence of natural buffers. Conversely, the association between stable banks and the presence of marsh or beach is also well established. This suggests that natural buffers such as beaches and fringe marshes play an important role in bank protection. This is illustrated on the maps. Banks without natural buffers, yet classified as low erosion, are often structurally controlled with rip rap or bulkheads.

Plate C delineates structures installed along the shoreline. These include erosion control structures, and structures to enhance recreational use of the waterway. This map is particularly useful for evaluating requests from property owners seeking structural methods for controlling shoreline erosion problems. Shoreline managers can evaluate the current situation of the surrounding shore including: impacts of earlier structural decisions, proximity to structures on neighboring parcels, and the vicinity to undisturbed lots. Alternative methods such as vegetative control may be evaluated by assessing the energy or fetch environment from the images. Use this plate in combination with Plate B to evaluate the condition of a bank proposed for protection.

A close examination of shore conditions may suggest whether certain structural choices have been effective. Success of groin field and breakwater systems is confirmed when sediment accretion is observed. Low erosion conditions surveyed along segments with bulkheads and riprap indicate structures have controlled the erosion problem. The width of the shorezone, estimated from the background image, also speaks to the success of structures as a method of controlling erosion. A very narrow shorezone implies that as bulkheads or riprap have secured the erosion problem at the bank, they have also deflated the supply of sediment available to nourish a healthy beach. This conflict remains unresolved in most management cases.

Shoreline managers are encouraged to use all three plates together when developing management strategies or making regulatory decisions. Each plate provides important information independent of the others, but collectively the plates become a more valuable management tool.

3.3 Non-Point Source Targeting

The identification of potential problem areas for non-point source pollution is a focal point of water quality improvement efforts throughout the Commonwealth. The three tiered approach provides a collection of data which, when combined, can allow for an assessment of potential non-point source pollution problems in a waterway.

Grass land, which includes cultivated and pasture lands, has the highest potential for nutrient runoff. These areas are also prone to high sediment loads since the adjacent banks are seldom restored when erosion problems persists. Residential, bare, and commercial land uses rank second because of the types of practices which prevail, and the large impervious surface areas.

The highest potential for non-point source pollution combines these land uses with “high” bank erosion conditions and no marsh buffer protection. The potential for non-point source pollution moderates as the condition of the bank changes from “high” bank erosion to “low” bank erosion, or with the presence or absence of stable marsh vegetation to function as a nutrient sink for runoff. Where defense structures occur in conjunction with “low” bank erosion, the structures are effectively controlling erosion at this time, and the potential for non-point source pollution is reduced. If the following characteristics are delineated: low bank erosion, stable marsh buffer, riprap or bulkhead; the potential for non-point source pollution from any land use class can be lowered.

At the other end of the spectrum, forested and scrub-shrub sites do not contribute significant amounts of non-point source pollution to the receiving waterway. Forest buffers, in particular, are noted for their ability to uptake nutrients running off the upland. Forested areas with stable or defended banks, a stable fringe marsh, and a beach would have the lowest potential as a source of non-point pollution. Scrub-shrub with similar bank and buffer characteristics would also be very low.

A quick search for potential non-point source sites would begin on Plate A. Identify the “grass” areas. Locate these areas on Plate B, and find those which have eroding banks (in red) without any marsh protection. The hot spots are these sites where the banks are highest (thick red line), so the potential sediment volume introduced to the water is greatest. Finally check plate C to determine if any artificial stabilization to protect the bank has occurred. If these areas are without stabilizing structures, they indicate the hottest spots for the introduction of non-point source pollution.

Bank cover is also an important attribute for assessing stability, and the potential for sediment load input. This attribute is now being considered in upcoming SSRs. Re-vegetation of eroding banks with little cover is often a preferred alternative to shoreline hardening.

3.4 Designating Areas of Concern (AOC) for Best Management Practice (BMP) Sites

Sediment load and nutrient management programs at the shore are largely based on installation of Best Management Practices (BMPs). Among other things, these practices include fencing to remove livestock from the water, installing erosion control structures, and bank re-vegetation programs. Installation of BMPs is costly. Cost share programs provide relief for property owners, but funds are scarce in comparison to the capacious number of waterway miles needing attention. Targeting Areas of Concern (AOC) can prioritize spending programs, and direct funds where most needed.

Data collected for the SSR can assist with targeting efforts for designating AOCs. AOCs can be areas where riparian buffers are fragmented, and could be restored. Use Plate A to identify forested upland. Breaks in the continuity of the riparian forest can be easily observed in the line segments, and background image. Land use between the breaks relates to potential opportunity for restoring the buffer where fragmentation has occurred. Agricultural tracts which breach forest buffers are more logical targets for restoration than developed residential or commercial stretches. Agricultural areas, therefore, offer the highest opportunity for conversion. Priority sites for riparian forest restoration should target forested tracts breached by “grass” land (green-yellow-green line pattern).

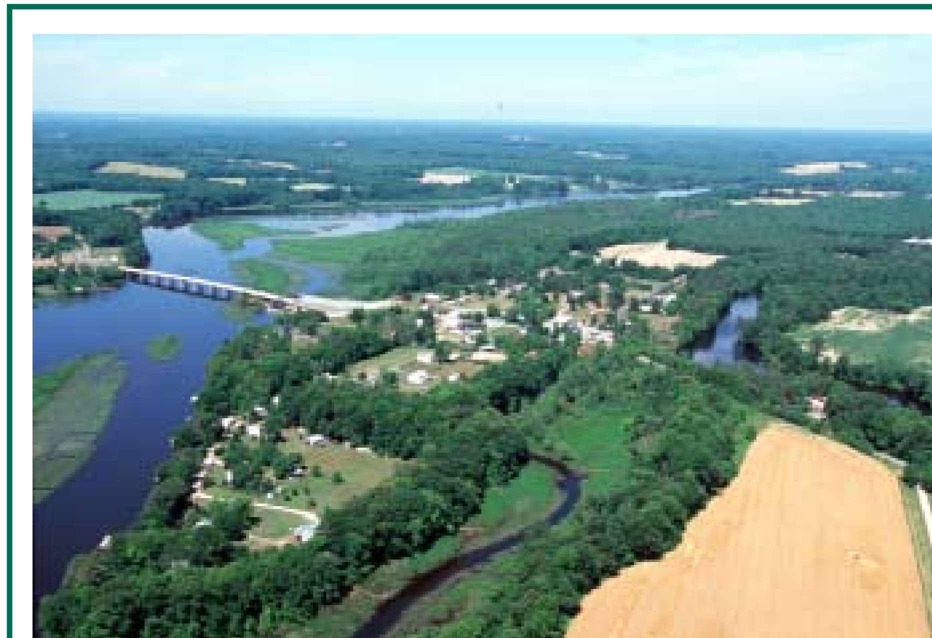
Plate B can be used to identify sites for BMPs. Look for where “red” (i.e. eroding) bank conditions persist. The thickness of the line indicates bank height and erosional quality. The fetch, or the distance of exposure across the water, can offer some insight into the type of BMP which might be most appropriate. Re-vegetation may be difficult to establish at the toe of a bank with high exposure to wave conditions. Plate C should be checked for existing shoreline erosion structures in place.

3.5 Targeting for Total Maximum Daily Load (TMDL) Modeling

As the TMDL program in Virginia evolves, the importance of shoreline erosion in the lower tidal tributaries will become evident. Total maximum daily loads are defined as a threshold value for a pollutant, which when exceeded, impedes the quality of water for specific uses (e.g. swimming, fishing). Among the pollutants to be considered are: fecal coliform, pathogens, nitrogen, phosphorous, and sediment load.

State agencies will develop models to address each of these parameters. In upper watersheds, nutrient and fecal coliform parameters will be critical where high agricultural land use practices prevail. Sediment loads will eventually be considered throughout the watershed. In the lower watersheds, loads from shoreline erosion must be addressed for a complete sediment source budget. Erosion from shorelines has been associated with high sediment loads in receiving waters (Hardaway et.al., 1992), and the potential for increased nutrient loads (Ibison et.al., 1990). Virginia’s TMDL program is still developing. Impaired stream segments are being used to initially identify where model development should focus. For Virginia, this streamlining has done little to reduce the scope of this daunting task, since much of the lower major tributaries are considered impaired. Additional targeting will be necessary to prioritize model development.

Targeting to prioritize TMDL can be assisted by maps which delineate areas of high erosion, and potential high sediment loads. Plate B in this inventory delineates banks of high erosion. Waterways with extensive footage of eroding shorelines should be targeted. The volume of sediment entering a system is also a function of bank height. Actual volumes of sediment eroded can be estimated by using bank height, and the linear extent that the condition persists along the shore. Bank height is an attribute defined in Plate B by the width of the line. Eroding banks (in red) with heights in excess of 10 feet (thickest line) would be target areas for high sediment loads. Plate A can be used in combination with Plate B to determine the dominant land use practice, and assess whether nutrient enrichment through sediment erosion is also a concern. This would be the case along agriculturally dominated waterbodies. Table 4 quantifies the linear extent of high, eroding banks on a plate by plate basis.



Walkerton, photo by Dwight Dyke

Chapter 4. The Shoreline Situation

The shoreline situation is described for conditions in King and Queen County extending along the Poropotank River, the York River, and the Mattaponi River, from its mouth to just below the Rt 628 crossing. Only the portion of these rivers within King and Queen County jurisdiction are described.

Brief descriptions are provided on the basis of river segments, designated on a geographic basis. These summarize data from Table 4, and discuss notable features present. Four segments are defined. Segment 1 includes plates 1-2. Segment 2 includes plates 3-5. Segment 3 combines plates 6-11, and Segment 4 describes plates 12-19. Important documentation pertaining to each plate map precedes the compositions.

Guthrie Creek, photo by Kirk Havens

Segment 1 (plates 1 and 2)

Description: Segment 1 consists mainly of the wide embayed marshes along the meandering headwaters of the Poropotank River. This narrow river stretch soon gives way to the much wider Morris Bay (Plate 2) before flowing into the York River. Numerous tidal creeks extend from the Poropotank, including Poplar Spring Branch, and Guthrie Creek. Approximately 11.7 miles of this segment were surveyed in August, 1998 out of a total 23.27 shoreline miles. The majority of unsurveyed shoreline is at the extreme headwaters, and along shallow tidal creeks.

Land Use: The riparian upland of this segment is dominated by forested land use. Forest cover averages more than 87% of land use on each plate. Just over 0.5 mile of shoreline is residential in this segment. Residential areas along the main stem of the Poropotank were not detected, but were surveyed at isolated locations in Guthrie Creek. Overall, this segment can be characterized as woody and rural.

Bank Condition: Banks along the shoreline of this segment range from under five feet to over ten feet. Approximately 83% of shoreline miles surveyed have bank heights under five feet, while 15% of the banks are over ten feet. Field observations record the condition of the bank as mostly stable. Only 3.7% of the banks surveyed were classified as high erosion. These areas tend to be concentrated along Guthrie Creek where there is undercutting of the bank, and a few isolated blow-out areas. This segment does not contain any beaches and is characterized as having a low, noncritical flood potential (Byrne and Anderson., 1978).

Shore Condition: The presence of wide, embayed marshes and fringe marshes, which protect the upland, contribute to the low erosion potential of the shoreline along this segment. Fetches are mostly low and thus wind waves are not a constant threat to the shoreline. Tidal currents, however, have been a major force in eroding approximately 43% of the marshes along the meandering stretches of the headwaters. Historical erosion rates are low in this area and should continue as such due to the presence of these marshes (Byrne and Anderson, 1978). Also, the absence of any significant residential development has helped to keep the erosion potential low. There are few piers and boat ramps in this segment; which would be expected with the low residential shore use. In addition, no boathouses, groins, and almost no riprap and bulkhead exist along this segment.

Gutherie Creek and Morris Bay, photo by Kirk Havens

Segment 2 (Plates 3 - 5)

Description: Segment 2 overlaps with Segment 1 around Morris Bay and Guthrie Creek, but continues along the shoreline of the York River, beyond Roane, and just below West Point, in the vicinity of the Municipal Airport. Approximately 16.53 miles of 41.86 miles of shoreline were survey in this segment during August, 1998. The unsurveyed shoreline occurs along major shallow tidal creeks, such as Hockley Creek. From aerial imagery it is known that these creeks are dominated by well established embayed marshes. The land use is a combination of forest cover with intermittent agricultural/grass uses. Overall, the surveyed portion of this segment is a mix of rural areas and residential development with forested and scrub-shrub.

Land Use: Forested land use dominates this segment. Approximately 61.8% of the shoreline can be characterized as forested, while 16.1% of the shoreline is scrub-shrub. Residential development contributes another 17% of land use along this segment. Scrub-shrub dominates around Roane, and residential development along the York River at Belleview. From Hockley Creek to the mouth of the Mattaponi River, forest cover dominates with sections of scrub-shrub. A significant residential community is located just south of the bridge. Residential development along the York River has increased since the 1970s. This increase has occurred in a few specific areas, but has been especially prominent near Belleview (Hobbs et.al., 1975).

Bank Condition: Most of the banks (92.3%) along this segment of King and Queen County shoreline are under five feet in height. Higher bank conditions are located mostly along Guthrie Creek.. Field observations record the stability of the banks as stable along more than 95% of surveyed shoreline. The one predominant area of instability is near Belleview, on a developed tract with little to no fringing marsh evident. The flood potential is low and noncritical in this segment for most of the shoreline. It does, however, become moderate and critical at Roane and for several of the residential areas near Belleview (Hobbs et.al., 1975).

Shore Condition: Higher fetches along the shoreline in this segment result in more marsh erosion, especially near Roane and in Morris Bay. Shoreline stability is good, and marsh erosion is low in Guthrie Creek. Along the mainstem of the York River, fringe marshes are common, and a few beaches exist. The extent of marsh erosion can not be determined since data was not collected on marsh condition for much of this shoreline. Historic erosion rates are slight with no shoreline change in Morris Bay, and for parts of the York River mainstem (Byrne and Anderson, 1978). Moderate, noncritical erosion rates characterize the shoreline from Belleview to Goff Point, delineated in Plate 5. This area has a historical erosion rate of 1.1 to 1.6 feet per year. Shoreline erosion structures are more frequent in this segment as 8.6% of the surveyed shoreline is bulkheaded or has riprap. Piers and boathouses are abundant near Belleview, and north of Goff Point.

York River, West Point, photo by Dwight Dyke.

Segment 3 (Plates 6 - 11)

Description: Segment 3 covers the lower portion of the Mattaponi River near West Point and continues upriver to Log Landing. This segment trends from northwest to southeast and is fetch-limited. The King and Queen county shore of the lowest portion of the Mattaponi is absent the industrial character present along King William county shoreline. In the vicinity of the Route 33 bridge, the shore is predominantly residential land use. Beyond West Point, the river meanders, and wide embayed marshes dominate. Approximately 19.25 miles of shoreline was surveyed in July and August,1998 out of a total 36.48 miles of shoreline. The bulk of the shoreline that was not surveyed is within two shallow tidal creeks (Burnt Mill Creek and Corbin Creek), near West Point.

Mattaponi River, photo by James P. Blair

Land Use: Similar to Segment 2, more than three quarters of the surveyed shoreline in Segment 3 is forested. Only 18% of the shoreline can be characterized as residential. The largest concentration of such development can be found near Courthouse Landing. Grass and scrub-shrub land uses are not very common, nor is commercial land use. Development of these shorelines has not occurred to a large extent since the 1970s, leaving the forested shorelines backed by agricultural land mostly untouched.

Bank Condition: Approximately 78% of the banks along this segment are under five feet in height, while approximately19% are 5-10 feet high. Only a few banks in this relatively low-lying area have heights over 10 feet. Field observations characterize more than 94% of these banks as stable with low erosion. Banks with high erosion can be found along some of the river meanders where the river width narrows and switches course. The flood hazard for Segment 3 is low and noncritical.

Shore Condition: Wide, embayed marshes are common along this segment, which help to keep upland erosion down and offer bank protection. As noted in plate B, no data exists on marsh stability. Beaches, which also protect upland from wave induced erosion, are not found along this segment. Only 0.41 mile of bulkhead and 0.26 mile of riprap are found in Segment 3, owing much to the low residential density along these shorelines. Piers are relatively scarce for most, but increase in density near Courthouse Landing residential area. No groinfields were found. Due to the low fetches and embayed marshes, erosion potential due to wind waves is minor along these stretches. Erosion due to tidal currents or sea level rise is possible.

Rainbow Acres Campground, photo by Donna Bilkovic

Segment 4 (Plates 12 - 19)

Description: The last segment of King and Queen County covers the upper portion of the Mattaponi River. This stretch of shoreline is defined by the presence of intertidal marsh islands that have formed at the meanders of the river. Segment 4 begins past Log Landing and continues toward the headwaters, ending just below the Route 628 road crossing. Approximately 35.71 miles of shoreline in Segment 4 were surveyed in July and August, 1998 from a total of 54.74 miles of shoreline. Shallow tidal creeks such as Garnetts Creek were not surveyed at this time, and are included in the unsurveyed shoreline miles. This section of the Mattaponi is very fetch limited, and shoreline conditions are generally influenced by tidal currents or sea level rise, as opposed to wind generated waves.

Land Use: Similar to other shorelines of the county, approximately 86.5% of the shoreline along this segment is forested. Another 12.5% of the shoreline is residential, and land uses of grass, scrub-shrub and commercial are not very common. The residential areas within this segment are mostly concentrated at the towns of Mantapike, Rickahock, Walkerton, and Whitehall. Erosion of these shorelines is mainly low except at selected river meanders.

Bank Condition: Bank heights along this segment vary from 0-5 feet to over 10 feet in height. Almost half (46.3%) of the banks are under 5 feet, while 40% of the banks are from 5-10 feet in height. Approximately 13.8% of the banks are over 10 feet. Most of these banks are characterized as low erosion. Only 1.21 miles of banks are considered to be highly eroding.

Garnetts Creek, photo by Dwight Dyke

Shore Condition: This segment is marked by an absence of beaches. It is also marked by a mix of embayed and fringing marshes. Almost half (6.37 miles) of the marshes surveyed are classified as stable, while another 6.86 miles of marsh are surveyed without any indication of stability. Pier density is relatively high in the residential areas. Almost half of the piers are concentrated around Mantapike. Boathouses are commonly found along the shoreline of this segment. No groins, marinas, or breakwaters exist. This segment has virtually no shoreline armoring; only 0.35 mile of bulkhead. A lack of armored shoreline along this segment is due to the low wave energy environment. Tidal current energy, however, is moderately high due to the narrowing of the river and meandering stretches.

Aylett, photo by Dwight Dyke

Map Compositions

Plate 1

Location:	Headwaters of river to near Partridge Landing
Major River:	Poropotank
Total Shoreline Miles:	4.83
Shoreline Miles Surveyed:	4.03
Survey Date(s):	8/17/98
Plate Rotation:	43 degrees E

Plate 2

Location:	Partridge Landing to Roane
Major River:	Poropotank
Total Shoreline Miles:	18.87
Shoreline Miles Surveyed:	8.10
Survey Date(s):	8/17/98
Plate Rotation:	14 degrees E

Plate 3

Location:	Morris Bay to 0.5 miles east of Belleview
Major River:	Poropotank, York
Total Shoreline Miles:	16.24
Shoreline Miles Surveyed:	10.87
Survey Date(s):	8/17/98
Plate Rotation:	66 degrees W

Plate 4

Location:	0.5 miles east of Belleview to 0.6 miles west of Bakers Creek
Major River:	York
Total Shoreline Miles:	13.60
Shoreline Miles Surveyed:	2.86
Survey Date(s):	8/5/98
Plate Rotation:	66 degrees W

Plate 5

Location:	0.2 miles east of Robinson's Creek to 0.4 miles south of Lord Delaware Bridge
Major River:	York
Total Shoreline Miles:	17.76
Shoreline Miles Surveyed:	2.93
Survey Date(s):	8/5/98
Plate Rotation:	66 degrees W

Plate 6

Location:	0.4 miles south of Lord Delaware Bridge to 0.3 miles northwest of Corbin's Creek
Major River:	Mattaponi
Total Shoreline Miles:	11.81
Shoreline Miles Surveyed:	2.46
Survey Date(s):	8/5/98
Plate Rotation:	23 degrees E

Plate 7

Location:	0.3 miles northwest of Corbin's Creek to the Rt. 657 approach to the river
Major River:	Mattaponi
Total Shoreline Miles:	9.7
Shoreline Miles Surveyed:	1.27
Survey Date(s):	8/5/98
Plate Rotation:	0 degrees

Plate 8

Location:	Muddy Point to Clifton
Major River:	Mattaponi
Total Shoreline Miles:	3.9
Shoreline Miles Surveyed:	3.9
Survey Date(s):	8/5/98
Plate Rotation:	90 degrees W

Plate 9

Location:	0.75 miles southeast of Chelsea Landing to Boardley
Major River:	Mattaponi
Total Shoreline Miles:	3.91
Shoreline Miles Surveyed:	3.91
Survey Date(s):	8/5/98
Plate Rotation:	90 degrees W

Plate 10

Location: **Boardley and around Gleason Marsh**
Major River: **Mattaponi**
Total Shoreline Miles: **4.73**
Shoreline Miles Surveyed: **4.73**
Survey Date(s): **7/9/98 and 8/5/98**
Plate Rotation: **90 degrees W**

Plate 11

Location: 0.75 miles southeast of Mitchell Hill Creek to Log Landing
Major River: Mattaponi
Total Shoreline Miles: 8.39
Shoreline Miles Surveyed: 4.14
Survey Date(s): 7/9/98
Plate Rotation: 0 degrees

Plate 12

Location: Log Landing to De Farges Bar
Major River: Mattaponi
Total Shoreline Miles: 9.86
Shoreline Miles Surveyed: 3.59
Survey Date(s): 7/9/98
Plate Rotation: 16 degrees W

Plate 13

Location: De Farges Bar to Rickahock
Major River: Mattaponi
Total Shoreline Miles: 8.61
Shoreline Miles Surveyed: 3.5
Survey Date(s): 7/9/98
Plate Rotation: 46 degrees W

Plate 14

Location: Rickahock to west of Walkerton
Major River: Mattaponi
Total Shoreline Miles: 8.33
Shoreline Miles Surveyed: 3.51
Survey Date(s): 7/9/98
Plate Rotation: 46 degrees W

Plate 15

Location: 0.6 miles west of Walkerton to Line Tree Bar
Major River: Mattaponi
Total Shoreline Miles: 4.84
Shoreline Miles Surveyed: 2.91
Survey Date(s): 7/8/98
Plate Rotation: 46 degrees W

Plate 16

Location: Line Tree Bar to Cape Charlie
Major River: Mattaponi
Total Shoreline Miles: 6.92
Shoreline Miles Surveyed: 5.84
Survey Date(s): 7/8/98
Plate Rotation: 90 degrees W

Plate 17

Location: Cape Charlie into headwaters of river
Major River: Mattaponi
Total Shoreline Miles: 6.91
Shoreline Miles Surveyed: 6.8
Survey Date(s): 7/8/98 and 8/6/98
Plate Rotation: 90 degrees W

Plate 18

Location: Headwaters of river
Major River: Mattaponi
Total Shoreline Miles: 3.95
Shoreline Miles Surveyed: 3.95
Survey Date(s): 8/6/98
Plate Rotation: 90 degrees W

Plate 19

Location:	Headwaters of river
Major River:	Mattaponi
Total Shoreline Miles:	6.55
Shoreline Miles Surveyed:	6.35
Survey Date(s):	8/6/98
Plate Rotation:	61 degrees W

Mattaponi River, photo by James P. Blair

Glossary of Shoreline Features Defined

Bare - Land use defined as bare includes areas void of any vegetation or obvious land use. Bare areas include those which have been cleared for construction.

Beaches - Beaches are sandy shores which are subaerial during mean high water. These features can be thick and persistent, or very thin lenses of sand.

Boat house - A boathouse is considered any covered structure alongside a dock or pier built to cover a boat. They include true "houses" for boats with roof and siding, as well as awnings which offer only overhead protection. Since nearly all boat houses have adjoining piers, piers are not surveyed separately, but are assumed. Boat houses may be difficult to see in aerial photography. On the maps they are denoted with a blue triangle.

Boat Ramp - Boat ramps provide vessels access to the waterway. They are usually constructed of concrete, but wood and gravel ramps are also found. Point identification of boat ramps does not discriminate based on type, size, material, or quality of the launch. Access at these sites is not guaranteed, as many may be located on private property. The location of these ramps was determined from static ten second GPS observations. Ramps are illustrated as purple squares on the maps.

Breakwaters - Breakwaters are structures which sit parallel to the shore, and generally occur in a series along the shore. Their purpose is to attenuate and deflect incoming wave energy, protecting the fastland behind the structure. In doing so, a beach may naturally accrete behind the structures if sediment is available. A beach nourishment program is frequently part of the construction plan.

The position of the breakwater offshore, the number of breakwaters in a series, and their length depends on the size of the beach which must be maintained for shoreline protection. Most breakwater systems sit with the top at or near MHW and are partially exposed during low water. Breakwaters can be composed of a variety of materials. Large rock breakwaters, or breakwaters constructed of gabion baskets filled with smaller stone are popular today. Breakwaters are not easily observed from aerial imagery. However, the symmetrical cuspate sand bodies which may accumulate behind the structures can be. In this survey, individual breakwaters are not mapped. The first and last breakwater in the series are surveyed as a ten-second static GPS observation. The system is delineated on the maps as a line paralleling the linear extent of the breakwater series along the shore.

Bulkhead - Bulkheads are traditionally treated wood or steel "walls" constructed to offer protection from wave attack. More recently, plastics are being used in the construction. Bulkheads are vertical structures built slightly seaward of the problem area and backfilled with suitable fill material. They function like a retaining wall, as they are designed to retain upland soil, and prevent erosion of the bank from impinging waves. The recent proliferation of vertical concrete cylinders, stacked side by side along an eroding stretch of shore offer similar level of protection as bulkheads, and include some of the same considerations for placement and success. These structures are also included in the bulkhead inventory.

Bulkheads are found in all types of environments, but they perform best in low to moderate energy conditions. Under high energy situations, the erosive power of reflective waves off bulkheads can scour material from the base, and cause eventual failure of the structure.

Bulkheads are common along residential and commercially developed shores. From aerial photography, long stretches of bulkheaded shoreline may be observed as an unnaturally straight or angular coast. In this inventory, they are mapped using kinematic GPS techniques. The data are displayed as linear features on the maps.

Commercial - Commercial zones include small commercial operations and larger industrial facilities. These operations are not necessarily water dependent businesses.

Dock/Pier - In this survey, a dock or pier is a structure, generally constructed of wood, which is built perpendicular or parallel to the shore. These are typical on private property, particularly residential areas. They provide access to the water, usually for recreational purposes. Docks and piers are mapped as point features on the shore. Pier length is not surveyed. In the map compositions, docks are denoted by a small green dot. Depending on resolution, docks can be observed in aerial imagery, and may be seen in the maps if the structure was built prior to 1994, when the photography was taken.

Mattaponi River, photo by James P. Blair

Forest Land Use - Forest cover includes deciduous, evergreen, and mixed forest stands greater than 18 feet high. The riparian zone is classified as forested if the tree stand extends at least 33 feet inland of the seaward limit of the riparian zone.

Grass - Grass lands include large unmanaged fields, managed grasslands adjacent to large estates, agriculture tracts reserved for pasture, and cultivated fields.

Groinfield - Groins are low profile structures that sit perpendicular to the shore. They are generally positioned at, or slightly above, the mean low water line. They can be constructed of rock, timber, or concrete. They are frequently set in a series known as a groinfield, which may extend along a stretch of shoreline for some distance.

The purpose of a groin is to trap sediment moving along shore in the littoral current. Sediment is deposited on the updrift side of the structure and can, when sufficient sediment is available in the system, accrete a small beach area. Some fields are nourished immediately after construction with suitable beach fill material. This approach does not deplete the longshore sediment supply, and offers immediate protection to the fastland behind the system.

For groins to be effective there needs to be a regular supply of sediment in the littoral system. In sediment starved areas, groin fields will not be particularly effective. In addition they can accelerate erosion on the downdrift side of the groin. The design of "low profile" groins was intended to allow some sediment to pass over the structure during intermediate and high tide stages, reducing the risk of down drift erosion.

From aerial imagery, most groins cannot be observed. However, effective groin fields appear as asymmetrical cusps where sediment has accumulated on the updrift side of the groin. The direction of net sediment drift is also evident.

This inventory does not delineate individual groins. In the field, the first and last groin of a series is surveyed. Others between them are assumed to be evenly spaced. On the map composition, the groin field is designated as a linear feature extending along the shore.

Marina - Marinas are denoted as line features in this survey. They are a collection of docks and wharfs which can extend along an appreciable length of shore. Frequently they are associated with extensive bulkheading. Structures associated with a marina are not identified individually. This means any docks, wharfs, and bulkheads would not be delineated separately. Marinas are generally commercial operations. Community docks offering slips and launches for community residents are becoming more popular. They are usually smaller in scale than a commercial operation. To distinguish these facilities from commercial marinas, the riparian land use map (Plate A) will denote the use of the land at the site as residential for a community facility, rather than commercial.

Marshes - Marshes can be extensive embayed marshes, or narrow, fragmented fringe marshes. The vegetation must be relatively well established, although not necessarily healthy.

Miscellaneous - Miscellaneous point features represent short isolated segments along the shore where material has been dumped to protect a section of shore undergoing chronic erosion. Longer sections of shore are illustrated as line features. They can include tires, bricks, broken concrete rubble, and railroad ties as examples.

Residential - Residential zones include rural and suburban size plots, as well as multi-family dwellings.

Riprap - Generally composed of large rock to withstand wave energy, riprap revetments are constructed along shores to protect eroding fastland. Revetments today are preferred to bulkhead construction. They reduce wave reflection which causes scouring at the base of the structure, and are known to provide some habitat for aquatic and terrestrial species. Most revetments are constructed with a fine mesh filter cloth placed between the ground and the rock. The filter cloth permits water to permeate through, but prevents sediment behind the cloth from being removed, and causing the rock to settle. Revetments can be massive structures, extending along extensive stretches of shore, and up graded banks. When a bulkhead fails, riprap is often placed at the base for protection, rather than a bulkhead replacement. Riprap is also used to protect the edge of an eroding marsh. This use is known as toe protection. This inventory does not distinguish among the various types of revetments.

Riprap revetments are popular along residential waterfront as a mechanism for stabilizing banks. Along commercial or industrial waterfront development such as marinas, bulkheads are still more common since they provide a facility along which a vessel can dock securely.

Riprap is mapped as a linear feature using kinematic GPS data collection techniques. The maps illustrate riprap as a linear feature along the shore.

Scrub-shrub - Scrub-shrub zones include trees less than 18 feet high, and is usually dominated by shrubs and bushy plants.

Walkerton, photo by Dwight Dyke

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Walkerton, photo by Dwight Dyke

King and Queen County, Virginia

2030 Comprehensive Plan

Appendix K:
NRCS Soil Report

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Virginia Polytechnic
Institute and State
University

Soil Survey of King and Queen County, Virginia

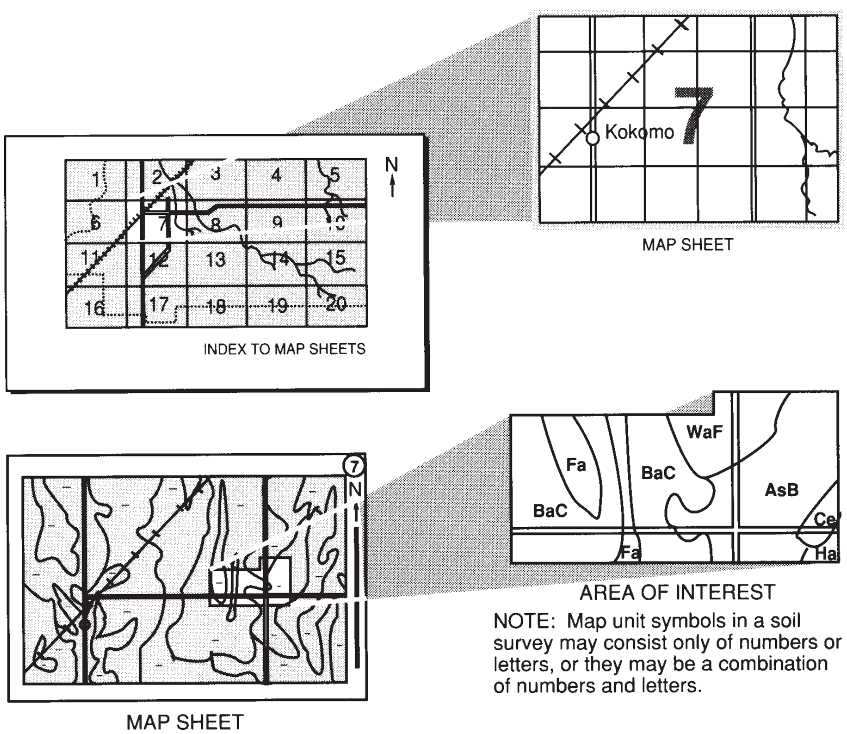
How To Use This Soil Survey

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and go to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Go to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1995. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. The most current official data are available at http://websoilsurvey.nrcs.usda.gov/app/. This survey was made cooperatively by the Natural Resources Conservation Service and the Virginia Polytechnic Institute and State University. The Virginia Department of Conservation and Recreation and the King and Queen County Board of Supervisors provided financial assistance for the survey. The survey is part of the technical assistance furnished to the Three Rivers Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Corn on Emporia sandy loam, 0 to 2 percent slopes.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

Contents

Issued 2007

Foreword

This soil survey contains information that affects land use planning in King and Queen County. It includes predictions of soil behavior for selected land uses. The survey highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use the survey to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

John A. Bricker
State Conservationist
Natural Resources Conservation Service

Soil Survey of King and Queen County, Virginia

John R. Davis, Natural Resources Conservation Service

Fieldwork by John R. Davis, Kenneth Crader, Dan J. Crowner, Denis A. Ebodaghe, David Fowlkes, Cornelius Harris, David H. Kingsbury, Val J. Krawiecki, Diane A. Shields, Robert Wimbish, and Barrie L. Wolf, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
Virginia Polytechnic Institute and State University

King and Queen County is in the middle peninsula of Virginia, approximately 50 miles west of the Chesapeake Bay (fig. 1). It is bordered on the north by Caroline, Essex, and Middlesex Counties. It is bordered on the south and west by Caroline, King William, New Kent, and James City Counties and by the Mattaponi and Poropotank Rivers.

King and Queen County has a total area of about 327 square miles, including about 320 square miles of land and 7 square miles of water. It has about 208,700 acres of land.

King and Queen Court House, the county seat, is located in the south-central part of the county. In 2000, the population of the county was 6,630 *(19).*

The county is primarily agricultural. Most farms produce cash grain crops. About 60 percent of the county is woodland, and about 40 percent is farmland.

General Nature of the Survey Area

This section provides general information about King and Queen County. It describes history; physiography, relief, and drainage; water resources; transportation; and climate.

History

Prior to 1648, it was unlawful to settle north of the York River because of treaties with the Native American Indian tribes. In 1649, the laws were amended to permit settlement.

In 1691, King and Queen County was named in honor of King William III and Queen Mary II of England. The original county included present-day King William and New Kent Counties and a large portion of present-day Spotsylvania County.

Numerous institutions of learning were established in King and Queen County between 1760 and 1850. Reputable academies were successfully operated at locations near Dunkirk, Fleetwood, Stephensville, Bruington, Newton, and Locust Cottage.

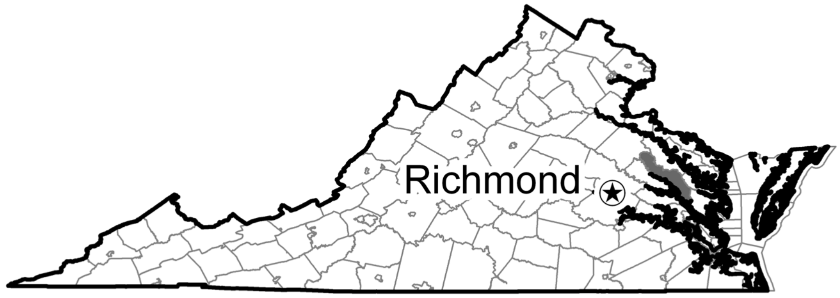


Figure 1.—Location of King and Queen County in Virginia.

The Mattaponi River was a major route during the early years of the county. Many vessels bound for England sailed out on the Mattaponi River. Numerous colonial mansions stood on both sides of the Mattaponi River. Prominent public tobacco warehouses were operated in Todds, Mantapike, and Shepherds as early as 1730. Dunkirk was once an active trade center.

Although no major conflicts of the Civil War occurred in the county, in March 1864 the King and Queen Home Guard helped to end Colonel Ulric Dahlgren's retreat from a raid on Richmond. Dahlgren was killed, and most of his force was captured. In retaliation, King and Queen Court House was burned on March 10, 1864, by Federal forces. Most of the early historical records of the county were lost in the fire.

Physiography, Relief, and Drainage

King and Queen County lies entirely in the Atlantic Southern Coastal Plain. The soils in the county are derived from several ancient, nearly level, marine and alluvial terraces that range from sea level to 190 feet above sea level. The Wicomico Terrace occurs between elevations of 50 and 90 feet; the Chowan Terrace, between elevations of 30 and 50 feet; the Dismal Swamp, between elevations of 15 and 30 feet; and the Princess Anne Terrace, between sea level and 15 feet. These terraces are located along the Mattaponi and Poropotank Rivers. Most of the county is on the Sunderland Terrace, which occurs between elevations of 90 and 190 feet above sea level. The highest point in the county is near Salvia. The Sunderland Terrace extends the length of the county from northwest to southeast, occurring as an elevated, gently rolling plateau that has been dissected by numerous steep drainageways. Steep slopes or escarpments commonly divide this terrace surface from the lower terraces.

Generally, the upper Coastal Plain has a gently rolling topography. The Sunderland and Wicomico Terraces are at the higher elevations and consist of nearly level to strongly sloping uplands that have been deeply eroded by numerous rivers and streams of dendritic watersheds. Moderately steep to very steep side slopes are typical along the smaller drainageways.

The Chowan Terrace and Dismal Swamp occur below an escarpment and consist of broad, nearly level or gently rolling areas with numerous meandering streams. These streams are fed by streams draining the more elevated Sunderland and Wicomico Terraces. Backswamps, oxbow lakes, and freshwater swamps are common.

The Princess Anne Terrace is an area of level or nearly level, low-lying alluvial sediments adjacent to the major tidal rivers and drainageways in the county. It is frequently flooded by brackish water.

The soils in the county range from sand and loamy sand to clay. Gravel deposits in the county are limited in extent.

Water Resources

The survey area is underlain by clay, sand, marl, shell, and a few gravel strata that occur at increasing depths and thicknesses towards the east. A basement complex composed of granitic rock is buried under several thousand feet of ancient marine sediments.

Ground water is usually obtained from several water-bearing strata, which commonly occur between depths of 50 and 200 feet. Wells drilled into these strata are generally for private residential use. In most areas, ground water has a high content of minerals; the content of minerals is lower in water from the deeper wells. In King and Queen County, most livestock use surface water but occasionally are provided water from wells feeding small dugout or embankment ponds.

The major sources of surface water in the county are the Mattaponi and Poropotank Rivers and the King and Queen Dragon Swamps. The Mattaponi and Poropotank Rivers are potential sources of large volumes of surface water throughout the year. Numerous other perennial streams dissect the county and contribute to the flow of the major rivers and swamps. The county also has numerous millponds, beaver ponds, oxbow lakes, backswamps, and manmade lakes, which contribute to the flow of most of the smaller tributaries.

Transportation

The principal highways in King and Queen County include U.S. Highway 360, which runs through the county from Aylett to Miller's Tavern and is the main thoroughfare between Richmond and Tappahannock; Highway VA-14, which runs the southern length of the county from St. Stephens Church to Plain View; Highway SR-721, which runs the northern length of the county from St. Stephens Church to Newtown; and Highway VA-33, which runs through the county from the Lord Delaware Bridge to the Gloucester County line, west of Glenns, Virginia.

The West Point Municipal Airport is located southwest of Shacklefords and has a paved runway. The field is attended during the daylight hours and offers fuel and limited maintenance facilities. Charter service and flight instructions are available.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Walkerton, Virginia, in the period 1971 to 2000. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 39.1 degrees F and the average daily minimum temperature is 28.1 degrees. The lowest temperature on record, which occurred on January 28, 1987, is -12 degrees. In summer, the average temperature is 75.9 degrees and the average daily maximum temperature is 86.9 degrees. The highest recorded temperature, which occurred on September 11, 1983, is 102 degrees.

Growing degree days are shown in the table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 43.65 inches. Of this, 26.03 inches, or about 60 percent, usually falls in April through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 7.75

inches, recorded on September 16, 1999. Thunderstorms occur on about 32 days each year, and most occur in July.

The average seasonal snowfall is 11.1 inches. The greatest snow depth at any one time during the period of record was 15 inches, recorded on January 25, 2000. On average, 9 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year. The heaviest 1-day snowfall on record was 14 inches, recorded on January 8, 1996.

The average relative humidity in midafternoon is about 51 percent. Humidity is higher at night, and the average at dawn is about 81 percent. The sun shines 72 percent of the time possible in summer and 56 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 9.1 miles per hour, in March.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Detailed Soil Map Units

The map units delineated on the detailed soil maps represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Mattaponi fine sandy loam, 2 to 6 percent slopes, is a phase of the Mattaponi series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Emporia-Slagle-Rumford complex, 15 to 50 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Kinston and Bibb soils, 0 to 2 percent slopes, occasionally flooded, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example.

Table 4 lists the map units in this survey area. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

1A—Augusta fine sandy loam, 0 to 2 percent slopes, rarely flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Nearly level linear, concave treads
Size of areas: 5 to 75 acres

Map Unit Composition

Augusta and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 6 inches—yellowish brown fine sandy loam

Subsurface layer:
6 to 9 inches—yellowish brown fine sandy loam; grayish brown iron depletions

Subsoil:
9 to 19 inches—light brownish gray sandy clay loam; gray iron depletions and light yellowish brown masses of oxidized iron
19 to 39 inches—light brownish gray clay loam; light yellowish brown and yellowish brown masses of oxidized iron
39 to 45 inches—light brownish gray clay loam
45 to 60 inches—gray sandy clay loam; yellowish brown masses of oxidized iron

Substratum:
60 to 70 inches—gray loamy sand

Minor Components

Dissimilar components:
- Roanoke soils, which are poorly drained and have more clay in the subsoil than the Augusta soil; in the lower landscape positions
- Wahee soils, which are somewhat poorly drained and have more clay in the subsoil than the Augusta soil; in similar landscape positions

Similar components:
- Munden and Tetotum soils, which are moderately well drained; in the higher landscape positions
- Tomotley soils, which are poorly drained; in the lower landscape positions

Soil Properties and Qualities

Available water capacity: High (about 9.3 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Somewhat poorly drained
Depth to seasonal water saturation: About 12 to 24 inches
Water table (kind): Apparent
Flooding hazard: Rare
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Very high
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Moderately suited to corn, soybeans, peanuts, and wheat; not suited to grass-legume hay
- The seasonal high water table restricts equipment operation, decreases the viability of crops, and interferes with the planting and harvesting of crops.

Pasture

Suitability: Moderately suited
- The seasonal high water table can affect equipment use, grazing patterns, and the viability of grass and legume species.

Woodland

Suitability: Well suited to loblolly pine and southern red oak; moderately suited to sweetgum
- Soil wetness may limit the use of log trucks.
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- This soil is well suited to haul roads and log landings.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: Prime farmland if drained
Land capability class: 4w
Virginia soil management group: Z
Hydric soil: No

2A—Bojac loamy sand, 0 to 2 percent slopes, rarely flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Nearly level convex treads
Size of areas: 5 to 50 acres

Map Unit Composition

Bojac and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 10 inches—yellowish brown loamy sand

Subsoil:
10 to 18 inches—yellowish brown sandy loam
18 to 27 inches—light yellowish brown sandy loam
27 to 35 inches—brownish yellow sandy loam
35 to 49 inches—brownish yellow sandy loam; light yellowish brown masses of oxidized iron
49 to 55 inches—light yellowish brown loamy sand; brownish yellow masses of oxidized iron

Substratum:
55 to 62 inches—brownish yellow loamy sand; light gray iron depletions

Minor Components

Dissimilar components:
- Tarboro soils, which are somewhat excessively drained and sandy throughout; in similar landscape positions
- Craven and Tetotum soils, which are moderately well drained and have more clay in the subsoil than the Bojac soil; in the lower landscape positions

Similar components:
- Munden soils, which are moderately well drained; in the lower linear or concave landscape positions
- State soils, which are well drained and have more clay in the subsoil than the Bojac soil; in similar landscape positions
- Soils that have a cobbly or gravelly surface layer; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Low (about 5.9 inches)
Slowest saturated hydraulic conductivity: High (about 1.98 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: About 48 to 79 inches
Water table (kind): Apparent
Flooding hazard: Rare
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Very low
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Well suited to peanuts, wheat, and grass-legume hay; moderately suited to corn; poorly suited to soybeans
- Soil crusting decreases water infiltration and interferes with the emergence of seedlings.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Moderately suited to loblolly pine, southern red oak, and sweetgum
- Coarse textured layers may slough, thus reducing the efficiency of mechanical planting equipment.
- The coarseness of the soil may reduce the traction of wheeled harvest equipment and log trucks.
- Coarse textured layers increase the maintenance of haul roads and log landings.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- This soil is well suited to local roads and streets.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 2w
Virginia soil management group: DD
Hydric soil: No

2B—Bojac loamy sand, 2 to 6 percent slopes, rarely flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace

Position on the landform: Gently sloping, convex treads
Size of areas: 5 to 50 acres

Map Unit Composition

Bojac and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 10 inches—yellowish brown loamy sand

Subsoil:
10 to 18 inches—yellowish brown sandy loam
18 to 27 inches—light yellowish brown sandy loam
27 to 35 inches—brownish yellow sandy loam
35 to 49 inches—brownish yellow sandy loam; light yellowish brown masses of oxidized iron
49 to 55 inches—light yellowish brown loamy sand; brownish yellow masses of oxidized iron

Substratum:
55 to 62 inches—brownish yellow loamy sand; light gray iron depletions

Minor Components

Dissimilar components:
- Tarboro soils, which are somewhat excessively drained and sandy throughout; in landscape positions similar to those of the Bojac soil
- Craven and Tetotum soils, which are moderately well drained and have more clay in the subsoil than the Bojac soil; in the lower landscape positions

Similar components:
- Munden soils, which are moderately well drained; in the lower linear or concave landscape positions
- State soils, which are well drained and have more clay in the subsoil than the Bojac soil; in similar landscape positions
- Soils that have a cobbly or gravelly surface layer; in landscape positions similar to those of the Bojac soil

Soil Properties and Qualities

Available water capacity: Low (about 5.9 inches)
Slowest saturated hydraulic conductivity: High (about 1.98 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: About 48 to 79 inches
Water table (kind): Apparent
Flooding hazard: Rare
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Very low
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Well suited to peanuts, wheat, and grass-legume hay; moderately suited to corn; poorly suited to soybeans
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

- Soil crusting decreases water infiltration and interferes with the emergence of seedlings.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine, southern red oak, and sweetgum
- Coarse textured layers may slough, thus reducing the efficiency of mechanical planting equipment.
- The coarseness of the soil may reduce the traction of wheeled harvest equipment and log trucks.
- Coarse textured layers increase the maintenance of haul roads and log landings.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- This soil is well suited to local roads and streets.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 2e
Virginia soil management group: DD
Hydric soil: No

3A—Craven fine sandy loam, 0 to 2 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Nearly level concave or linear areas on summits and shoulders
Size of areas: 5 to 15 acres

Map Unit Composition

Craven and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 11 inches—light yellowish brown clay loam; brownish yellow masses of oxidized iron
11 to 31 inches—light yellowish brown clay; reddish brown masses of oxidized iron and gray iron depletions

31 to 45 inches—brownish yellow sandy clay loam; reddish brown masses of oxidized iron and gray iron depletions

Substratum:
45 to 62 inches—brownish yellow, light yellowish brown, and light gray loamy sand

Minor Components

Dissimilar components:
- Bojac and State soils, which are well drained and have less clay in the subsoil than the Craven soil; in the higher landscape positions
- Emporia and Rumford soils, which are well drained and have less clay in the subsoil than the Craven soil; in the higher landscape positions

Similar components:
- Mattaponi soils, which are well drained; in the slightly higher landscape positions
- Munden and Tetotum soils, which are moderately well drained and have less clay in the subsoil than the Craven soil; in the lower landscape positions
- Slagle soils, which are moderately well drained and have less clay in the subsoil than the Craven soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.9 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.06 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 24 to 36 inches
Water table (kind): Apparent
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Low
Parent material: Clayey marine sediments

Use and Management Considerations

Cropland

Suitability: Moderately suited to corn, peanuts, wheat, grass-legume hay; poorly suited to soybeans
- The high clay content restricts the rooting depth of crops.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Well suited to loblolly pine and southern red oak
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.
- The stickiness of the soil increases the difficulty of constructing haul roads and log landings when the soil is wet.
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- The stickiness of the soil restricts the use of equipment for site preparation to the drier periods.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.

- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.
- The high content of clay in the subsurface layer increases the difficulty of digging, filling, and compacting the soil material in shallow excavations.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2w
Virginia soil management group: HH
Hydric soil: No

3B—Craven fine sandy loam, 2 to 6 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Gently sloping concave or linear areas on summits and shoulders
Size of areas: 5 to 25 acres

Map Unit Composition

Craven and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 11 inches—light yellowish brown clay loam; brownish yellow masses of oxidized iron
11 to 31 inches—light yellowish brown clay; reddish brown masses of oxidized iron and gray iron depletions
31 to 45 inches—brownish yellow sandy clay loam; reddish brown masses of oxidized iron and gray iron depletions

Substratum:
45 to 62 inches—brownish yellow, light yellowish brown, and light gray loamy sand

Minor Components

Dissimilar components:
- Bojac and State soils, which are well drained and have less clay in the subsoil than the Craven soil; in the higher landscape positions
- Emporia and Rumford soils, which are well drained and have less clay in the subsoil than the Craven soil; in the higher landscape positions

Similar components:
- Mattaponi soils, which are well drained; in the slightly higher landscape positions
- Munden and Tetotum soils, which are moderately well drained and have less clay in the subsoil than the Craven soil; in the lower landscape positions
- Slagle soils, which are moderately well drained and have less clay in the subsoil than the Craven soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.9 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.06 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 24 to 36 inches
Water table (kind): Apparent
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Low
Parent material: Clayey marine sediments

Use and Management Considerations

Cropland

Suitability: Moderately suited to corn, peanuts, wheat, and grass-legume hay; poorly suited to soybeans
- The slope increases surface runoff, the erosion hazard, and nutrient loss.
- The high clay content restricts the rooting depth of crops.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Well suited to loblolly pine and southern red oak
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.
- The stickiness of the soil increases the difficulty of constructing haul roads and log landings when the soil is wet.
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- The stickiness of the soil restricts the use of equipment for site preparation to the drier periods.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.
- The high content of clay in the subsurface layer increases the difficulty of digging, filling, and compacting the soil material in shallow excavations.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2e
Virginia soil management group: HH
Hydric soil: No

3C—Craven fine sandy loam, 6 to 10 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Strongly sloping side slopes
Size of areas: 5 to 15 acres

Map Unit Composition

Craven and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 6 inches—brown fine sandy loam

Subsoil:
6 to 11 inches—light yellowish brown clay loam; brownish yellow masses of oxidized iron
11 to 31 inches—light yellowish brown clay; reddish brown masses of oxidized iron and gray iron depletions
31 to 45 inches—brownish yellow sandy clay loam; reddish brown masses of oxidized iron and gray iron depletions

Substratum:
45 to 62 inches—brownish yellow, light yellowish brown, and light gray loamy sand

Minor Components

Dissimilar components:
- Bojac and State soils, which are well drained and have less clay in the subsoil than the Craven soil; in the higher landscape positions
- Emporia and Rumford soils, which are well drained and have less clay in the subsoil than the Craven soil; in the higher landscape positions

Similar components:
- Mattaponi soils, which are well drained; in the slightly higher landscape positions

- Munden and Tetotum soils, which are moderately well drained and have less clay in the subsoil than the Craven soil; in the lower landscape positions
- Slagle soils, which are moderately well drained and have less clay in the subsoil than the Craven soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.9 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.06 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 24 to 36 inches
Water table (kind): Apparent
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Medium
Parent material: Clayey marine sediments

Use and Management Considerations

Cropland

Suitability: Moderately suited to peanuts, wheat, and grass-legume hay; poorly suited to corn and soybeans
- The slope increases surface runoff, the erosion hazard, and nutrient loss.
- The high clay content restricts the rooting depth of crops.

Pasture

Suitability: Moderately suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Well suited to loblolly pine and southern red oak
- Because of the slope, operating conditions are unsafe and the operating efficiency of log trucks is reduced.
- The slope may restrict the use of some mechanical planting equipment.
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.
- The stickiness of the soil increases the difficulty of constructing haul roads and log landings when the soil is wet.
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- The stickiness of the soil restricts the use of equipment for site preparation to the drier periods.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- The slope influences the use of machinery and the amount of excavation required.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.
- The high content of clay in the subsurface layer increases the difficulty of digging, filling, and compacting the soil material in shallow excavations.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.

- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.
- The slope limits the proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.
- Designing local roads and streets is difficult because of the slope.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 3e
Virginia soil management group: HH
Hydric soil: No

4A—Emporia sandy loam, 0 to 2 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Nearly level convex areas on summits and shoulders
Size of areas: 5 to 150 acres

Map Unit Composition

Emporia and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 6 inches—grayish brown sandy loam

Subsurface layer:
6 to 12 inches—light yellowish brown sandy loam

Subsoil:
12 to 22 inches—yellowish brown loam; light yellowish brown masses of oxidized iron
22 to 36 inches—yellowish brown loam; strong brown and very pale brown masses of oxidized iron
36 to 42 inches—yellowish brown loam; very pale brown masses of oxidized iron
42 to 62 inches—brownish yellow, strong brown, pinkish gray, and red sandy clay loam

Minor Components

Dissimilar components:
- Rumford soils, which are well drained and have less clay in the subsoil than the Emporia soil; in similar landscape positions
- Suffolk soils, which are well drained and have coarse underlying material within a depth of 50 inches; in landscape positions similar to those of the Emporia soil

Similar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Emporia soil; in the lower landscape positions
- Mattaponi soils, which are well drained and have more clay in the subsoil than the Emporia soil; in similar landscape positions
- Slagle soils, which are moderately well drained; in concave landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.8 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.01 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: About 36 to 54 inches
Water table (kind): Perched
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Low
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

- This soil is well suited to soybeans, peanuts, wheat, and grass-legume hay and moderately suited to corn.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 1
Virginia soil management group: R
Hydric soil: No

4B—Emporia sandy loam, 2 to 6 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace

Position on the landform: Gently sloping convex areas on summits and shoulders
Size of areas: 5 to 150 acres

Map Unit Composition

Emporia and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 6 inches—grayish brown sandy loam

Subsurface layer:
6 to 12 inches—light yellowish brown sandy loam

Subsoil:
12 to 22 inches—yellowish brown loam; light yellowish brown masses of oxidized iron
22 to 36 inches—yellowish brown loam; strong brown and very pale brown masses of oxidized iron
36 to 42 inches—yellowish brown loam; very pale brown masses of oxidized iron
42 to 62 inches—brownish yellow, strong brown, pinkish gray, and red sandy clay loam

Minor Components

Dissimilar components:
- Rumford soils, which are well drained and have less clay in the subsoil than the Emporia soil; in similar landscape positions
- Suffolk soils, which are well drained and have coarse underlying material within a depth of 50 inches; in landscape positions similar to those of the Emporia soil

Similar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Emporia soil; in similar landscape positions
- Mattaponi soils, which are well drained and have more clay in the subsoil than the Emporia soil; in similar landscape positions
- Slagle soils, which are moderately well drained; in concave landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.8 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.01 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: About 36 to 54 inches
Water table (kind): Perched
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Low
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to soybeans, peanuts, wheat, and grass-legume hay; moderately suited to corn
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2e
Virginia soil management group: R
Hydric soil: No

4C—Emporia sandy loam, 6 to 10 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Strongly sloping side slopes
Size of areas: 5 to 150 acres

Map Unit Composition

Emporia and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 6 inches—grayish brown sandy loam

Subsurface layer:
6 to 12 inches—light yellowish brown sandy loam

Subsoil:
12 to 22 inches—yellowish brown loam; light yellowish brown masses of oxidized iron
22 to 36 inches—yellowish brown loam; strong brown and very pale brown masses of oxidized iron
36 to 42 inches—yellowish brown loam; very pale brown masses of oxidized iron
42 to 62 inches—brownish yellow, strong brown, pinkish gray, and red sandy clay loam

Minor Components

Dissimilar components:
- Rumford soils, which are well drained and have less clay in the subsoil than the Emporia soil; in similar landscape positions
- Suffolk soils, which are well drained and have coarse underlying material within a depth of 50 inches; in landscape positions similar to those of the Emporia soil

Similar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Emporia soil; in similar landscape positions
- Mattaponi soils, which are well drained and have more clay in the subsoil than the Emporia soil; in similar landscape positions
- Slagle soils, which are moderately well drained; in concave landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.8 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.01 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: About 36 to 54 inches
Water table (kind): Perched
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Medium
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to peanuts and grass-legume hay; moderately suited to corn, soybeans, and wheat
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- Because of the slope, operating conditions are unsafe and the operating efficiency of log trucks is reduced.
- The slope may restrict the use of some mechanical planting equipment.
- This soil is well suited to haul roads and log landings.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- The slope influences the use of machinery and the amount of excavation required.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The slope limits the proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The low soil strength is unfavorable for supporting heavy loads.
- Designing local roads and streets is difficult because of the slope.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 3e

Figure 2.—An area of Emporia-Slagle-Rumford complex, 6 to 15 percent slopes, that is used as pasture.

Virginia soil management group: R
Hydric soil: No

5D—Emporia-Slagle-Rumford complex, 6 to 15 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Strongly sloping side slopes (fig. 2)
Size of areas: 5 to 600 acres

Map Unit Composition

Emporia and similar soils: Typically 35 percent, ranging from about 30 to 40 percent
Slagle and similar soils: Typically 30 percent, ranging from about 25 to 35 percent
Rumford and similar soils: Typically 15 percent, ranging from about 10 to 20 percent

Typical Profile

Emporia

Surface layer:
0 to 6 inches—grayish brown sandy loam

Subsurface layer:
6 to 12 inches—light yellowish brown sandy loam

Subsoil:
12 to 22 inches—yellowish brown loam; light yellowish brown masses of oxidized iron
22 to 36 inches—yellowish brown loam; strong brown and very pale brown masses of oxidized iron
36 to 42 inches—yellowish brown loam; very pale brown masses of oxidized iron
42 to 62 inches—brownish yellow, strong brown, pinkish gray, and red sandy clay loam

Slagle

Surface layer:
0 to 8 inches—yellowish brown sandy loam

Subsoil:
8 to 18 inches—yellowish brown sandy clay loam
18 to 32 inches—brownish yellow sandy loam; very pale brown iron depletions
32 to 46 inches—yellowish brown sandy clay loam; white iron depletions and yellowish red masses of oxidized iron
46 to 56 inches—yellowish brown sandy clay loam; yellowish brown masses of oxidized iron and very pale brown iron depletions
56 to 62 inches—brownish yellow sandy clay loam; red masses of oxidized iron and very pale brown iron depletions

Rumford

Surface layer:
0 to 7 inches—brown loamy sand

Subsurface layer:
7 to 14 inches—light yellowish brown loamy sand

Subsoil:
14 to 24 inches—dark yellowish brown sandy loam
24 to 38 inches—yellowish brown sandy loam
38 to 55 inches—yellowish brown loamy sand

Substratum:
55 to 84 inches—brownish yellow sand
84 to 95 inches—yellowish brown sandy loam
95 to 99 inches—brownish yellow loamy sand

Minor Components

Dissimilar components:
- Bibb and Kinston soils, which are poorly drained and subject to flooding; on narrow bottoms along drainageways and small streams

Similar components:
- Suffolk soils, which are well drained and similar to the Rumford soil but have more clay in the subsoil; in similar landscape positions
- Craven soils, which are moderately well drained and similar to the Slagle soil but have more clay in the subsoil; in similar landscape positions
- Mattaponi soils, which are well drained and similar to the Slagle soil but have more clay in the subsoil; in concave areas
- Soils that are similar to the Emporia soil but do not have redoximorphic depletions and accumulations in the subsoil; in similar landscape positions
- Soils that have a cobbly or gravelly surface layer; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Emporia—moderate (about 8.8 inches); Slagle—moderate (about 8.3 inches); Rumford—moderate (about 6.3 inches)

Slowest saturated hydraulic conductivity: Emporia and Slagle—moderately low (about 0.01 in/hr); Rumford—high (about 1.98 in/hr)
Drainage class: Emporia and Rumford—well drained; Slagle—moderately well drained
Depth to seasonal water saturation: Emporia—about 36 to 54 inches; Slagle—about 18 to 36 inches; Rumford—more than 6 feet
Water table (kind): Emporia and Slagle—perched; Rumford—none
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Emporia—moderate; Slagle and Rumford—low
Runoff class: Emporia and Slagle—medium; Rumford—low
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to peanuts; moderately suited to corn, soybeans, wheat, and grass-legume hay
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- Because of the slope, operating conditions are unsafe and the operating efficiency of log trucks is reduced.
- The slope may restrict the use of some mechanical planting equipment.
- Coarse textured layers may slough, thus reducing the efficiency of mechanical planting equipment.
- The coarseness of the soil may reduce the traction of wheeled harvest equipment and log trucks.
- Coarse textured layers increase the maintenance of haul roads and log landings.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- The slope influences the use of machinery and the amount of excavation required.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are susceptible to caving.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The slope limits the proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.
- Designing local roads and streets is difficult because of the slope.

Interpretive Groups

Prime farmland: Not prime farmland

Land capability class: 4e
Virginia soil management group: Emporia—R; Slagle—K; Rumford—DD
Hydric soils: No

5E—Emporia-Slagle-Rumford complex, 15 to 50 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Moderately steep to very steep side slopes
Size of areas: 5 to 600 acres

Map Unit Composition

Emporia and similar soils: Typically 35 percent, ranging from about 30 to 40 percent
Slagle and similar soils: Typically 30 percent, ranging from about 25 to 35 percent
Rumford and similar soils: Typically 15 percent, ranging from about 10 to 20 percent

Typical Profile

Emporia

Surface layer:
0 to 6 inches—grayish brown sandy loam

Subsurface layer:
6 to 12 inches—light yellowish brown sandy loam

Subsoil:
12 to 22 inches—yellowish brown loam; light yellowish brown masses of oxidized iron
22 to 36 inches—yellowish brown loam; strong brown and very pale brown masses of oxidized iron
36 to 42 inches—yellowish brown loam; very pale brown masses of oxidized iron
42 to 62 inches—brownish yellow, strong brown, pinkish gray, and red sandy clay loam

Slagle

Surface layer:
0 to 8 inches—yellowish brown sandy loam

Subsoil:
8 to 18 inches—yellowish brown sandy clay loam
18 to 32 inches—brownish yellow sandy loam; very pale brown iron depletions
32 to 46 inches—yellowish brown sandy clay loam; white iron depletions and yellowish red masses of oxidized iron
46 to 56 inches—yellowish brown sandy clay loam; yellowish brown masses of oxidized iron and very pale brown iron depletions
56 to 62 inches—brownish yellow sandy clay loam; red masses of oxidized iron and very pale brown iron depletions

Rumford

Surface layer:
0 to 7 inches—brown loamy sand

Subsurface layer:
7 to 14 inches—light yellowish brown loamy sand

Subsoil:
14 to 24 inches—dark yellowish brown sandy loam
24 to 38 inches—yellowish brown sandy loam
38 to 55 inches—yellowish brown loamy sand

Substratum:
55 to 84 inches—brownish yellow sand
84 to 95 inches—yellowish brown sandy loam
95 to 99 inches—brownish yellow loamy sand

Minor Components

Dissimilar components:
- Bibb and Kinston soils, which are poorly drained and subject to flooding; on narrow bottoms along drainageways and small streams

Similar components:
- Suffolk soils, which are well drained and similar to the Rumford soil but have more clay in the subsoil; in similar landscape positions
- Craven soils, which are moderately well drained and similar to the Slagle soil but have more clay in the subsoil; in similar landscape positions
- Mattaponi soils, which are well drained and similar to the Slagle soil but have more clay in the subsoil; in concave areas
- Soils that are similar to the Emporia soil but do not have redoximorphic depletions and accumulations in the subsoil; in similar landscape positions
- Soils that have a cobbly or gravelly surface layer; in landscape positions similar to those of the Emporia, Slagle, and Rumford soils

Soil Properties and Qualities

Available water capacity: Emporia—moderate (about 8.8 inches); Slagle—moderate (about 8.3 inches); Rumford—moderate (about 6.3 inches)
Slowest saturated hydraulic conductivity: Emporia and Slagle—moderately low (about 0.01 in/hr); Rumford—high (about 1.98 in/hr)
Drainage class: Emporia and Rumford—well drained; Slagle—moderately well drained
Depth to seasonal water saturation: Emporia—about 36 to 54 inches; Slagle—about 18 to 36 inches; Rumford—more than 6 feet
Water table (kind): Emporia and Slagle—perched; Rumford—none
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Emporia—moderate; Slagle and Rumford—low
Runoff class: Emporia and Slagle—high; Rumford—medium
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

- These soils are unsuited to cropland.

Pasture

- These soils are unsuited to pasture.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- The slope poses safety hazards and creates a potential for erosion during construction of haul roads and log landings.
- Because of the slope, operating conditions are unsafe and the operating efficiency of log trucks and harvesting and mechanical planting equipment is reduced.

- The slope restricts the use of equipment for preparing sites for planting and seeding.
- Because of the slope, the use of mechanical planting equipment is impractical.
- Coarse textured layers may slough, thus reducing the efficiency of mechanical planting equipment.
- The coarseness of the soil may reduce the traction of wheeled harvest equipment and log trucks.
- Coarse textured layers increase the maintenance of haul roads and log landings.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- The slope influences the use of machinery and the amount of excavation required.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The slope limits the proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.
- Designing local roads and streets is difficult because of the slope.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: Emporia and Rumford—7e; Slagle—6e
Virginia soil management group: Emporia—R; Slagle—K; Rumford—DD
Hydric soils: No

6A—Faceville fine sandy loam, 0 to 2 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Nearly level convex areas on summits and shoulders
Size of areas: 5 to 50 acres

Map Unit Composition

Faceville and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 7 inches—yellowish brown fine sandy loam

Subsurface layer:
7 to 9 inches—yellowish brown fine sandy loam

Subsoil:
9 to 18 inches—yellowish brown sandy clay
18 to 30 inches—strong brown and reddish yellow sandy clay

30 to 47 inches—red and yellowish red clay loam
47 to 67 inches—yellowish red, red, and strong brown sandy clay loam

Minor Components

Dissimilar components:
- Slagle soils, which are moderately well drained and have less clay in the subsoil than the Faceville soil; in concave landscape positions
- Suffolk soils, which are well drained and have less clay in the subsoil than the Faceville soil; in the higher landscape positions

Similar components:
- Mattaponi soils, which are well drained and have a thinner solum than the Faceville soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.1 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: More than 6 feet
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Clayey marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to soybeans, peanuts, wheat, and grass-legume hay; moderately suited to corn
- The high clay content restricts the rooting depth of crops.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Moderately suited to loblolly pine
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- This soil is well suited to building sites.

Septic tank absorption fields

- This soil is well suited to septic tank absorption fields.

Local roads and streets

- This soil is well suited to local roads and streets

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 1
Virginia soil management group: R
Hydric soil: No

6B—Faceville fine sandy loam, 2 to 6 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Gently sloping convex areas on summits and shoulders
Size of areas: 5 to 50 acres

Map Unit Composition

Faceville and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 7 inches—yellowish brown fine sandy loam

Subsurface layer:
7 to 9 inches—yellowish brown fine sandy loam

Subsoil:
9 to 18 inches—yellowish brown sandy clay
18 to 30 inches—strong brown and reddish yellow sandy clay
30 to 47 inches—red and yellowish red clay loam
47 to 67 inches—yellowish red, red, and strong brown sandy clay loam

Minor Components

Dissimilar components:
- Slagle soils, which are moderately well drained and have less clay in the subsoil than the Faceville soil; in concave landscape positions
- Suffolk soils, which are well drained and have less clay in the subsoil than the Faceville soil; in the higher landscape positions

Similar components:
- Mattaponi soils, which are well drained and have a thinner solum than the Faceville soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.1 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: More than 6 feet
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Clayey marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to soybeans, peanuts, wheat, and grass-legume hay; moderately suited to corn
- The slope increases surface runoff, the erosion hazard, and nutrient loss.
- The high clay content restricts the rooting depth of crops.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- This soil is well suited to building sites.

Septic tank absorption fields

- This soil is well suited to septic tank absorption fields.

Local roads and streets

- This soil is well suited to local roads and streets

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2e
Virginia soil management group: R
Hydric soil: No

7A—Kinston and Bibb soils, 0 to 2 percent slopes, occasionally flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Flood plain
Position on the landform: Nearly level low, linear, concave areas (fig. 3)
Size of areas: 5 to 200 acres

Map Unit Composition

Kinston and similar soils: Typically 45 percent, ranging from about 40 to 50 percent
Bibb and similar soils: Typically 35 percent, ranging from about 30 to 40 percent

Typical Profile

Kinston

Surface layer:
0 to 4 inches—brown fine sandy loam; brown masses of oxidized iron

Subsoil:
4 to 10 inches—light brownish gray sandy clay loam; brown and pale brown masses of oxidized iron

Substratum:
10 to 28 inches—light gray clay loam; yellowish brown and strong brown masses of oxidized iron
28 to 47 inches—light gray clay loam; yellowish brown masses of oxidized iron and light brownish gray iron depletions
47 to 62 inches—light gray loam

Figure 3.—An area of Kinston and Bibb soils, 0 to 2 percent slopes, occasionally flooded, that is ponded by beavers.

Bibb

Surface layer:
0 to 6 inches—brown fine sandy loam
6 to 15 inches—dark gray sandy loam; strong brown, brown, and yellowish brown masses of oxidized iron

Substratum:
15 to 30 inches—grayish brown sandy loam
30 to 40 inches—grayish brown loamy sand
40 to 62 inches—grayish brown gravelly sand

Minor Components

Dissimilar components:
- Levy soils, which are very poorly drained and have more clay in the substratum than the Kinston and Bibb soils; in marshes and swamps
- Roanoke and Tomotley soils, which are poorly drained; on low terraces

Similar components:
- Rappahannock soils, which are very poorly drained and organic; in landscape positions similar to those of the Kinston and Bibb soils

Soil Properties and Qualities

Available water capacity: Kinston—moderate (about 8.7 inches); Bibb—moderate (about 6.0 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Poorly drained
Depth to seasonal water saturation: Kinston—about 0 to 12 inches; Bibb—about 6 to 12 inches
Water table (kind): Apparent
Flooding hazard: Occasional
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Very high
Parent material: Kinston—loamy alluvial sediments; Bibb—loamy and sandy alluvial sediments

Use and Management Considerations

Cropland

- These soils are unsuited to cropland.

Pasture

- Flooding may damage pastures.
- The seasonal high water table can affect equipment use, grazing patterns, and the viability of grass and legume species.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to sweetgum
- Flooding may result in damage to haul roads.
- Flooding restricts the safe use of roads by log trucks.
- Soil wetness may limit the use of log trucks.
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- Flooding is a limitation affecting septic tank absorption fields.
- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Flooding may damage local roads and streets.
- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 6w
Virginia soil management group: Kinston—OO; Bibb—EE
Hydric soils: Yes

8A—Levy silt loam, 0 to 2 percent slopes, very frequently flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Swamp
Position on the landform: Nearly level low, linear flood plains
Size of areas: 5 to 25 acres

Map Unit Composition

Levy and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 4 inches—light brownish gray silt loam

Substratum:
4 to 8 inches—light olive gray silty clay
8 to 22 inches—gray and greenish gray silty clay
22 to 35 inches—greenish gray and gray silty clay
35 to 62 inches—gray silty clay

Minor Components

Dissimilar components:
- Bibb and Kinston soils, which are poorly drained and have less clay in the substratum than the Levy soil; on flood plains
- Roanoke and Tomotley soils, which are poorly drained; on low terraces

Similar components:
- Rappahannock soils, which are very poorly drained and organic; in tidal marshes

Soil Properties and Qualities

Available water capacity: High (about 11.4 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.06 in/hr)
Drainage class: Very poorly drained
Depth to seasonal water saturation: About 0 inches
Water table (kind): Apparent
Flooding hazard: Very frequent
Ponding hazard: Frequent
Depth of ponding: 1.0 to 2.0 feet
Shrink-swell potential: High
Runoff class: Negligible
Parent material: Clayey alluvial sediments

Use and Management Considerations

Cropland

- This soil is unsuited to cropland.

Pasture

- This soil is unsuited to pasture.

Woodland

Suitability: Well suited to baldcypress; moderately suited to sweetgum

- Flooding may result in damage to haul roads.
- Flooding and ponding restrict the safe use of roads by log trucks.
- Soil wetness may limit the use of log trucks.
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.
- The stickiness of the soil increases the difficulty of constructing haul roads and log landings when the soil is wet.
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- The stickiness of the soil restricts the use of equipment for site preparation to the drier periods.

Building sites

- Flooding and ponding are limitations affecting building site development.

Septic tank absorption fields

- Flooding and ponding are limitations affecting septic tank absorption fields.
- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Flooding may damage local roads and streets.
- Ponding affects the ease of excavation and grading and limits the bearing capacity of the soil.
- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 7w
Virginia soil management group: PP
Hydric soil: Yes

9A—Mattaponi fine sandy loam, 0 to 2 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Nearly level convex areas on summits and shoulders
Size of areas: 5 to 50 acres

Map Unit Composition

Mattaponi and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown fine sandy loam

Subsoil:
8 to 18 inches—yellowish brown clay loam
18 to 29 inches—strong brown clay; pale brown iron depletions and brownish yellow masses of oxidized iron
29 to 36 inches—yellowish brown clay

36 to 52 inches—yellowish brown clay; light brownish gray iron depletions and red masses of oxidized iron
52 to 62 inches—yellowish brown clay; light brownish gray iron depletions and red masses of oxidized iron

Minor Components

Dissimilar components:
- Emporia, Rumford, and Suffolk soils, which are well drained and have less clay in the subsoil than the Mattaponi soil; in similar landscape positions
- Slagle soils, which are moderately well drained and have less clay in the subsoil than the Mattaponi soil; in concave landscape positions

Similar components:
- Craven soils, which are moderately well drained; in concave landscape positions
- Faceville soils, which are well drained and have a thicker solum than the Mattaponi soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.7 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.20 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 36 to 54 inches
Water table (kind): Perched
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Low
Parent material: Clayey marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to soybeans, wheat, and grass-legume hay; moderately suited to corn
- The high clay content restricts the rooting depth of crops.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Moderately suited to loblolly pine and sweetgum
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- The stickiness of the soil restricts the use of equipment for site preparation to the drier periods.
- This soil is well suited to haul roads and log landings.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- The high content of clay in the subsurface layer increases the difficulty of digging, filling, and compacting the soil material in shallow excavations.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.

- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2w
Virginia soil management group: R
Hydric soil: No

9B—Mattaponi fine sandy loam, 2 to 6 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Gently sloping convex areas on summits and shoulders
Size of areas: 5 to 50 acres

Map Unit Composition

Mattaponi and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown fine sandy loam

Subsoil:
8 to 18 inches—yellowish brown clay loam
18 to 29 inches—strong brown clay; pale brown iron depletions and brownish yellow masses of oxidized iron
29 to 36 inches—yellowish brown clay
36 to 52 inches—yellowish brown clay; light brownish gray iron depletions and red masses of oxidized iron
52 to 62 inches—yellowish brown clay; light brownish gray iron depletions and red masses of oxidized iron

Minor Components

Dissimilar components:
- Emporia, Rumford, and Suffolk soils, which are well drained and have less clay in the subsoil than the Mattaponi soil; in similar landscape positions
- Slagle soils, which are moderately well drained and have less clay in the subsoil than the Mattaponi soil; in concave landscape positions

Similar components:
- Craven soils, which are moderately well drained; in concave landscape positions
- Faceville soils, which are well drained and have a thicker solum than the Mattaponi soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.7 inches)

Slowest saturated hydraulic conductivity: Moderately high (about 0.20 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 36 to 54 inches
Water table (kind): Perched
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Low
Parent material: Clayey marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to soybeans, wheat, and grass-legume hay; moderately suited to corn
- The slope increases surface runoff, the erosion hazard, and nutrient loss.
- The high clay content restricts the rooting depth of crops.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine and sweetgum
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- The stickiness of the soil restricts the use of equipment for site preparation to the drier periods.
- This soil is well suited to haul roads and log landings.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- The high content of clay in the subsurface layer increases the difficulty of digging, filling, and compacting the soil material in shallow excavations.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2e
Virginia soil management group: R
Hydric soil: No

9C—Mattaponi fine sandy loam, 6 to 10 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Strongly sloping side slopes
Size of areas: 5 to 50 acres

Map Unit Composition

Mattaponi and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown fine sandy loam

Subsoil:
8 to 18 inches—yellowish brown clay loam
18 to 29 inches—strong brown clay; pale brown iron depletions and brownish yellow masses of oxidized iron
29 to 36 inches—yellowish brown clay
36 to 52 inches—yellowish brown clay; light brownish gray iron depletions and red masses of oxidized iron
52 to 62 inches—yellowish brown clay; light brownish gray iron depletions and red masses of oxidized iron

Minor Components

Dissimilar components:
- Emporia, Rumford, and Suffolk soils, which are well drained and have less clay in the subsoil than the Mattaponi soil; in similar landscape positions
- Slagle soils, which are moderately well drained and have less clay in the subsoil than the Mattaponi soil; in concave landscape positions

Similar components:
- Craven soils, which are moderately well drained; in concave landscape positions
- Faceville soils, which are well drained and have a thicker solum than the Mattaponi soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.7 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.20 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 36 to 54 inches
Water table (kind): Perched
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Medium
Parent material: Clayey marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to grass-legume hay; moderately suited to corn, soybeans, and wheat

- The slope increases surface runoff, the erosion hazard, and nutrient loss.
- The high clay content restricts the rooting depth of crops.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine and sweetgum
- Because of the slope, operating conditions are unsafe and the operating efficiency of log trucks is reduced.
- The slope may restrict the use of some mechanical planting equipment.
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- The stickiness of the soil restricts the use of equipment for site preparation to the drier periods.
- This soil is well suited to haul roads and log landings.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- The slope influences the use of machinery and the amount of excavation required.
- The high content of clay in the subsurface layer increases the difficulty of digging, filling, and compacting the soil material in shallow excavations.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.
- The slope limits the proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.
- Designing local roads and streets is difficult because of the slope.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 3e
Virginia soil management group: R
Hydric soil: No

10A—Munden loamy sand, 0 to 2 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Nearly level linear and concave treads
Size of areas: 5 to 25 acres

Map Unit Composition

Munden and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—dark grayish brown loamy sand

Subsoil:
8 to 16 inches—pale brown sandy loam
16 to 24 inches—light yellowish brown sandy loam; pale brown iron depletions
24 to 33 inches—yellowish brown sandy loam; pale brown and light gray iron depletions
33 to 42 inches—pale brown loamy sand; light gray iron depletions

Substratum:
42 to 60 inches—pale brown loamy sand; yellowish brown masses of oxidized iron and light gray iron depletions
60 to 70 inches—light gray sand; very pale brown masses of oxidized iron

Minor Components

Dissimilar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Munden soil; in similar landscape positions
- State soils, which are well drained and have more clay in the subsoil than the Munden soil; in the slightly higher landscape positions
- Tarboro soils, which are somewhat excessively drained and sandy throughout; on the lower stream terraces

Similar components:
- Bojac soils, which are well drained; in the slightly higher landscape positions on stream terraces
- Tetotum soils, which are moderately well drained and have more clay in the subsoil than the Munden soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Low (about 5.5 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 18 to 30 inches
Water table (kind): Apparent
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Very low
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Well suited to corn, soybeans, wheat, and grass-legume hay
- Soil crusting decreases water infiltration and interferes with the emergence of seedlings.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to sweetgum
- Coarse textured layers may slough, thus reducing the efficiency of mechanical planting equipment.
- The coarseness of the soil may reduce the traction of wheeled harvest equipment and log trucks.
- Coarse textured layers increase the maintenance of haul roads and log landings.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2w
Virginia soil management group: F
Hydric soil: No

10B—Munden loamy sand, 2 to 6 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Gently sloping convex treads
Size of areas: 5 to 25 acres

Map Unit Composition

Munden and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—dark grayish brown loamy sand

Subsoil:
8 to 16 inches—pale brown sandy loam
16 to 24 inches—light yellowish brown sandy loam; pale brown iron depletions
24 to 33 inches—yellowish brown sandy loam; pale brown and light gray iron depletions
33 to 42 inches—pale brown loamy sand; light gray iron depletions

Substratum:
42 to 60 inches—pale brown loamy sand; yellowish brown masses of oxidized iron and light gray iron depletions
60 to 70 inches—light gray sand; very pale brown masses of oxidized iron

Minor Components

Dissimilar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Munden soil; in similar landscape positions
- State soils, which are well drained and have more clay in the subsoil than the Munden soil; in the slightly higher landscape positions
- Tarboro soils, which are somewhat excessively drained and sandy throughout; on the lower stream terraces

Similar components:
- Bojac soils, which are well drained; in the slightly higher landscape positions on stream terraces
- Tetotum soils, which are moderately well drained and have more clay in the subsoil than the Munden soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Low (about 5.5 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 18 to 30 inches
Water table (kind): Apparent
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Very low
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Well suited to corn, soybeans, wheat, and grass-legume hay
- The slope increases surface runoff, the erosion hazard, and nutrient loss.
- Soil crusting decreases water infiltration and interferes with the emergence of seedlings.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to sweetgum
- Coarse textured layers may slough, thus reducing the efficiency of mechanical planting equipment.
- The coarseness of the soil may reduce the traction of wheeled harvest equipment and log trucks.
- Coarse textured layers increase the maintenance of haul roads and log landings.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.

- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 2e
Virginia soil management group: F
Hydric soil: No

11A—Pits, gravel

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Size of areas: 5 to 100 acres

Map Unit Composition

Pits, gravel: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

This map unit consists of open excavations from which sand, gravel, road base, and other foundation material has been mined. A typical profile is not given due to the variability of the material.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: None assigned
Virginia soil management group: None assigned
Hydric soils: No

12A—Rappahannock muck, 0 to 1 percent slopes, very frequently flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Tidal marsh
Position on the landform: Nearly level low, linear flood plains
Size of areas: 5 to 25 acres

Map Unit Composition

Rappahannock and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Organic layer:
0 to 12 inches—very dark grayish brown muck
12 to 29 inches—very dark grayish brown highly decomposed plant material
29 to 39 inches—very dark gray highly decomposed plant material

Substratum:
39 to 62 inches—very dark gray sandy loam

Minor Components

Dissimilar components:
- Roanoke and Tomotley soils, which are poorly drained; on low terraces

Similar components:
- Levy soils, which are very poorly drained and mineral; in marshes and swamps
- Bibb and Kinston soils, which are poorly drained and mineral; on flood plains

Soil Properties and Qualities

Available water capacity: Very high (about 12.3 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Very poorly drained
Depth to seasonal water saturation: About 0 inches
Water table (kind): Apparent
Flooding hazard: Very frequent
Ponding hazard: Frequent
Depth of ponding: 0.0 to 2.0 feet
Shrink-swell potential: Low
Runoff class: Negligible
Parent material: Loamy and organic alluvial sediments

Use and Management Considerations

Cropland

- This soil is unsuited to cropland.

Pasture

- This soil is unsuited to pasture.

Woodland

- Flooding may result in damage to haul roads.
- Flooding and ponding restrict the safe use of roads by log trucks.
- Soil wetness may limit the use of log trucks.
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.

Building sites

- Flooding and ponding are limitations affecting building site development.

Septic tank absorption fields

- Flooding and ponding are limitations affecting septic tank absorption fields.
- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Flooding may damage local roads and streets.

- Ponding affects the ease of excavation and grading and limits the bearing capacity of the soil.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 7w
Virginia soil management group: PP
Hydric soil: Yes

13A—Roanoke loam, 0 to 2 percent slopes, rarely flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Nearly level linear or concave treads
Size of areas: 5 to 75 acres

Map Unit Composition

Roanoke and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown loam

Subsoil:
5 to 10 inches—dark grayish brown clay loam; grayish brown iron depletions and brownish yellow masses of oxidized iron
10 to 30 inches—grayish brown clay; brownish yellow masses of oxidized iron
30 to 36 inches—light brownish gray clay
36 to 42 inches—light brownish gray sandy clay loam; brownish yellow masses of oxidized iron

Substratum:
42 to 62 inches—light brownish gray stratified loamy sand to sandy loam to clay loam; brownish yellow masses of oxidized iron

Minor Components

Dissimilar components:
- Augusta soils, which are somewhat poorly drained and have less clay in the subsoil than the Roanoke soil; in the higher landscape positions
- Bibb and Kinston soils, which are poorly drained and have less clay throughout than the Roanoke soil; on flood plains

Similar components:
- Tomotley soils, which are poorly drained and have less clay in the subsoil than the Roanoke soil; in similar landscape positions
- Wahee soils, which are somewhat poorly drained; in the higher landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.9 inches)
Slowest saturated hydraulic conductivity: Low (about 0.00 in/hr)
Drainage class: Poorly drained
Depth to seasonal water saturation: About 0 to 12 inches
Water table (kind): Apparent

Flooding hazard: Rare
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Very high
Parent material: Clayey alluvial sediments

Use and Management Considerations

Cropland

Suitability: Poorly suited to corn, soybeans, and wheat; not suited to grass-legume hay
- The high clay content restricts the rooting depth of crops.
- The seasonal high water table restricts equipment operation, decreases the viability of crops, and interferes with the planting and harvesting of crops.

Pasture

Suitability: Moderately suited
- The seasonal high water table can affect equipment use, grazing patterns, and the viability of grass and legume species.

Woodland

Suitability: Moderately suited to sweetgum
- Soil wetness may limit the use of log trucks.
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- The stickiness of the soil restricts the use of equipment for site preparation to the drier periods.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 4w
Virginia soil management group: NN
Hydric soil: Yes

14B—Rumford loamy sand, 0 to 6 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace

Position on the landform: Nearly level to gently sloping convex areas on summits and shoulders
Size of areas: 5 to 50 acres

Map Unit Composition

Rumford and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 7 inches—brown loamy sand

Subsurface layer:
7 to 14 inches—light yellowish brown loamy sand

Subsoil:
14 to 24 inches—dark yellowish brown sandy loam
24 to 38 inches—yellowish brown sandy loam
38 to 55 inches—yellowish brown loamy sand

Substratum:
55 to 84 inches—brownish yellow sand
84 to 95 inches—yellowish brown sandy loam
95 to 99 inches—brownish yellow loamy sand

Minor Components

Dissimilar components:
- Craven and Slagle soils, which are moderately well drained and have more clay in the subsoil than the Rumford soil; in concave landscape positions
- Emporia and Mattaponi soils, which are well drained and have more clay in the subsoil than the Rumford soil; in similar landscape positions

Similar components:
- Suffolk soils, which are well drained and have more clay in the subsoil than the Rumford soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.3 inches)
Slowest saturated hydraulic conductivity: High (about 1.98 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: More than 6 feet
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Very low
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to peanuts, wheat, and grass-legume hay; moderately suited to corn; poorly suited to soybeans
- The slope increases surface runoff, the erosion hazard, and nutrient loss.
- Soil crusting decreases water infiltration and interferes with the emergence of seedlings.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- Coarse textured layers may slough, thus reducing the efficiency of mechanical planting equipment.
- The coarseness of the soil may reduce the traction of wheeled harvest equipment and log trucks.
- Coarse textured layers increase the maintenance of haul roads and log landings.

Building sites

- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- This soil is well suited to local roads and streets.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 2s
Virginia soil management group: DD
Hydric soil: No

14C—Rumford loamy sand, 6 to 10 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Strongly sloping side slopes
Size of areas: 5 to 50 acres

Map Unit Composition

Rumford and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 7 inches—brown loamy sand

Subsurface layer:
7 to 14 inches—light yellowish brown loamy sand

Subsoil:
14 to 24 inches—dark yellowish brown sandy loam
24 to 38 inches—yellowish brown sandy loam
38 to 55 inches—yellowish brown loamy sand

Substratum:
55 to 84 inches—brownish yellow sand

84 to 95 inches—yellowish brown sandy loam
95 to 99 inches—brownish yellow loamy sand

Minor Components

Dissimilar components:
- Craven and Slagle soils, which are moderately well drained and have more clay in the subsoil than the Rumford soil; in concave landscape positions
- Emporia and Mattaponi soils, which are well drained and have more clay in the subsoil than the Rumford soil; in similar landscape positions

Similar components:
- Suffolk soils, which are well drained and have more clay in the subsoil than the Rumford soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.3 inches)
Slowest saturated hydraulic conductivity: High (about 1.98 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: More than 6 feet
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

Suitability: Moderately suited to peanuts, wheat, and grass-legume hay; poorly suited to corn and soybeans
- The slope increases surface runoff, the erosion hazard, and nutrient loss.
- Soil crusting decreases water infiltration and interferes with the emergence of seedlings.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- Because of the slope, operating conditions are unsafe and the operating efficiency of log trucks is reduced.
- The slope may restrict the use of some mechanical planting equipment.
- Coarse textured layers may slough, thus reducing the efficiency of mechanical planting equipment.
- The coarseness of the soil may reduce the traction of wheeled harvest equipment and log trucks.
- Coarse textured layers increase the maintenance of haul roads and log landings.

Building sites

- The slope influences the use of machinery and the amount of excavation required.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.
- The slope limits the proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Designing local roads and streets is difficult because of the slope.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 3e
Virginia soil management group: DD
Hydric soil: No

15A—Slagle sandy loam, 0 to 2 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Nearly level linear or concave areas on summits and shoulders
Size of areas: 5 to 150 acres

Map Unit Composition

Slagle and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—yellowish brown sandy loam

Subsoil:
8 to 18 inches—yellowish brown sandy clay loam
18 to 32 inches—brownish yellow sandy loam; very pale brown iron depletions
32 to 46 inches—yellowish brown sandy clay loam; white iron depletions and yellowish red masses of oxidized iron
46 to 56 inches—yellowish brown sandy clay loam; yellowish brown masses of oxidized iron and very pale brown iron depletions
56 to 62 inches—brownish yellow sandy clay loam; red masses of oxidized iron and very pale brown iron depletions

Minor Components

Dissimilar components:
- Rumford soils, which are well drained and have less clay in the subsoil than the Slagle soil; in the higher convex landscape positions
- Suffolk soils, which are well drained and have coarse underlying material within a depth of 50 inches; in the higher convex landscape positions

Similar components:
- Emporia soils, which are well drained; in the higher convex landscape positions
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Slagle soil; in similar landscape positions

- Mattaponi soils, which are well drained and have more clay in the subsoil than the Slagle soil; in the higher convex landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.3 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.01 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 18 to 36 inches
Water table (kind): Perched
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

- This soil is well suited to corn, soybeans, peanuts, wheat, and grass-legume hay.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to southern red oak, yellow-poplar, and sweetgum
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2w
Virginia soil management group: K
Hydric soil: No

15B—Slagle sandy loam, 2 to 6 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace

Position on the landform: Gently sloping linear or concave areas on summits and shoulders
Size of areas: 5 to 150 acres

Map Unit Composition

Slagle and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—yellowish brown sandy loam

Subsoil:
8 to 18 inches—yellowish brown sandy clay loam
18 to 32 inches—brownish yellow sandy loam; very pale brown iron depletions
32 to 46 inches—yellowish brown sandy clay loam; white iron depletions and yellowish red masses of oxidized iron
46 to 56 inches—yellowish brown sandy clay loam; yellowish brown masses of oxidized iron and very pale brown iron depletions
56 to 62 inches—brownish yellow sandy clay loam; red masses of oxidized iron and very pale brown iron depletions

Minor Components

Dissimilar components:
- Rumford soils, which are well drained and have less clay in the subsoil than the Slagle soil; in the higher convex landscape positions
- Suffolk soils, which are well drained and have coarse underlying material within a depth of 50 inches; in the higher convex landscape positions

Similar components:
- Emporia soils, which are well drained; in the higher convex landscape positions
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Slagle soil; in similar landscape positions
- Mattaponi soils, which are well drained and have more clay in the subsoil than the Slagle soil; in the higher convex landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.3 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.01 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 18 to 36 inches
Water table (kind): Perched
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to corn, soybeans, peanuts, wheat, and grass-legume hay
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to southern red oak, yellow-poplar, and sweetgum
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2e
Virginia soil management group: K
Hydric soil: No

15C—Slagle sandy loam, 6 to 10 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Strongly sloping side slopes and areas at the heads of drainageways
Size of areas: 5 to 150 acres

Map Unit Composition

Slagle and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—yellowish brown sandy loam

Subsoil:
8 to 18 inches—yellowish brown sandy clay loam
18 to 32 inches—brownish yellow sandy loam; very pale brown iron depletions
32 to 46 inches—yellowish brown sandy clay loam; white iron depletions and yellowish red masses of oxidized iron
46 to 56 inches—yellowish brown sandy clay loam; yellowish brown masses of oxidized iron and very pale brown iron depletions
56 to 62 inches—brownish yellow sandy clay loam; red masses of oxidized iron and very pale brown iron depletions

Minor Components

Dissimilar components:
- Rumford soils, which are well drained and have less clay in the subsoil than the Slagle soil; in the higher convex landscape positions
- Suffolk soils, which are well drained and have coarse underlying material within a depth of 50 inches; in the higher convex landscape positions

Similar components:
- Emporia soils, which are well drained; in the higher convex landscape positions
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Slagle soil; in similar landscape positions
- Mattaponi soils, which are well drained and have more clay in the subsoil than the Slagle soil; in the higher convex landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.3 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.01 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 18 to 36 inches
Water table (kind): Perched
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Medium
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to peanuts, wheat, and grass-legume hay; moderately suited to corn and soybeans
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to southern red oak, yellow-poplar, and sweetgum
- Because of the slope, operating conditions are unsafe and the operating efficiency of log trucks is reduced.
- The slope may restrict the use of some mechanical planting equipment.
- This soil is well suited to haul roads and log landings.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- The slope influences the use of machinery and the amount of excavation required.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.

- The slope limits the proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- Designing local roads and streets is difficult because of the slope.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 3e
Virginia soil management group: K
Hydric soil: No

16A—State fine sandy loam, 0 to 2 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Nearly level convex treads
Size of areas: 5 to 150 acres

Map Unit Composition

State and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown fine sandy loam

Subsurface layer:
8 to 17 inches—light yellowish brown fine sandy loam

Subsoil:
17 to 28 inches—yellowish brown sandy clay loam
28 to 36 inches—yellowish brown sandy loam

Substratum:
36 to 46 inches—yellowish brown loamy fine sand
46 to 56 inches—brownish yellow and very pale brown loamy sand
56 to 62 inches—very pale brown and olive yellow loamy fine sand

Minor Components

Dissimilar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the State soil; in the higher concave landscape positions
- Munden soils, which are moderately well drained and have less clay in the subsoil than the State soil; in the lower landscape positions
- Tarboro soils, which are somewhat excessively drained and sandy throughout; in the slightly lower landscape positions

Similar components:
- Bojac soils, which are well drained and have less clay in the subsoil than the State soil; in similar landscape positions
- Tetotum soils, which are moderately well drained; in the lower landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.7 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: About 48 to 79 inches
Water table (kind): Apparent
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

- This soil is well suited to corn, soybeans, peanuts, wheat, and grass-legume hay.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Well suited to loblolly pine, southern red oak, and yellow-poplar
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- This soil is well suited to local roads and streets.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 1
Virginia soil management group: B
Hydric soil: No

16B—State fine sandy loam, 2 to 6 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Gently sloping convex treads
Size of areas: 5 to 150 acres

Map Unit Composition

State and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown fine sandy loam

Subsurface layer:
8 to 17 inches—light yellowish brown fine sandy loam

Subsoil:
17 to 28 inches—yellowish brown sandy clay loam
28 to 36 inches—yellowish brown sandy loam

Substratum:
36 to 46 inches—yellowish brown loamy fine sand
46 to 56 inches—brownish yellow and very pale brown loamy sand
56 to 62 inches—very pale brown and olive yellow loamy fine sand

Minor Components

Dissimilar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the State soil; in the higher concave landscape positions
- Munden soils, which are moderately well drained and have less clay in the subsoil than the State soil; in the lower landscape positions
- Tarboro soils, which are somewhat excessively drained and sandy throughout; in the slightly lower landscape positions

Similar components:
- Bojac soils, which are well drained and have less clay in the subsoil than the State soil; in similar landscape positions
- Tetotum soils, which are moderately well drained; in the lower landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.7 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: About 48 to 79 inches
Water table (kind): Apparent
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Well suited to corn, soybeans, peanuts, wheat, and grass-legume hay
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Well suited to loblolly pine, southern red oak, and yellow-poplar
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- This soil is well suited to local roads and streets.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2e
Virginia soil management group: B
Hydric soil: No

17A—Suffolk sandy loam, 0 to 2 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Nearly level convex areas on summits and shoulders
Size of areas: 5 to 30 acres

Map Unit Composition

Suffolk and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown sandy loam

Subsurface layer:
8 to 16 inches—yellowish brown sandy loam

Subsoil:
16 to 21 inches—yellowish brown sandy loam
21 to 28 inches—dark yellowish brown sandy loam
28 to 37 inches—strong brown sandy clay loam
37 to 43 inches—strong brown sandy loam

Substratum:
43 to 59 inches—yellowish brown loamy sand
59 to 65 inches—very pale brown, brownish yellow, and yellowish brown sand

Minor Components

Dissimilar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Suffolk soil; in concave landscape positions
- Slagle soils, which are moderately well drained; in concave landscape positions
- Emporia soils, which are well drained and have more clay in the underlying material than the Suffolk soil; in similar landscape positions

- Mattaponi soils, which are well drained and have more clay in the subsoil than the Suffolk soil; in similar landscape positions

Similar components:
- Rumford soils, which are well drained and have less clay in the subsoil than the Suffolk soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.8 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: More than 6 feet
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

- This soil is well suited to soybeans, peanuts, wheat, and grass-legume hay and moderately suited to corn.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- This soil is well suited to local roads and streets.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 1
Virginia soil management group: T
Hydric soil: No

17B—Suffolk sandy loam, 2 to 6 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace

Figure 4.—Winter wheat in an area of Suffolk sandy loam, 2 to 6 percent slopes.

Position on the landform: Gently sloping convex areas on summits and shoulders (fig. 4)
Size of areas: 5 to 30 acres

Map Unit Composition

Suffolk and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown sandy loam

Subsurface layer:
8 to 16 inches—yellowish brown sandy loam

Subsoil:
16 to 21 inches—yellowish brown sandy loam
21 to 28 inches—dark yellowish brown sandy loam
28 to 37 inches—strong brown sandy clay loam
37 to 43 inches—strong brown sandy loam

Substratum:
43 to 59 inches—yellowish brown loamy sand
59 to 65 inches—very pale brown, brownish yellow, and yellowish brown sand

Minor Components

Dissimilar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Suffolk soil; in concave landscape positions
- Slagle soils, which are moderately well drained; in concave landscape positions
- Emporia soils, which are well drained and have more clay in the underlying material than the Suffolk soil; in similar landscape positions
- Mattaponi soils, which are well drained and have more clay in the subsoil than the Suffolk soil; in similar landscape positions

Similar components:
- Rumford soils, which are well drained and have less clay in the subsoil than the Suffolk soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.8 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: More than 6 feet
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to soybeans, peanuts, wheat, and grass-legume hay; moderately suited to corn
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- This soil is well suited to haul roads and log landings and to equipment operations.

Building sites

- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- This soil is well suited to local roads and streets.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2e

Virginia soil management group: T
Hydric soil: No

17C—Suffolk sandy loam, 6 to 10 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Marine terrace
Position on the landform: Strongly sloping side slopes
Size of areas: 5 to 30 acres

Map Unit Composition

Suffolk and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown sandy loam

Subsurface layer:
8 to 16 inches—yellowish brown sandy loam

Subsoil:
16 to 21 inches—yellowish brown sandy loam
21 to 28 inches—dark yellowish brown sandy loam
28 to 37 inches—strong brown sandy clay loam
37 to 43 inches—strong brown sandy loam

Substratum:
43 to 59 inches—yellowish brown loamy sand
59 to 65 inches—very pale brown, brownish yellow, and yellowish brown sand

Minor Components

Dissimilar components:
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Suffolk soil; in concave landscape positions
- Slagle soils, which are moderately well drained; in concave landscape positions
- Emporia soils, which are well drained and have more clay in the underlying material than the Suffolk soil; in similar landscape positions
- Mattaponi soils, which are well drained and have more clay in the subsoil than the Suffolk soil; in similar landscape positions

Similar components:
- Rumford soils, which are well drained and have less clay in the subsoil than the Suffolk soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 6.8 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Well drained
Depth to seasonal water saturation: More than 6 feet
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Medium
Parent material: Loamy marine sediments

Use and Management Considerations

Cropland

Suitability: Well suited to peanuts; moderately suited to corn, soybeans, wheat, and grass-legume hay
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Moderately suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Moderately suited to loblolly pine and southern red oak
- Because of the slope, operating conditions are unsafe and the operating efficiency of log trucks is reduced.
- The slope may restrict the use of some mechanical planting equipment.
- This soil is well suited to haul roads and log landings.

Building sites

- The slope influences the use of machinery and the amount of excavation required.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.
- The slope limits the proper treatment of the effluent from conventional septic systems.

Local roads and streets

- Designing local roads and streets is difficult because of the slope.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 3e
Virginia soil management group: T
Hydric soil: No

18B—Tarboro sand, 0 to 6 percent slopes, rarely flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Nearly level to gently sloping convex treads
Size of areas: 5 to 150 acres

Map Unit Composition

Tarboro and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 7 inches—brown sand

Substratum:
7 to 32 inches—yellowish brown sand
32 to 48 inches—yellowish brown and reddish yellow sand
48 to 58 inches—brownish yellow and reddish yellow sand
58 to 62 inches—yellowish brown sand

Minor Components

Dissimilar components:
- Bojac and State soils, which are well drained and have more clay throughout than the Tarboro soil; in similar landscape positions
- Munden and Tetotum soils, which are moderately well drained and have more clay throughout than the Tarboro soil; in concave landscape positions

Similar components:
- Soils that have a thin subhorizon of sandy loam in the subsoil; in landscape positions similar to those of the Tarboro soil
- Soils that have a gravelly surface layer; in landscape positions similar to those of the Tarboro soil

Soil Properties and Qualities

Available water capacity: Very low (about 2.6 inches)
Slowest saturated hydraulic conductivity: High (about 5.95 in/hr)
Drainage class: Somewhat excessively drained
Depth to seasonal water saturation: More than 6 feet
Flooding hazard: Rare
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Very low
Parent material: Sandy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Moderately suited to wheat; poorly suited to corn, soybeans, and peanuts; not suited to grass-legume hay
- The slope increases surface runoff, the erosion hazard, and nutrient loss.
- The limited available water capacity may cause plants to suffer from moisture stress.
- The rate at which plant nutrients are leached is accelerated because of sandy or coarse textured layers.
- Soil crusting decreases water infiltration and interferes with the emergence of seedlings.

Pasture

Suitability: Poorly suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.
- The limited available water capacity may cause plants to suffer from moisture stress during the drier summer months.

Woodland

Suitability: Poorly suited to loblolly pine
- Coarse textured layers may slough, thus reducing the efficiency of mechanical planting equipment.
- The coarseness of the soil may reduce the traction of wheeled harvest equipment and log trucks.
- Coarse textured layers increase the maintenance of haul roads and log landings.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- This soil is well suited to local roads and streets.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 3s
Virginia soil management group: II
Hydric soil: No

19A—Tetotum fine sandy loam, 0 to 2 percent slopes, rarely flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Nearly level linear and convex treads
Size of areas: 5 to 75 acres

Map Unit Composition

Tetotum and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown fine sandy loam

Subsurface layer:
8 to 12 inches—light yellowish brown fine sandy loam

Subsoil:
12 to 18 inches—yellowish brown loam; light yellowish brown and strong brown masses of oxidized iron
18 to 25 inches—yellowish brown loam; strong brown masses of oxidized iron
25 to 32 inches—yellowish brown sandy clay loam; light yellowish brown masses of oxidized iron and light brownish gray iron depletions
32 to 49 inches—yellowish brown, light yellowish brown, and light brownish gray sandy loam

Substratum:
49 to 56 inches—yellow and yellowish brown sand
56 to 62 inches—yellowish brown and yellow sand

Minor Components

Dissimilar components:
- Bojac soils, which are well drained and have less clay in the subsoil than the Tetotum soil; in the higher landscape positions

- Craven soils, which are moderately well drained and have more clay in the subsoil than the Tetotum soil; in similar landscape positions
- Tarboro soils, which are somewhat excessively drained and sandy throughout; in the higher landscape positions
- Wahee soils, which are somewhat poorly drained and have more clay in the subsoil than the Tetotum soil; in the slightly lower, concave landscape positions

Similar components:
- Augusta soils, which are somewhat poorly drained; in concave landscape positions
- Munden soils, which are moderately well drained and have less clay in the subsoil than the Tetotum soil; in similar landscape positions
- State soils, which are well drained; in convex landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 7.9 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 18 to 30 inches
Water table (kind): Apparent
Flooding hazard: Rare
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

- This soil is well suited to corn, soybeans, peanuts, wheat, and grass-legume hay.

Pasture

- This soil is well suited to pasture.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to southern red oak and sweetgum
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- The low soil strength may cause structural damage to local roads and streets.

Interpretive Groups

Prime farmland: All areas are prime farmland

Land capability class: 2w
Virginia soil management group: K
Hydric soil: No

19B—Tetotum fine sandy loam, 2 to 6 percent slopes, rarely flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Gently sloping linear and convex treads
Size of areas: 5 to 50 acres

Map Unit Composition

Tetotum and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown fine sandy loam

Subsurface layer:
8 to 12 inches—light yellowish brown fine sandy loam

Subsoil:
12 to 18 inches—yellowish brown loam; light yellowish brown and strong brown masses of oxidized iron
18 to 25 inches—yellowish brown loam; strong brown masses of oxidized iron
25 to 32 inches—yellowish brown sandy clay loam; light yellowish brown masses of oxidized iron and light brownish gray iron depletions
32 to 49 inches—yellowish brown, light yellowish brown, and light brownish gray sandy loam

Substratum:
49 to 56 inches—yellow and yellowish brown sand
56 to 62 inches—yellowish brown and yellow sand

Minor Components

Dissimilar components:
- Bojac soils, which are well drained and have less clay in the subsoil than the Tetotum soil; in the higher landscape positions
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Tetotum soil; in similar landscape positions
- Tarboro soils, which are somewhat excessively drained and sandy throughout; in the higher landscape positions
- Wahee soils, which are somewhat poorly drained and have more clay in the subsoil than the Tetotum soil; in the slightly lower, concave landscape positions

Similar components:
- Augusta soils, which are somewhat poorly drained; in concave landscape positions
- Munden soils, which are moderately well drained and have less clay in the subsoil than the Tetotum soil; in similar landscape positions
- State soils, which are well drained; in convex landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 7.9 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 18 to 30 inches
Water table (kind): Apparent
Flooding hazard: Rare
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Low
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Well suited to corn, soybeans, peanuts, wheat, and grass-legume hay
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to southern red oak and sweetgum
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- The low soil strength may cause structural damage to local roads and streets.

Interpretive Groups

Prime farmland: All areas are prime farmland
Land capability class: 2e
Virginia soil management group: K
Hydric soil: No

19C—Tetotum fine sandy loam, 6 to 10 percent slopes

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace

Position on the landform: Strongly sloping side slopes and areas at the head of drainageways
Size of areas: 5 to 50 acres

Map Unit Composition

Tetotum and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 8 inches—brown fine sandy loam

Subsurface layer:
8 to 12 inches—light yellowish brown fine sandy loam

Subsoil:
12 to 18 inches—yellowish brown loam; light yellowish brown and strong brown masses of oxidized iron
18 to 25 inches—yellowish brown loam; strong brown masses of oxidized iron
25 to 32 inches—yellowish brown sandy clay loam; light yellowish brown masses of oxidized iron and light brownish gray iron depletions
32 to 49 inches—yellowish brown, light yellowish brown, and light brownish gray sandy loam

Substratum:
49 to 56 inches—yellow and yellowish brown sand
56 to 62 inches—yellowish brown and yellow sand

Minor Components

Dissimilar components:
- Bojac soils, which are well drained and have less clay in the subsoil than the Tetotum soil; in the higher landscape positions
- Craven soils, which are moderately well drained and have more clay in the subsoil than the Tetotum soil; in similar landscape positions
- Tarboro soils, which are somewhat excessively drained and sandy throughout; in the higher landscape positions
- Wahee soils, which are somewhat poorly drained and have more clay in the subsoil than the Tetotum soil; in the slightly lower, concave landscape positions

Similar components:
- Augusta soils, which are somewhat poorly drained; in concave landscape positions
- Munden soils, which are moderately well drained and have less clay in the subsoil than the Tetotum soil; in similar landscape positions
- State soils, which are well drained; in convex landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 7.9 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.57 in/hr)
Drainage class: Moderately well drained
Depth to seasonal water saturation: About 18 to 30 inches
Water table (kind): Apparent
Flooding hazard: None
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Medium
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Well suited to peanuts, wheat, and grass-legume hay; moderately suited to corn and soybeans
- The slope increases surface runoff, the erosion hazard, and nutrient loss.

Pasture

Suitability: Well suited
- The slope increases the erosion hazard, surface runoff, and nutrient loss.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to southern red oak and sweetgum
- Because of the slope, operating conditions are unsafe and the operating efficiency of log trucks is reduced.
- The slope may restrict the use of some mechanical planting equipment.
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.

Building sites

- The seasonal high water table may restrict the period when excavations can be made.
- The slope influences the use of machinery and the amount of excavation required.
- Because of the high content of sand or gravel in the soil, sloughing is increased and cutbanks are more susceptible to caving.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The excessive permeability limits the proper treatment of the effluent from conventional septic systems and may pollute the water table.
- The slope limits the proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- The low soil strength may cause structural damage to local roads and streets.
- Designing local roads and streets is difficult because of the slope.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 3e
Virginia soil management group: K
Hydric soil: No

20A—Tomotley fine sandy loam, 0 to 2 percent slopes, rarely flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace

Position on the landform: Nearly level linear or concave treads
Size of areas: 5 to 15 acres

Map Unit Composition

Tomotley and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 5 inches—dark grayish brown fine sandy loam; brown masses of oxidized iron

Subsoil:
5 to 11 inches—grayish brown loam; yellowish brown masses of oxidized iron
11 to 19 inches—gray sandy loam; yellowish brown masses of oxidized iron
19 to 33 inches—gray sandy clay loam; strong brown and yellowish brown masses of oxidized iron
33 to 45 inches—light brownish gray sandy clay loam; dark yellowish brown masses of oxidized iron

Substratum:
45 to 62 inches—gray sandy loam; yellowish brown masses of oxidized iron

Minor Components

Dissimilar components:
- Bibb and Kinston soils, which are poorly drained; on flood plains
- Levy soils, which are very poorly drained; in swamps and marshes
- Rappahannock soils, which are very poorly drained and organic; in marshes
- Wahee soils, which are somewhat poorly drained and have more clay in the subsoil than the Tomotley soil; in the higher landscape positions

Similar components:
- Augusta soils, which are somewhat poorly drained; in the higher landscape positions
- Roanoke soils, which are poorly drained and have more clay in the subsoil than the Tomotley soil; in similar landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 8.1 inches)
Slowest saturated hydraulic conductivity: Moderately high (about 0.20 in/hr)
Drainage class: Poorly drained
Depth to seasonal water saturation: About 0 to 12 inches
Water table (kind): Apparent
Flooding hazard: Rare
Ponding hazard: None
Shrink-swell potential: Low
Runoff class: Very high
Parent material: Loamy alluvial sediments

Use and Management Considerations

Cropland

Suitability: Poorly suited to corn, soybeans, wheat, and grass-legume hay
- The seasonal high water table restricts equipment operation, decreases the viability of crops, and interferes with the planting and harvesting of crops.

Pasture

Suitability: Poorly suited

- The seasonal high water table can affect equipment use, grazing patterns, and the viability of grass and legume species.

Woodland

Suitability: Well suited to loblolly pine
- Soil wetness may limit the use of log trucks.
- The low soil strength may create unsafe conditions for log trucks.
- This soil is well suited to haul roads and log landings.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 4w
Virginia soil management group: OO
Hydric soil: Yes

21A—Wahee fine sandy loam, 0 to 2 percent slopes, rarely flooded

Setting

Major land resource area: Southern Coastal Plain (MLRA 133A)
Landform: Stream terrace
Position on the landform: Nearly level concave treads
Size of areas: 5 to 75 acres

Map Unit Composition

Wahee and similar soils: Typically 80 percent, ranging from about 75 to 90 percent

Typical Profile

Surface layer:
0 to 5 inches—dark brown fine sandy loam

Subsurface layer:
5 to 11 inches—pale brown sandy loam; grayish brown iron depletions

Subsoil:
11 to 19 inches—light brownish gray clay; brownish yellow masses of oxidized iron
19 to 38 inches—light brownish gray clay

Substratum:
38 to 48 inches—grayish brown loamy sand
48 to 62 inches—grayish brown loamy coarse sand

Minor Components

Dissimilar components:
- Augusta soils, which are somewhat poorly drained and have less clay in the subsoil than the Wahee soil; in similar landscape positions
- Munden and Tetotum soils, which are moderately well drained and have less clay in the subsoil than the Wahee soil; in the higher landscape positions

Similar components:
- Roanoke soils, which are poorly drained; in the lower landscape positions
- Soils that are subject to ponding; in concave landscape positions

Soil Properties and Qualities

Available water capacity: Moderate (about 7.5 inches)
Slowest saturated hydraulic conductivity: Moderately low (about 0.06 in/hr)
Drainage class: Somewhat poorly drained
Depth to seasonal water saturation: About 6 to 18 inches
Water table (kind): Apparent
Flooding hazard: Rare
Ponding hazard: None
Shrink-swell potential: Moderate
Runoff class: Very high
Parent material: Clayey alluvial sediments

Use and Management Considerations

Cropland

Suitability: Poorly suited to corn, soybeans, wheat, and grass-legume hay
- The high clay content restricts the rooting depth of crops.
- The seasonal high water table restricts equipment operation, decreases the viability of crops, and interferes with the planting and harvesting of crops.

Pasture

Suitability: Poorly suited
- The seasonal high water table can affect equipment use, grazing patterns, and the viability of grass and legume species.

Woodland

Suitability: Well suited to loblolly pine; moderately suited to sweetgum
- Soil wetness may limit the use of log trucks.
- The low soil strength interferes with the construction of haul roads and log landings.
- The low soil strength may create unsafe conditions for log trucks.
- The stickiness of the soil reduces the efficiency of mechanical planting equipment.
- The stickiness of the soil restricts the use of equipment for site preparation to the drier periods.

Building sites

- Flooding is a limitation affecting building site development.

Septic tank absorption fields

- The seasonal high water table greatly limits the absorption and proper treatment of the effluent from conventional septic systems.
- The restricted permeability limits the absorption and proper treatment of the effluent from conventional septic systems.

Local roads and streets

- The seasonal high water table affects the ease of excavation and grading and reduces the bearing capacity of the soil.
- Shrinking and swelling restrict the use of the soil as base material for local roads and streets.
- The low soil strength is unfavorable for supporting heavy loads.

Interpretive Groups

Prime farmland: Not prime farmland
Land capability class: 4w
Virginia soil management group: OO
Hydric soil: No

W—Water

Setting

This map unit is in the Southern Coastal Plain major land resource area (MLRA 133A). It consists of streams, lakes, ponds, and reservoirs.

This map unit is not assigned any interpretive groups.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as forestland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for agricultural waste management. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of gravel, sand, reclamation material, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited, somewhat limited,* and *very limited*. The suitability ratings are expressed as *well suited, moderately suited, poorly suited,* and *unsuited* or as *good, fair,* and *poor*.

Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation. The limitations appear in order from the most limiting to the least limiting. Thus, if more than one limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed, and the system of land capability classification used by the Natural Resources Conservation Service is explained.

Effective pasture management practices include maintaining a mixture of grasses and legumes, rotating pasture, deferring grazing, controlling undesirable vegetation, and using proper stocking rates.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

According to the 2002 Census of Agriculture, King and Queen County has about 32,600 acres of cropland *(11)*. Most of the cropland is used for row crops, such as corn and soybeans. Hay crops are grown on about 2,600 acres.

The acreage of cultivated crops has been gradually decreasing. The acreage of pasture has been increasing because more beef cattle are being raised. Some areas of cropland and pasture have been converted to community development.

Nearly level and gently sloping soils, such as Emporia, Craven, and Suffolk soils on uplands and State and Tetotum soils on terraces, have few or no limitations for growing grain crops. These soils also have few or no limitations for growing truck crops, such as tomatoes, sweet corn, melons, and tree fruits. Truck crops, however, are not commercially grown to any significant extent in the county.

Soil erosion is a concern on soils that have slopes of more than 2 percent. If the surface layer is lost to erosion, most of the available nutrients and organic matter are lost. Organic matter improves soil structure, the rate of water infiltration, available water capacity, and soil tilth. Erosion of the surface layer is especially damaging on some soils that have firm, underlying layers because the germination of seeds is difficult. Erosion on farmland causes the sedimentation of streams and ponds and thus reduces water quality for municipal use and for fish and wildlife.

Soil blowing is a concern on soils that have a sandy surface layer, such as Bojac, Munden, and Rumford soils. Maintaining a plant cover or using crop residue as a surface mulch helps to control soil blowing.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5, parts I and II. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area also is shown in the table.

The yields are based VALUES—the Virginia Agronomic Land Use Evaluation System *(20)*. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

Realistic yield goals can be maintained over a long-term basis through proper nutrient management and other soil amendments such as lime. Applications of nitrogen and phosphorus from organic and inorganic forms should be done according to approved nutrient management practices and regulations.

Pasture yields are expressed in terms of animal unit months. An animal unit month (AUM) is the amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forestland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit *(17)*. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, forestland, wildlife habitat, or recreation.

The capability classification of the soils in this survey area is given in the section “Detailed Soil Map Units” and in table 5.

Virginia Soil Management Groups

The Virginia Agronomic Land Use Evaluation System (VALUES) is a system that ranks soils for management and productivity *(20)*. VALUES places each soil series in Virginia into one of 43 management groups. The format of the management groups, A through QQ, include the following soil characteristics—regional occurrence; parent material; landscape position or influence; solum thickness; dominant profile features, such as texture; available water capacity for plants; and internal soil drainage. Yields that are both economically and environmentally feasible were assigned to each management group, based on yields of field trial crop data and research. The following paragraphs describe the soil management groups in King and Queen County.

Group B. The soils in this group formed from alluvium within the Coastal Plain region and are associated with stream and river terraces. These soils are deep, have loamy textures throughout, have a high available water capacity, and are well drained or moderately well drained.

Group F. The soils in this group formed in coarse textured coastal plain sediments in low-lying landscape positions and are underlain by stratified loamy sediments. These soils are deep, have coarse-loamy textures throughout, have a high or moderately high available water capacity, and are somewhat poorly drained.

Group K. The soils in this group formed from mixed marine and fluvial sediments on Coastal Plain landscapes that range from stream terraces to broad, nearly level interfluves on uplands. These soils are deep, have loamy surface layers and clay loam to clayey subsurface layers, have a moderate available water capacity, and are somewhat poorly drained.

Group R. The soils in this group formed from marine sediments on the gently sloping uplands of the Coastal Plain. These soils are deep, have a sandy loam surface layer, have subsurface layers of reddish yellow clay to clay loam, have some mottles in the lower part, have a moderate available water capacity, and are well drained or moderately well drained.

Group T. The soils in this group formed from loamy sediments and are located on uplands and streams terraces in the Coastal Plain. These soils are deep, have fine-loamy subsurface textures, are typically underlain by coarser sediments, have a moderate available water capacity, and are well drained.

Group Z. The soils in this group formed in alluvium in low-lying terrace positions. These soils are deep, have clayey subsurface horizons, have a moderately high available water capacity, and are somewhat poorly drained.

Group DD. The soils in this group formed from loamy sediments and local alluvium. These soils formed on gently sloping uplands and stream terraces of the Coastal Plain. They are moderately deep, have predominantly coarse-loamy subsurface horizons, and, in some areas, have Arenic or very thick sandy surface layers. They have a moderately low available water capacity and are excessively drained.

Group EE. The soils in this group formed in loamy sediments on low-lying landscape positions of the Coastal Plain. These soils are deep and have coarse-loamy to sandy subsurface horizons. They typically have a high water table during some part of the year even though the soil textures are very sandy. They are poorly drained or very poorly drained.

Group HH. The soils in this group formed from loamy and finer sediments in flood-plain positions of the Coastal Plain. These soils are moderately deep, have fine-loamy or clayey subsurface textures, have a moderate available water capacity, and range from somewhat poorly drained to moderately well drained.

Group II. The soils in this group formed from sandy parent materials within the Coastal Plain or from local alluvium or colluvium of sandy origin. These soils are sandy throughout, have little horizonation, have a low or very low available water capacity, and are well drained or moderately well drained.

Group NN. The soils in this group formed in alluvium along streams or on terraces. These soils are moderately deep, have silty to clay loam subsurface textures, have a moderately high available water capacity, and are somewhat poorly drained or poorly drained.

Group OO. The soils in this group formed from alluvium or coastal plain sediments on terraces, levees, and broad, nearly level landscapes of the Coastal Plain. These soils have loamy to silty textures throughout, have a high available water capacity, and are poorly drained.

Group PP. The soils in this group formed in marshes and tidal wetlands in the Coastal Plain. These soils occur in tidal basins, on tidal flats, and in other ponded areas. Some of these soils have organic horizons, have clayey mineral horizons, or have sulfidic materials. The soils have a water table at or near the soil surface and are saturated most of the time.

The management groups for the map units in the survey area are given in the section “Detailed Soil Map Units” and in table 5.

Prime Farmland

Table 6 lists the map units in the survey area that are considered prime farmland. This list does not constitute a recommendation for a particular land use.

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation’s food supply.

Prime farmland is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

For some soils identified in table 6 as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures.

About 105,170 acres in the survey area, or about 57 percent of the total acreage, meets the requirements for prime farmland. About 12,000 acres of this total, however, has a wetness limitation.

Hydric Soils

Table 7 lists the map unit components that are rated as hydric soils in the survey area. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site *(6, 8)*.

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology *(3, 8, 9, 10)*. Criteria for all of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part *(4)*. These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established *(5)*. These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in “Soil Taxonomy” *(15)* and “Keys to Soil Taxonomy” *(14)* and in the “Soil Survey Manual” *(18)*.

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in “Field Indicators of Hydric Soils in the United States” *(6)*.

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

Map units that are dominantly made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units dominantly made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The following map units, in general, do not meet the definition of hydric soils because they do not have one of the hydric soil indicators. A portion of these map units, however, may include hydric soils. Onsite investigation is recommended to determine whether hydric soils occur and the location of the included hydric soils.

1A	Augusta fine sandy loam, 0 to 2 percent slopes, rarely flooded
5D	Emporia-Slagle-Rumford complex, 6 to 15 percent slopes
5E	Emporia-Slagle-Rumford complex, 15 to 50 percent slopes
21A	Wahee fine sandy loam, 0 to 2 percent slopes, rarely flooded

Agricultural Waste Management

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

Table 8, parts I, II, and III, show the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of this table, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the table are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops (application of manure and food-processing waste, application of sewage sludge, and disposal of wastewater by irrigation) and for waste management systems that are designed only for the purpose of wastewater disposal and treatment (overland flow of wastewater, rapid infiltration of wastewater, and slow rate treatment of wastewater).

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are either solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Disposal of wastewater by irrigation not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings in the table are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

Overland flow of wastewater is a process in which wastewater is applied to the upper reaches of sloped land and allowed to flow across vegetated surfaces, sometimes called terraces, to runoff-collection ditches. The length of the run generally is 150 to 300 feet. The application rate ranges from 2.5 to 16.0 inches per week. It commonly exceeds the rate needed for irrigation of cropland. The wastewater leaves solids and nutrients on the vegetated surfaces as it flows downslope in a thin film. Most of the water reaches the collection ditch, some is lost through evapotranspiration, and a small amount may percolate to the ground water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, and the design and construction of the system. Reaction and the cation-exchange capacity affect absorption. Reaction, salinity, and the sodium adsorption ratio affect plant growth and microbial activity. Slope, permeability, depth to a water table, ponding, flooding, depth to bedrock or a cemented pan, stones, and cobbles affect design and construction. Permanently frozen soils are unsuitable for waste treatment.

Rapid infiltration of wastewater is a process in which wastewater applied in a level basin at a rate of 4 to 120 inches per week percolates through the soil. The wastewater may eventually reach the ground water. The application rate commonly exceeds the rate needed for irrigation of cropland. Vegetation is not a necessary part of the treatment; hence, the basins may or may not be vegetated. The thickness of the soil material needed for proper treatment of the wastewater is more than 72 inches. As a result, geologic and hydrologic investigation is needed to ensure proper design and performance and to determine the risk of ground-water pollution.

The ratings in the table are based on the soil properties that affect the risk of pollution and the design, construction, and performance of the system. Depth to a water table, ponding, flooding, and depth to bedrock or a cemented pan affect the risk of pollution and the design and construction of the system. Slope, stones, and cobbles also affect design and construction. Permeability and reaction affect performance. Permanently frozen soils are unsuitable for waste treatment.

Slow rate treatment of wastewater is a process in which wastewater is applied to land at a rate normally between 0.5 inch and 4.0 inches per week. The application rate commonly exceeds the rate needed for irrigation of cropland. The applied wastewater is treated as it moves through the soil. Much of the treated water may percolate to the ground water, and some enters the atmosphere through evapotranspiration. The applied water generally is not allowed to run off the surface. Waterlogging is prevented either through control of the application rate or through the use of tile drains, or both.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, and the application of waste. The properties that affect absorption include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, depth to bedrock or a cemented pan, reaction, the cation-exchange capacity, and slope. Reaction, the sodium adsorption ratio, salinity, and bulk density affect plant growth and microbial activity. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood of wind erosion or water erosion. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Forestland Productivity and Management

The tables described in this section can help forest owners or managers plan the use of soils for wood crops. They show the potential productivity of the soils for wood crops and rate the soils according to the limitations that affect various aspects of forestland management.

King and Queen County was originally covered with a virgin forest, but most of the land suitable for cultivation has been cleared. The remaining areas of woodland are generally too steep or too wet for farming. The woodland is composed of second-growth hardwoods, loblolly pine, and Virginia pine.

Forestland Productivity

In table 9, the *potential productivity* of merchantable or *common trees* on a soil is expressed as a site index and as a volume number. The *site index* is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that forest managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. More detailed information regarding site index is available in the “National Forestry Manual” *(12)*, which is available at the local office of the Natural Resources Conservation Service or on the Internet.

The *volume of wood fiber*, a number, is the yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmination of the mean annual increment (CMAI), indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Trees to manage are those that are preferred for planting, seeding, or natural regeneration and those that remain in the stand after thinning or partial harvest.

Forestland Management

In table 10, parts I through V, interpretive ratings are given for various aspects of forestland management. The ratings are both verbal and numerical.

Some rating class terms indicate the degree to which the soils are suited to a specified aspect of forestland management. *Well suited* indicates that the soil has features that are favorable for the specified management aspect and has no limitations. Good performance can be expected, and little or no maintenance is needed. *Moderately suited* indicates that the soil has features that are moderately favorable for the specified management aspect. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. *Poorly suited* indicates that the soil has one or more properties that are unfavorable for the specified management aspect. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. *Unsuited* indicates that the expected performance of the soil is unacceptable for the specified management aspect or that extreme measures are needed to overcome the undesirable soil properties.

Proper planning for timber harvesting is essential to minimize the potential impact to soil and water quality. A harvest plan should include logging roads, log decks, streamside management zones, stream crossings, skid trails, schedule of activities, and Best Management Practices (BMPs) for each activity. Forests should be managed to increase economic and environmental benefits. A forest stewardship plan should be developed to guide management and utilization of the woodlands.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating class terms for fire damage and seedling mortality are expressed as *low, moderate,* and *high*. Where these terms are used, the numerical ratings indicate gradations between the point at which the potential for fire damage or seedling mortality is highest (1.00) and the point at which the potential is lowest (0.00).

The paragraphs that follow indicate the soil properties considered in rating the soils. More detailed information about the criteria used in the ratings is available in the "National Forestry Manual" *(12)*, which is available at the local office of the Natural Resources Conservation Service or on the Internet.

For *limitations affecting construction of haul roads and log landings*, the ratings are based on slope, flooding, permafrost, plasticity index, the hazard of soil slippage, content of sand, the Unified classification, rock fragments on or below the surface, depth to a restrictive layer that is indurated, depth to a water table, and ponding. The limitations are described as slight, moderate, or severe. A rating of *slight* indicates that no significant limitations affect construction activities, *moderate* indicates that one or more limitations can cause some difficulty in construction, and *severe* indicates that one or more limitations can make construction very difficult or very costly.

The ratings of *suitability for log landings* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, ponding, flooding, and the hazard of soil slippage. The soils are described as well suited, moderately suited, or poorly suited to use as log landings.

Ratings in the column *soil rutting hazard* are based on depth to a water table, rock fragments on or below the surface, the Unified classification, depth to a restrictive layer, and slope. Ruts form as a result of the operation of forest equipment. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that the soil is subject to little or no rutting, *moderate* indicates that rutting is likely, and *severe* indicates that ruts form readily.

Ratings in the column *hazard of off-road or off-trail erosion* are based on slope and on soil erodibility factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. A rating of *slight* indicates that erosion is unlikely under ordinary climatic conditions; *moderate* indicates that some erosion is likely and that erosion-control measures may be needed; *severe* indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and *very severe* indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Ratings in the column *hazard of erosion on roads and trails* are based on the soil erodibility factor K, slope, and content of rock fragments. The ratings apply to unsurfaced roads and trails. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that little or no erosion is likely; *moderate* indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and *severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Ratings in the column *suitability for roads (natural surface)* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, ponding, flooding, and the hazard of soil slippage. The ratings indicate the suitability for using the natural surface of the soil for roads. The soils are described as well suited, moderately suited, or poorly suited to this use.

Ratings in the columns *suitability for hand planting* and *suitability for mechanical planting* are based on slope, depth to a restrictive layer, content of sand, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, moderately suited, poorly suited, or unsuited to these methods of planting. It is assumed that necessary site preparation is completed before seedlings are planted.

Ratings in the column *suitability for use of harvesting equipment* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, and ponding. The soils are described as well suited, moderately suited, or poorly suited to this use.

Ratings in the column *suitability for mechanical site preparation (surface)* are based on slope, depth to a restrictive layer, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, poorly suited, or unsuited to this management activity. The part of the soil from the surface to a depth of about 1 foot is considered in the ratings.

Ratings in the column *suitability for mechanical site preparation (deep)* are based on slope, depth to a restrictive layer, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, poorly suited, or unsuited to this management activity. The part of the soil from the surface to a depth of about 3 feet is considered in the ratings.

Ratings in the column *potential for damage to soil by fire* are based on texture of the surface layer, content of rock fragments and organic matter in the surface layer, thickness of the surface layer, and slope. The soils are described as having a low, moderate, or high potential for this kind of damage. The ratings indicate an evaluation of the potential impact of prescribed fires or wildfires that are intense enough to remove the duff layer and consume organic matter in the surface layer.

Ratings in the column *potential for seedling mortality* are based on flooding, ponding, depth to a water table, content of lime, reaction, salinity, available water capacity, soil moisture regime, soil temperature regime, aspect, and slope. The soils are described as having a low, moderate, or high potential for seedling mortality.

Recreational Development

In King and Queen County, the Mattaponi, Poropotank, and York Rivers provide many recreational opportunities, including boating, fishing, swimming, waterskiing, and hunting. Several public boat landings are located along the Mattaponi River. Upland areas throughout the county provide opportunites for hunting and fishing. The County Department of Parks and Recreation organizes and provides facilities for athletic and recreational activities.

In table 11, parts I and II, the soils of the survey area are rated according to limitations that affect their suitability for recreational development. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the table are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in this table can be supplemented by other information in this survey, for example, interpretations for dwellings without basements, for local roads and streets, and for septic tank absorption fields.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading “Soil Properties.”

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, reclamation material, roadfill, and topsoil; plan structures for water management; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table 12, parts I and II, show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Table 13, parts I and II, show the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Construction Materials

Table 14, parts I and II, give information about the soils as potential sources of gravel, sand, reclamation material, roadfill, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

Gravel and *sand* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, part I, only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

The soils are rated *good, fair,* or *poor* as potential sources of sand and gravel. A rating of *good* or *fair* means that the source material is likely to be in or below the soil.

The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

In table 14, part II, the rating class terms are *good, fair,* and *poor*. The features that limit the soils as sources of these materials are specified in the table. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of reclamation material, roadfill, and topsoil. The lower the number, the greater the limitation.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

Engineering Soil Properties

Table 16 gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical Soil Properties

Table 17 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In the table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In the table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$- or $^{1}/_{10}$-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in micrometers per second, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook" *(13)*, which is available at the local office of the Natural Resources Conservation Service or on the Internet.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Soil Properties

Table 18 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable bases plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

Table 19 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. The table indicates, by month, depth to the top *(upper limit)* and base *(lower limit)* of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

Table 20 gives estimates of some soil features. The estimates are used in land use planning that involves engineering considerations.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(14, 15)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 21 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizonation, plus *udult*, the suborder of the Ultisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, thermic Typic Hapludults.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(18)* and in the "Field Book for Describing and Sampling Soils" *(16)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(15)* and in "Keys to Soil Taxonomy" *(14)*. Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

Augusta Series

Physiographic province: Southern Coastal Plain
Landform: Stream terraces
Parent material: Loamy alluvial sediments
Drainage class: Somewhat poorly drained
Slowest permeability class: Moderate
Slope: 0 to 2 percent

Associated Soils

- Tetotum soils, which are moderately well drained
- Munden soils, which are moderately well drained and have less clay in the subsoil than the Augusta soils
- Tomotley soils, which are poorly drained
- Wahee soils, which have more clay in the subsoil than the Augusta soils
- Roanoke soils, which are poorly drained and have more clay in the subsoil than the Augusta soils

Taxonomic Classification

Fine-loamy, mixed, semiactive, thermic Aeric Endoaquults

Typical Pedon

Augusta fine sandy loam, 0 to 2, percent slopes, rarely flooded; about 1.0 mile southeast of the intersection of Highways VA-639 and VA-684 on Highway VA-684, about 60 feet west of Highway VA-684, in cropland:

Ap—0 to 6 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine granular structure; very friable, slightly sticky, slightly plastic; many fine and few medium and coarse roots; many fine and medium tubular pores; strongly acid; abrupt smooth boundary.

E—6 to 9 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium granular structure; very friable, slightly sticky, slightly plastic; many fine and few medium roots; many fine and medium tubular pores; common medium distinct grayish brown (10YR 5/2) iron depletions; strongly acid; clear wavy boundary.

Btg1—9 to 19 inches; light brownish gray (10YR 6/2) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; many fine and medium tubular pores; common distinct clay films on all faces of peds; common medium faint gray (10YR 6/1) iron depletions and common medium distinct light yellowish brown (2.5Y 6/4) masses of oxidized iron; strongly acid; gradual wavy boundary.

Btg2—19 to 39 inches; light brownish gray (10YR 6/2) clay loam; weak medium and coarse subangular blocky structure; friable, moderately sticky, moderately plastic; few fine and medium roots; many fine and medium and few coarse tubular pores; common distinct clay films on all faces of peds; common medium distinct light yellowish brown (2.5Y 6/4) and yellowish brown (10YR 5/8) masses of oxidized iron; strongly acid; gradual wavy boundary.

Btg3—39 to 45 inches; light brownish gray (10YR 6/2) clay loam; moderate medium subangular blocky structure; friable, moderately sticky, moderately plastic; few fine roots; few fine vesicular pores; few faint clay films on all faces of peds; strongly acid; gradual wavy boundary.

BCg—45 to 60 inches; gray (10YR 6/1) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium tubular and vesicular pores; few faint clay films on all faces of peds; common medium distinct yellowish brown (10YR 5/8) masses of oxidized iron; strongly acid; gradual wavy boundary.

Cg—60 to 70 inches; gray (10YR 6/1) loamy sand; massive; friable, nonsticky, nonplastic; 2 percent rounded quartz gravel; strongly acid.

Range in Characteristics

Solum thickness: 40 to 80 inches
Rock fragments: 0 to 10 percent quartz gravel throughout the profile
Reaction: Very strongly acid to moderately acid, except in limed areas

A horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—2 to 6
Texture—sandy loam, fine sandy loam, loam, or silt loam

E horizon:
Hue—10YR to 5Y
Value—5 to 7
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, loam, or silt loam

BE horizon (if it occurs):
Hue—10YR to 5Y
Value—5 to 7
Chroma—3 to 8
Texture—fine sandy loam, sandy loam, loam, or silt loam

Btg horizon:
Hue—neutral or 10YR to 5Y
Value—5 to 7
Chroma—0 to 2
Texture—loam, sandy clay loam, or clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

BCg horizon:
Hue—neutral or 10YR to 5Y
Value—5 to 7
Chroma—0 to 2
Texture—loam, sandy clay loam, or clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Cg horizon:
Hue—neutral or 10YR to 5Y
Value—5 to 7
Chroma—0 to 2
Texture—sand, loamy sand, sandy loam, loam, or clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Bibb Series

Physiographic province: Southern Coastal Plain
Landform: Flood plains
Parent material: Loamy and sandy alluvial sediments
Drainage class: Poorly drained
Slowest permeability class: Moderate
Slope: 0 to 2 percent

Associated Soils

- Roanoke and Tomotley soils, which have more clay in the subsoil than the Bibb soils
- Levy soils, which are very poorly drained; in freshwater swamps
- Rappahannock soils, which are organic; in brackish tidal marshes
- Kinston soils, which have more clay than the Bibb soils

Taxonomic Classification

Coarse-loamy, siliceous, active, acid, thermic Typic Fluvaquents

Typical Pedon

Bibb fine sandy loam in an area of Kinston and Bibb soils, 0 to 2 percent slopes, occasionally flooded; 300 feet north of Highway VA-627 and Beaverly Creek, in woodland:

A—0 to 6 inches; brown (10YR 5/3) fine sandy loam; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear smooth boundary.
Ag—6 to 15 inches; dark gray (10YR 4/1) sandy loam; weak fine granular structure; friable, slightly sticky, slightly plastic; few fine roots; few fine prominent strong brown (7.5YR 5/6) and common medium distinct brown (10YR 4/3) and yellowish brown (10YR 5/8) masses of oxidized iron; strongly acid; clear smooth boundary.
Cg1—15 to 30 inches; grayish brown (10YR 5/2) sandy loam; massive; very friable, slightly sticky, slightly plastic; strongly acid; gradual smooth boundary.
Cg2—30 to 40 inches; grayish brown (10YR 5/2) loamy sand; massive; very friable; 10 percent rounded quartz gravel; strongly acid; gradual smooth boundary.
Cg3—40 to 62 inches; grayish brown (10YR 5/2) gravelly sand; single grain; loose; 20 percent rounded quartz gravel; strongly acid.

Range in Characteristics

Rock fragment content: 0 to 10 percent in the A horizon; 0 to 30 percent in the C horizon
Reaction: Extremely acid to strongly acid, except in limed areas

A horizon:
Hue—10YR
Value—3 to 5
Chroma—1 to 3
Texture—loamy sand, sandy loam, fine sandy loam, loam, or silt loam

Ag horizon:
Hue—neutral or 10YR or 2.5Y
Value—3 to 7
Chroma—0 to 2
Texture—loamy sand, sandy loam, fine sandy loam, loam, or silt loam

Cg horizon:
Hue—neutral or 10YR to 5Y
Value—3 to 7

Chroma—0 to 2
Texture—commonly stratified; sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam, or silt loam

Bojac Series

Physiographic province: Southern Coastal Plain
Landform: Stream terraces
Parent material: Loamy alluvial sediments
Drainage class: Well drained
Slowest permeability class: Moderately rapid
Slope: 0 to 6 percent

Associated Soils

- Craven and Tetotum soils, which are moderately well drained and have more clay in the subsoil than the Bojac soils
- State soils, which have more clay in the subsoil than the Bojac soils
- Tarboro soils, which are somewhat excessively drained and have less clay than the Bojac soils

Taxonomic Classification

Coarse-loamy, mixed, semiactive, thermic Typic Hapludults

Typical Pedon

Bojac loamy sand, 0 to 2 percent slopes, rarely flooded; 0.1 mile south on Highway VA-721 to Highway VA-693, about 1.3 miles along the field road extension to a small cultivated field just west of a small cemetery, 50 feet south of the field road, in cropland:

Ap—0 to 10 inches; yellowish brown (10YR 5/4) loamy sand; weak fine granular structure; very friable, nonsticky, nonplastic; many fine and medium roots; many fine vesicular pores; moderately acid; abrupt smooth boundary.
Bt1—10 to 18 inches; yellowish brown (10YR 5/4) sandy loam; weak fine subangular blocky structure; very friable, nonsticky, nonplastic; many fine and medium roots; many fine vesicular pores; few faint clay bridging between sand grains; strongly acid; gradual wavy boundary.
Bt2—18 to 27 inches; light yellowish brown (10YR 6/4) sandy loam; weak fine subangular blocky structure; friable, nonsticky, nonplastic; many fine and medium roots; few fine vesicular pores; few faint clay bridging between sand grains; strongly acid; gradual wavy boundary.
Bt3—27 to 35 inches; brownish yellow (10YR 6/6) sandy loam; weak fine subangular blocky structure; very friable, nonsticky, nonplastic; many very fine and fine roots; few fine vesicular pores; few faint clay films on all faces of peds; strongly acid; gradual wavy boundary.
Bt4—35 to 49 inches; brownish yellow (10YR 6/6) sandy loam; weak fine subangular blocky structure; very friable, nonsticky, nonplastic; few fine roots; few faint clay films on all faces of peds; common medium faint light yellowish brown (10YR 6/4) masses of oxidized iron; 5 percent rounded quartz gravel; strongly acid; gradual wavy boundary.
BC—49 to 55 inches; light yellowish brown (10YR 6/4) loamy sand; weak fine subangular blocky structure; very friable, nonsticky, nonplastic; few fine roots; common medium faint lenses of sandy clay loam; common medium faint brownish yellow (10YR 6/6) masses of oxidized iron; 5 percent rounded quartz gravel; strongly acid; gradual wavy boundary.

C—55 to 62 inches; brownish yellow (10YR 6/6) loamy sand; single grain; loose, nonsticky, nonplastic; common medium prominent light gray (10YR 7/1) iron depletions; 5 percent rounded quartz gravel; strongly acid.

Range in Characteristics

Solum thickness: 30 to 65 inches
Rock fragments: 0 to 5 percent gravel in the A and B horizons; 0 to 15 percent gravel in the C horizon
Reaction: Extremely acid to slightly acid in the A, E, and B horizons, except in limed areas; very strongly acid to moderately acid in the C horizon
Mica flakes: Few or common in most pedons

Ap horizon:
Hue—7.5YR to 2.5Y
Value—3 to 6
Chroma—1 to 4
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loam

E horizon (if it occurs):
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—4 to 6
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loam

BE horizon (if it occurs):
Hue—5YR to 2.5Y
Value—4 to 7
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, or loam

Bt horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy loam, fine sandy loam, or loam; thin subhorizons of sandy clay loam or clay loam occur in some pedons
Redoximorphic features—horizon has iron depletions with chroma of 2 or less in some pedons below a depth of 40 inches

BC horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—loamy sand or loamy fine sand
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

C horizon:
Hue—7.5YR to 2.5Y
Value—4 to 7
Chroma—4 to 8
Texture—commonly stratified; ranging from sand to loamy fine sand
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Craven Series

Physiographic province: Southern Coastal Plain
Landform: Marine terraces
Parent material: Clayey marine sediments
Drainage class: Moderately well drained
Slowest permeability class: Slow
Slope: 0 to 10 percent

Associated Soils

- Bojac, Emporia, Rumford, and State soils, which are well drained and have less clay in the subsoil than the Craven soils
- Mattaponi soils, which have better permeability than the Craven soils and have less silt in the subsoil
- Slagle and Tetotum soils, which have less clay in the subsoil than the Craven soils

Taxonomic Classification

Fine, mixed, subactive, thermic Aquic Hapludults

Typical Pedon

Craven fine sandy loam, 0 to 2 percent slopes; 1.4 miles southeast of the junction of Highways VA-639 and VA-684 on Highway VA-684, just past the elbow in Highway VA-684, about 300 feet northwest of a farm road, in cropland:

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam; weak medium subangular blocky structure; very friable, slightly sticky, nonplastic; many fine and medium roots; strongly acid; abrupt smooth boundary.

Bt1—6 to 11 inches; light yellowish brown (10YR 6/4) clay loam; moderate medium subangular blocky structure; friable, moderately sticky, moderately plastic; many fine and medium roots; common distinct clay films on all faces of peds; few fine distinct brownish yellow (10YR 6/8) masses of oxidized iron; strongly acid; gradual wavy boundary.

Bt2—11 to 31 inches; light yellowish brown (10YR 6/4) clay; moderate medium subangular blocky structure; friable, moderately sticky, moderately plastic; many fine roots; common distinct clay films on all faces of peds; common medium prominent reddish brown (2.5YR 5/4) masses of oxidized iron and common fine distinct gray (10YR 6/1) iron depletions; strongly acid; gradual wavy boundary.

BC—31 to 45 inches; brownish yellow (10YR 6/6) sandy clay loam; weak medium subangular blocky structure; very friable, moderately sticky, moderately plastic; few fine roots; few faint clay films on all faces of peds; few fine prominent reddish brown (2.5YR 5/4) and common medium faint masses of oxidized iron and common medium prominent gray (10YR 6/1) iron depletions; strongly acid; gradual wavy boundary.

C—45 to 62 inches; brownish yellow (10YR 6/6), light yellowish brown (10YR 6/4), and light gray (10YR 7/2) loamy sand; massive; very friable, nonsticky, nonplastic; very strongly acid.

Range in Characteristics

Solum thickness: 40 to 60 inches or more
Soil reaction: Very strongly or strongly acid throughout the profile, except in limed areas
Rock fragment content: 0 to 3 percent gravel throughout the profile

Ap horizon:
Hue—10YR or 2.5Y

Value—3 to 6
Chroma—1 to 3
Texture—fine sandy loam, very fine sandy loam, loam, or silt loam

E horizon (if it occurs):
Hue—10YR to 5Y
Value—5 to 7
Chroma—2 to 4
Texture—fine sandy loam, very fine sandy loam, loam, or silt loam

BE horizon (if it occurs):
Hue—10YR to 2.5Y
Value—4 to 7
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, or loam

Bt horizon (upper part):
Hue—7.5YR to 2.5Y
Value—5 to 7
Chroma—4 to 8
Texture—clay loam, silty clay loam, clay, or silty clay
Redoximorphic features—iron masses in shades of brown, yellow, or red

Bt horizon (lower part):
Hue—7.5YR to 2.5Y
Value—5 to 7
Chroma—3 to 8
Texture—clay loam, silty clay loam, clay, or silty clay
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray

BC horizon:
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—3 to 8
Texture—sandy clay loam, clay loam, silty clay loam, sandy clay, clay, or silty clay
Redoximorphic features—iron masses in shades of red, brown, or yellow and iron depletions in shades of gray

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—1 to 6
Texture—loamy sand, sandy loam, loam, or sandy clay loam
Redoximorphic features—iron masses in shades of red, brown, or yellow and iron depletions in shades of gray

Emporia Series

Physiographic province: Southern Coastal Plain
Landform: Marine terraces
Parent material: Loamy marine sediments
Drainage class: Well drained
Slowest permeability class: Very slow
Slope: 0 to 50 percent

Associated Soils

- Craven and Mattaponi soils, which are moderately well drained and have more clay in the subsoil than the Emporia soils
- Faceville soils, which have more clay in the subsoil than the Emporia soils
- Rumford soils, which have less clay in the subsoil than the Emporia soils
- Slagle soils, which are moderately well drained
- Suffolk soils, which have coarse substrata within a depth of 50 inches

Taxonomic Classification

Fine-loamy, siliceous, subactive, thermic Typic Hapludults

Typical Pedon

Emporia sandy loam, 2 to 6 percent slopes; near Clancie, 1.1 miles southwest of Highway VA-647 from its junction with Highway VA-609, about 1,000 feet south on Chesapeake Corporation Road, 100 feet west of the road, in woodland:

A—0 to 6 inches; grayish brown (2.5Y 5/2) sandy loam; weak fine granular structure; friable, nonsticky, nonplastic; many very fine and fine and few medium roots; many fine vesicular pores; moderately acid; clear wavy boundary.

E—6 to 12 inches; light yellowish brown (2.5Y 6/4) sandy loam; massive parting to moderate medium subangular blocky structure; friable, hard, very strong, slightly sticky, slightly plastic; brittle; few fine and medium roots; few fine vesicular pores; moderately acid; clear smooth boundary.

Bt1—12 to 22 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; few very fine and fine roots; few fine vesicular pores; few faint patchy clay films on all faces of peds; many medium and coarse distinct light yellowish brown (10YR 6/4) masses of oxidized iron; strongly acid; clear smooth boundary.

Bt2—22 to 36 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable, slightly hard, strong, slightly sticky, slightly plastic; few very fine and fine roots; few fine vesicular pores; common distinct clay films on all faces of peds; common medium distinct strong brown (7.5YR 5/6) and many medium distinct very pale brown (10YR 7/4) masses of oxidized iron; strongly acid; clear smooth boundary.

Bt3—36 to 42 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable, slightly hard, strong, slightly sticky, slightly plastic; few very fine and fine roots; few fine vesicular pores; common distinct clay films on all faces of peds; few fine and medium distinct very pale brown (10YR 7/4) masses of oxidized iron; very strongly acid; clear smooth boundary.

BC—42 to 62 inches; brownish yellow (10YR 6/8), strong brown (7.5YR 5/6), pinkish gray (7.5YR 7/2), and red (2.5YR 5/6) sandy clay loam; weak coarse subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; very strongly acid.

Range in Characteristics

Solum thickness: 40 to 75 inches
Rock fragments: 0 to 20 percent gravel in the A, E, and B horizons; 0 to 35 percent gravel in the C horizon
Reaction: Very strongly acid to moderately acid, except in limed areas

A horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loam

E horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 to 6
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loam

BE horizon (if it occurs):
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—4 to 6
Texture—sandy loam, fine sandy loam, or loam

Bt horizon (upper part):
Hue—5YR to 10YR
Value—4 to 6
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red

Bt horizon (lower part):
Hue—5YR to 2.5Y
Value—4 to 6
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam; sandy clay or clay in some pedons
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray below a depth of 36 inches

BC horizon:
Hue—2.5YR to 2.5Y
Value—4 to 6
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam; sandy clay or clay in some pedons
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray

C horizon (if it occurs):
Hue—2.5YR to 5Y
Value—3 to 8
Chroma—3 to 8
Texture—sandy loam to clay
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray

Faceville Series

Physiographic province: Southern Coastal Plain
Landform: Marine terraces
Parent material: Clayey marine sediments
Drainage class: Well drained
Slowest permeability class: Moderate
Slope: 0 to 6 percent

Associated Soils

- Emporia and Suffolk soils, which have less clay in the subsoil than the Faceville soils

- Mattaponi soils, which are moderately well drained and have a yellower subsoil than the Faceville soils
- Slagle soils, which are moderately well drained and have less clay in the subsoil than the Faceville soils

Taxonomic Classification

Fine, kaolinitic, thermic Typic Kandiudults

Typical Pedon

Faceville fine sandy loam, 0 to 2 percent slopes; 1.1 miles northeast of the junction of Highways VA-619 and VA-631 on Highway VA-619, about 50 feet west of Highway VA-619, on an elevated rise, in cropland:

Ap—0 to 7 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium granular structure; very friable, slightly sticky, slightly plastic; many fine and medium and few coarse roots; strongly acid; abrupt smooth boundary.

AB—7 to 9 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium granular structure; very friable, slightly sticky, nonplastic; many fine and medium and few coarse roots; strongly acid; gradual wavy boundary.

Bt1—9 to 18 inches; yellowish brown (10YR 5/8) sandy clay; weak medium subangular blocky structure; friable, moderately sticky, slightly plastic; many fine and medium and few coarse roots; few fine and medium vesicular pores; common distinct clay films on all faces of peds; strongly acid; gradual wavy boundary.

Bt2—18 to 30 inches; strong brown (7.5YR 5/8) and reddish yellow (7.5YR 7/8) sandy clay; moderate medium subangular blocky structure; friable, moderately sticky, slightly plastic; many fine and medium roots; few fine and medium vesicular pores; common distinct clay films on all faces of peds; strongly acid; gradual wavy boundary.

Bt3—30 to 47 inches; red (2.5YR 4/8) and yellowish red (5YR 5/6) clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine vesicular pores; common distinct clay films on all faces of peds; strongly acid; gradual wavy boundary.

Bt4—47 to 67 inches; yellowish red (5YR 5/6), red (2.5YR 4/8), and strong brown (7.5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; many medium lenses of clay loam; few distinct clay films on all faces of peds; strongly acid.

Range in Characteristics

Solum thickness: 65 inches or more
Rock fragment content: 0 to 3 percent ironstone nodules in the A and E horizons; 0 to 10 percent quartz gravel throughout the profile
Reaction: Very strongly acid or strongly acid, except in limed areas

A and AB horizons:
Hue—5YR to 10YR
Value—4 or 5
Chroma—2 to 8
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

E horizon (if it occurs):
Hue—5YR to 10YR
Value—5 to 7
Chroma—3 or 4
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

BA horizon (if it occurs):
Hue—2.5YR to 7.5YR
Value—4 or 5
Chroma—6 to 8
Texture—sandy clay loam or clay loam

Bt horizon:
Hue—10R to 5YR
Value—4 or 5
Chroma—4 to 8
Texture—sandy clay, clay loam, or clay; clay content of the control section ranges from 36 to 55 percent with less than 30 percent silt
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray below a depth of 60 inches

BC horizon (if it occurs):
Hue—10R to 5YR
Value—4 or 5
Chroma—4 to 8
Texture—sandy clay or sandy clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray below a depth of 60 inches

Kinston Series

Physiographic province: Southern Coastal Plain
Landform: Flood plains
Parent material: Loamy alluvial sediments
Drainage class: Poorly drained
Slowest permeability class: Moderate
Slope: 0 to 2 percent

Associated Soils

- Bibb soils, which have a substratum that is coarser than that of the Kinston soils
- Levy soils, which are very poorly drained; in freshwater swamps
- Rappahannock soils, which are very poorly drained and organic; in brackish tidal marshes
- Tomotley soils, which have a developed subsoil
- Roanoke soils, which are poorly drained and have more clay in the subsoil than the Kinston soils

Taxonomic Classification

Fine-loamy, siliceous, semiactive, acid, thermic Fluvaquentic Endoaquepts

Typical Pedon

Kinston fine sandy loam in an area of Kinston and Bibb soils, 0 to 2 percent slopes, occasionally flooded; 350 feet north of Highway VA-627 and Beaverly Creek, in woodland:

A—0 to 4 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; many fine and medium roots; common medium faint brown (10YR 5/3) masses of oxidized iron; strongly acid; clear smooth boundary.
Bg—4 to 10 inches; light brownish gray (10YR 6/2) sandy clay loam; massive; friable, slightly sticky, slightly plastic; many fine and medium roots; common medium faint

brown (10YR 5/3) and pale brown (10YR 6/3) masses of oxidized iron; strongly acid; gradual smooth boundary.

Cg1—10 to 28 inches; light gray (10YR 7/2) clay loam; massive; firm, slightly sticky, slightly plastic; few fine and medium roots; common medium prominent yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8) masses of oxidized iron; strongly acid; gradual smooth boundary.

Cg2—28 to 47 inches; light gray (10YR 7/2) clay loam; massive; firm; common thin strata of fine sand and sandy loam; common medium prominent yellowish brown (10YR 5/8) masses of oxidized iron and common medium faint light brownish gray (10YR 6/2) iron depletions; strongly acid; gradual smooth boundary.

Cg3—47 to 62 inches; light gray (2.5Y 7/2) loam; massive; friable; common thin strata of gravelly loamy sand and sandy loam; 10 percent rounded quartz gravel; strongly acid.

Range in Characteristics

Reaction: Very strongly acid or strongly acid, except in limed areas
Rock fragment content: 0 to 3 percent in the A and B horizons; 0 to 10 percent in the C horizon

A horizon:
Hue—10YR
Value—3 to 5
Chroma—1 to 3
Texture—loamy sand, sandy loam, fine sandy loam, loam, or silt loam

Bg horizon:
Hue—10YR to 5Y
Value—3 to 7
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Cg horizon:
Hue—neutral or 10YR to 5Y
Value—3 to 7
Chroma—0 to 2
Texture—sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Levy Series

Physiographic province: Southern Coastal Plain
Landform: Marshes and swamps
Parent material: Clayey alluvial sediments
Drainage class: Very poorly drained
Slowest permeability class: Slow
Slope: 0 to 2 percent

Associated Soils

- Rappahannock soils, which are organic; in brackish tidal swamps

- Kinston, Bibb, and Tomotley soils, which are poorly drained and have less clay than the Levy soils
- Roanoke soils, which are poorly drained

Taxonomic Classification

Fine, mixed, superactive, acid, thermic Typic Hydraquents

Typical Pedon

Levy silt loam, 0 to 2 percent slopes, very frequently flooded; about 7.4 miles southeast of the junction of Highways US-360 and VA-14 at St. Stephens on Highway VA-14, about 50 yards north of the bridge crossing Dickey's Swamp near the center of the drainageway, in woodland:

Ag—0 to 4 inches; light brownish gray (10YR 6/2) silt loam; massive; few faint dark gray (10YR 4/1) organic stains; very strongly acid; clear wavy boundary.

Cg1—4 to 8 inches; light olive gray (5Y 6/2) silty clay; massive; moderately sticky; few faint dark gray (10YR 4/1) organic stains; very strongly acid; clear wavy boundary.

Cg2—8 to 22 inches; gray (5Y 5/1) and greenish gray (5GY 5/1) silty clay; massive; very sticky, very plastic; very strongly acid; gradual wavy boundary.

Cg3—22 to 35 inches; greenish gray (5GY 5/1) and gray (5Y 5/1 and 6/1) silty clay; massive; very sticky, very plastic; few partly decomposed wood fragments; very strongly acid; gradual wavy boundary.

Cg4—35 to 45 inches; gray (5Y 6/1) silty clay; massive; very sticky, very plastic; many partly decomposed wood fragments; few pockets of dark humus; very strongly acid; gradual wavy boundary.

Cg5—45 to 62 inches; gray (5Y 6/1) silty clay; massive; very sticky, very plastic; common pockets of dark humus; few thin layers of sandy loam, sandy clay loam, and sandy clay; very strongly acid.

Range in Characteristics

Reaction: Extremely acid to strongly acid above a depth of 40 inches; strongly acid to mildly alkaline below a depth of 40 inches

A horizon:
Hue—neutral or 10YR to 5Y
Value—3 to 7
Chroma—0 to 2
Texture—silt loam, silty clay loam, silty clay, or clay or the mucky analogs of those textures

Cg horizon:
Hue—neutral or 10YR, 2.5Y, 5Y, 5GY, or 5G
Value—3 to 6
Chroma—0 to 2
Texture—dominantly clay or silty clay; horizon has thin strata of clay loam in some pedons; horizon has organic, sandy, loamy, or clayey layers at a depth of 40 inches below the mineral surface in some pedons; fragments of partly decomposed wood, logs, and buried stumps occur in many pedons

Mattaponi Series

Physiographic province: Southern Coastal Plain
Landform: Marine terraces
Parent material: Clayey marine sediments
Drainage class: Moderately well drained

Slowest permeability class: Moderately slow
Slope: 0 to 10 percent

Associated Soils

- Craven soils, which have more silt in the subsoil than the Mattaponi soils
- Emporia, Rumford, and Suffolk soils, which are well drained and have less clay in the subsoil than the Mattaponi soils
- Faceville soils, which are well drained and have a red subsoil
- Slagle soils, which have less clay in the subsoil than the Mattaponi soils

Taxonomic Classification

Fine, mixed, subactive, thermic Oxyaquic Hapludults

Typical Pedon

Mattaponi fine sandy loam, 2 to 6 percent slopes; 2.0 miles north of Helmet, 0.6 mile north on Highway VA-624 from its junction with Highway VA-635, about 0.25 mile northeast along farmland, 25 feet north of the farmland, in cropland:

Ap—0 to 8 inches; brown (10YR 5/3) fine sandy loam; weak medium granular structure; friable, slightly hard, slightly sticky, nonplastic; many fine and medium and few coarse roots; few fine and medium tubular pores; strongly acid; abrupt smooth boundary.

Bt1—8 to 18 inches; yellowish brown (10YR 5/8) clay loam; weak medium subangular blocky structure; friable, slightly hard, moderately sticky, slightly plastic; many fine and medium and few coarse roots; few fine and medium tubular pores; few faint clay films on all faces of peds; strongly acid; clear smooth boundary.

Bt2—18 to 29 inches; strong brown (7.5YR 5/6) clay; moderate fine platy structure; very firm, hard, slightly sticky, slightly plastic; many fine and medium and few coarse roots; few fine and medium tubular pores; few distinct continuous clay films on all faces of peds; common medium distinct pale brown (10YR 6/3) iron depletions and brownish yellow (10YR 6/8) masses of oxidized iron; very strongly acid; clear smooth boundary.

Bt3—29 to 36 inches; yellowish brown (10YR 5/8) clay; weak medium and moderate fine subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; few fine, medium, and coarse roots; few fine tubular pores; common distinct continuous clay films on all faces of peds; very strongly acid; clear smooth boundary.

Bt4—36 to 52 inches; yellowish brown (10YR 5/8) clay; moderate medium subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; few fine and medium roots; few fine tubular pores; common prominent continuous clay films on all faces of peds; few fine prominent light brownish gray (10YR 6/2) iron depletions and common fine prominent red (2.5YR 4/8) masses of oxidized iron; very strongly acid; gradual smooth boundary.

BC—52 to 62 inches; yellowish brown (10YR 5/8) clay; weak coarse subangular blocky structure; firm, slightly hard, slightly sticky, moderately plastic; few fine and medium roots; few fine tubular pores; few distinct clay films on all faces of peds; many medium and coarse prominent light brownish gray (10YR 6/2) iron depletions and many medium and coarse prominent red (2.5YR 4/8) masses of oxidized iron; very strongly acid.

Range in Characteristics

Solum thickness: 30 to 60 inches or more
Rock fragment content: 0 to 15 percent quartz gravel throughout the profile
Reaction: Very strongly acid or strongly acid, except in limed areas

Ap horizon:
Hue—5YR to 10YR
Value—3 to 7
Chroma—2 to 8
Texture—sandy loam, fine sandy loam, or loam

E horizon (if it occurs):
Hue—5YR to 10YR
Value—3 to 7
Chroma—2 to 8
Texture—sandy loam, fine sandy loam, or loam

Bt horizon:
Hue—7.5YR to 2.5Y
Value—4 to 8
Chroma—3 to 8
Texture—clay loam, sandy clay, or clay
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray

BC horizon:
Hue—7.5YR to 2.5Y
Value—4 to 8
Chroma—3 to 8
Texture—sandy clay loam, clay loam, sandy clay, or clay
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray

Munden Series

Physiographic province: Southern Coastal Plain
Landform: Stream terraces
Parent material: Loamy alluvial sediments
Drainage class: Moderately well drained
Slowest permeability class: Moderate
Slope: 0 to 6 percent

Associated Soils

- Augusta soils, which are somewhat poorly drained and have more clay in the subsoil than the Munden soils
- State soils, which are well drained and have more clay in the subsoil than the Munden soils
- Tarboro soils, which are somewhat excessively drained and have less clay in the profile than the Munden soils
- Tetotum soils, which have more clay in the subsoil than the Munden soils

Taxonomic Classification

Coarse-loamy, mixed, semiactive, thermic Aquic Hapludults

Typical Pedon

Munden loamy sand, 0 to 2 percent slopes; 0.5 mile east and 0.25 mile north of the junction of Highways VA-634 and VA-636, about 0.4 mile south of Highway VA-636, about 80 feet south of a farm entrance, in a cultivated field:

A—0 to 8 inches; dark grayish brown (10YR 4/2) loamy sand; weak fine granular structure; very friable; many fine roots; moderately acid; clear wavy boundary.

Bt1—8 to 16 inches; pale brown (10YR 6/3) sandy loam; weak medium subangular blocky structure; very friable; many fine roots; few faint clay films on all faces of peds; moderately acid; gradual wavy boundary.

Bt2—16 to 24 inches; light yellowish brown (10YR 6/4) sandy loam; moderate medium subangular blocky structure; very friable, slightly sticky, slightly plastic; few fine roots; few faint clay films on all faces of peds; common fine faint pale brown (10YR 6/3) iron depletions; strongly acid; gradual smooth boundary.

Bt3—24 to 33 inches; yellowish brown (10YR 5/4) sandy loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; common faint clay films on all faces of peds; common medium distinct pale brown (10YR 6/3) and common fine distinct light gray (10YR 7/2) iron depletions; strongly acid; gradual wavy boundary.

BC—33 to 42 inches; pale brown (10YR 6/3) loamy sand; weak medium subangular blocky structure; very friable, nonsticky, nonplastic; common fine distinct light gray (10YR 7/2) iron depletions; strongly acid; clear smooth boundary.

C—42 to 60 inches; pale brown (10YR 6/3) loamy sand; massive; very friable, nonsticky, nonplastic; common fine distinct yellowish brown (10YR 5/6) masses of oxidized iron and many coarse distinct light gray (10YR 7/2) iron depletions; strongly acid; gradual smooth boundary.

Cg—60 to 70 inches; light gray (10YR 7/2) sand; single grain; loose, nonsticky, nonplastic; common coarse faint very pale brown (10YR 7/3) masses of oxidized iron; 2 percent rounded quartz gravel; strongly acid.

Range in Characteristics

Solum thickness: 25 to 50 inches or more
Reaction: Very strongly acid to moderately acid, except in limed areas
Rock fragment content: 0 to 5 percent in the C horizon

Ap horizon or A horizon (if it occurs):
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 to 4
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

E horizon (if it occurs):
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—2 to 6
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

Bt horizon:
Hue—7.5YR to 2.5Y
Value—3 to 6
Chroma—4 to 8
Texture—sandy loam, fine sandy loam, or loam; subhorizons of sandy clay loam occur in some subhorizons
Redoximorphic features—iron masses in shades of brown, red, or yellow and iron depletions in shades of olive or gray

Btg horizon (if it occurs):
Hue—neutral or 7.5YR to 2.5Y
Value—3 to 6
Chroma—0 to 2
Texture—sandy loam, fine sandy loam, or loam; subhorizons of sandy clay loam occur in some pedons

Redoximorphic features—iron masses in shades of brown, red, or yellow and iron depletions in shades of olive or gray

BC horizon:
Hue—7.5YR to 5Y
Value—5 to 7
Chroma—3 to 8
Texture—loamy sand, sandy loam, fine sandy loam, or loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

BCg horizon (if it occurs):
Hue—neutral or 7.5YR to 2.5Y
Value—3 to 6
Chroma—0 to 2
Texture—loamy sand, sandy loam, fine sandy loam, or loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Cg horizon:
Hue—neutral or 7.5YR to 2.5Y
Value—5 to 7
Chroma—0 to 2
Texture—dominantly sand, loamy sand, loamy fine sand, sandy loam, or fine sandy loam; thin strata ranging from sandy clay loam to silty clay occur in some pedons
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Rappahannock Series

Physiographic province: Southern Coastal Plain
Landform: Tidal marshes
Parent material: Loamy and organic alluvial sediments
Drainage class: Very poorly drained
Slowest permeability class: Moderate
Slope: 0 to 1 percent

Associated Soils

- Bibb, Kinston, Tomotley, and Roanoke soils, which are poorly drained and do not have a thick organic surface horizon
- Levy soils, which do not have an organic surface layer more than 16 inches thick

Taxonomic Classification

Loamy, mixed, euic, thermic Terric Sulfisaprists

Typical Pedon

Rappahannock muck, 0 to 1 percent slopes, very frequently flooded; about 0.4 mile south of the junction of Highways VA-666 and VA-667 on Highway VA-667, about 100 feet west of Highway VA-667, in a tidal marsh:

Oe—0 to 12 inches; very dark grayish brown (10YR 3/2) muck; 20 percent rubbed fiber; massive; nonsticky; very fluid; many fine and medium roots; flows easily between fingers when squeezed; moderate sulfur odor; slightly alkaline; gradual wavy boundary.
Oa1—12 to 29 inches; very dark grayish brown (10YR 3/2) sapric material; 10 percent

rubbed fiber; massive; nonsticky; many fine roots; slightly alkaline; gradual wavy boundary.

Oa2—29 to 39 inches; very dark gray (10YR 3/1) sapric material; 5 percent rubbed fiber; massive; slightly sticky; many fine roots; moderately alkaline; gradual wavy boundary.

Cg—39 to 62 inches; very dark gray (10YR 3/1) sandy loam; 5 percent unrubbed fiber; massive; moderately sticky, slightly plastic; moderately fluid; few fine roots; flows easily between fingers when squeezed; strong sulfur odor; moderately alkaline.

Range in Characteristics

Reaction: Strongly acid to moderately alkaline

O horizon:
Hue—neutral or 10YR to 5Y
Value—2 or 3
Chroma—0 to 2
Texture—muck

Cg horizon:
Hue—neutral or 10YR to 5GY
Value—2 to 5
Chroma—0 to 2
Texture—loamy sand or sandy loam

Roanoke Series

Physiographic province: Southern Coastal Plain
Landform: Stream terraces
Parent material: Clayey alluvial sediments
Drainage class: Poorly drained
Slowest permeability class: Very slow
Slope: 0 to 2 percent

Associated Soils

- Augusta soils, which are somewhat poorly drained and have less clay in the subsoil than the Roanoke soils
- Bibb, Kinston, and Tomotley soils, which have less clay in the subsoil than the Roanoke soils
- Wahee soils, which are somewhat poorly drained

Taxonomic Classification

Fine, mixed, semiactive, thermic Typic Endoaquults

Typical Pedon

Roanoke loam, 0 to 2 percent slopes, rarely flooded; near Traveler's Rest, about 2.3 miles northwest on Highway VA-721 from Lawson School, 0.3 mile west of Highway VA-721, north of Chapel Creek, in woodland:

Ap—0 to 5 inches; very dark grayish brown (2.5Y 3/2) loam; weak fine granular structure; very friable, slightly sticky, slightly plastic; many fine and medium and common coarse roots; strongly acid; clear smooth boundary.

Btg1—5 to 10 inches; dark grayish brown (2.5Y 4/2) clay loam; moderate medium subangular blocky structure; friable, moderately sticky, slightly plastic; common fine and medium and few coarse roots; common faint clay films on all faces of peds; few fine faint grayish brown (2.5Y 5/2) iron depletions and common medium distinct brownish yellow (10YR 6/8) masses of oxidized iron; strongly acid; gradual wavy boundary.

Btg2—10 to 30 inches; grayish brown (2.5Y 5/2) clay; moderate medium subangular blocky structure; friable, moderately sticky, moderately plastic; common fine and few medium and coarse roots; many faint clay films on all faces of peds; few coarse distinct brownish yellow (10YR 6/8) masses of oxidized iron; strongly acid; gradual wavy boundary.

Btg3—30 to 36 inches; light brownish gray (2.5Y 6/2) clay; moderate coarse subangular blocky structure; friable, moderately sticky, moderately plastic; few fine and medium roots; common faint clay films on all faces of peds; very strongly acid; gradual wavy boundary.

BCg—36 to 42 inches; light brownish gray (2.5Y 6/2) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common clay lenses; few faint clay films on all faces of peds; common medium distinct brownish yellow (10YR 6/8) masses of oxidized iron; very strongly acid; gradual smooth boundary.

Cg—42 to 62 inches; light brownish gray (2.5Y 6/2) stratified loamy sand, sandy loam, and clay loam; massive; very friable; common clay lenses in coarse strata; common medium distinct brownish yellow (10YR 6/8) masses of oxidized iron; very strongly acid.

Range in Characteristics

Solum thickness: 40 to 60 inches

Reaction: Extremely acid to strongly acid in the A, E, and B horizons, except in limed areas; extremely acid to slightly acid in the C horizon

Ap horizon:

Hue—10YR to 5Y
Value—2 to 6
Chroma—0 to 2
Texture—fine sandy loam, loam, or silt loam

Eg horizon (if it occurs):

Hue—neutral or 10YR to 5Y
Value—4 to 7
Chroma—0 to 2
Texture—fine sandy loam, loam, or silt loam

BAg or BEg horizon (if it occurs):

Hue—neutral or 10YR to 5Y
Value—4 to 7
Chroma—0 to 2
Texture—loam, silt loam, clay loam, or silty clay loam

Btg horizon:

Hue—neutral or 10YR to 5Y
Value—4 to 7
Chroma—0 to 2
Texture—clay loam, silty clay loam, clay, or silty clay
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

BCg horizon:

Hue—neutral or 10YR to 5Y
Value—4 to 7
Chroma—0 to 2
Texture—sandy clay loam, clay loam, or silty clay loam

Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Cg horizon:
Hue—neutral or 10YR to 5Y
Value—5 to 7
Chroma—0 to 2
Texture—sand to clay; commonly stratified
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Rumford Series

Physiographic province: Southern Coastal Plain
Landform: Marine terraces
Parent material: Loamy marine sediments
Drainage class: Well drained
Slowest permeability class: Moderately rapid
Slope: 0 to 50 percent

Associated Soils

- Craven, Mattaponi, and Slagle soils, which are moderately well drained and have more clay in the subsoil than the Rumford soils
- Emporia and Suffolk soils, which have more clay in the subsoil than the Rumford soils

Taxonomic Classification

Coarse-loamy, siliceous, subactive, thermic Typic Hapludults

Typical Pedon

Rumford loamy sand, 0 to 6 percent slopes; about 1.4 miles north on Highway VA-72 from St. Stephens Church, 100 feet east of Highway VA-721 on a farm lane, 50 feet south of the farm lane, in cropland:

Ap—0 to 7 inches; brown (10YR 4/3) loamy sand; weak fine granular structure; very friable, nonsticky, nonplastic; many fine and medium roots; many fine vesicular pores; strongly acid; abrupt smooth boundary.
E—7 to 14 inches; light yellowish brown (10YR 6/4) loamy sand; weak fine granular structure; very friable, nonsticky, nonplastic; many fine and medium roots; common fine vesicular pores; strongly acid; clear wavy boundary.
Bt1—14 to 24 inches; dark yellowish brown (10YR 4/6) sandy loam; weak medium subangular blocky structure; very friable, nonsticky, nonplastic; many fine and medium roots; common fine vesicular pores; few faint clay bridging between sand grains; strongly acid; clear wavy boundary.
Bt2—24 to 38 inches; yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; friable, nonsticky, nonplastic; many very fine and fine roots; common fine vesicular pores; few faint clay bridging between sand grains; strongly acid; clear wavy boundary.
BC—38 to 55 inches; yellowish brown (10YR 5/6) loamy sand; weak medium subangular blocky structure; very friable, nonsticky, nonplastic; few fine roots; common medium (0.5 to 1 cm thick) faint dark yellowish brown (10YR 4/6) lamellae and white (10YR 8/2) vertical sand lenses; few fine vesicular pores; few faint clay bridging between sand grains; moderately acid; clear wavy boundary.
C1—55 to 84 inches; brownish yellow (10YR 6/8) sand; single grain; loose; few fine

roots; many coarse prominent white (10YR 8/2) lenses of uncoated coarse sand grains; moderately acid; gradual wavy boundary.

C2—84 to 95 inches; yellowish brown (10YR 5/6) sandy loam; single grain; loose; few coarse prominent white (10YR 8/2) lenses of uncoated coarse sand grains; moderately acid; gradual wavy boundary.

C3—95 to 99 inches; brownish yellow (10YR 6/6) loamy sand; single grain; loose; few coarse distinct white (10YR 8/2) lenses of uncoated coarse sand grains; moderately acid.

Range in Characteristics

Reaction: Extremely acid to strongly acid in the A and E horizons, except in limed areas; extremely acid to moderately acid in the B horizon; extremely acid to slightly acid in the C horizon

Ap horizon:
Hue—10YR
Value—3 to 6
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

E horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—3 or 4
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

BE horizon (if it occurs):
Hue—5YR to 2.5Y
Value—4 or 5
Chroma—4 to 8
Texture—loamy sand, sandy loam, or fine sandy loam

Bt horizon:
Hue—5YR to 2.5Y
Value—4 or 5
Chroma—4 to 8
Texture—sandy loam, fine sandy loam, or sandy clay loam

BC horizon:
Hue—5YR to 2.5Y
Value—4 or 5
Chroma—4 to 8
Texture—loamy sand, sandy loam, or fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 8
Chroma—2 to 8
Texture—dominantly sand to fine sandy loam; thin strata of sandy clay loam occur in some pedons; commonly stratified

Slagle Series

Physiographic province: Southern Coastal Plain
Landform: Marine terraces
Parent material: Loamy marine sediments
Drainage class: Moderately well drained

Slowest permeability class: Very slow
Slope: 0 to 25 percent

Associated Soils

- Craven and Mattaponi soils, which have more clay in the subsoil than the Slagle soils
- Rumford soils, which are well drained and have less clay in the subsoil than the Slagle soils
- Emporia soils, which are well drained
- Faceville soils, which are well drained and have more clay in the subsoil than the Slagle soils
- Suffolk soils, which are well drained and have coarse substrata within a depth of 50 inches

Taxonomic Classification

Fine-loamy, siliceous, subactive, thermic Aquic Hapludults

Typical Pedon

Slagle sandy loam, 0 to 2 percent slopes; near Dragonville, 3.3 miles northeast on Highway VA-614 from the junction of Highways VA-614 and VA-616, about 0.4 mile east on a field road, 200 feet south of the field road, in cropland:

Ap—0 to 8 inches; yellowish brown (10YR 5/4) sandy loam; weak fine granular structure; very friable, nonsticky, nonplastic; common fine and few medium roots; strongly acid; abrupt smooth boundary.

Bt1—8 to 18 inches; yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; few faint clay films on all faces of peds; strongly acid; gradual wavy boundary.

Bt2—18 to 32 inches; brownish yellow (10YR 6/6) sandy loam; weak medium subangular blocky structure; very friable, slightly sticky, slightly plastic; 5 percent fragic properties; few distinct clay films on all faces of peds; common medium distinct very pale brown (10YR 8/2) iron depletions; strongly acid; gradual wavy boundary.

Bt3—32 to 46 inches; yellowish brown (10YR 5/8) sandy clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; 5 percent fragic properties; few distinct clay films on all faces of peds; common fine distinct white (10YR 8/1) iron depletions and yellowish red (5YR 5/8) masses of oxidized iron; strongly acid; gradual wavy boundary.

Bt4—46 to 56 inches; yellowish brown (10YR 5/8) sandy clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; few distinct clay films on all faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of oxidized iron and very pale brown (10YR 8/3) iron depletions; strongly acid; gradual wavy boundary.

BC—56 to 62 inches; brownish yellow (10YR 6/8) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few distinct clay films on all faces of peds; common medium prominent red (2.5YR 4/8) masses of oxidized iron and common fine prominent very pale brown (10YR 8/3) iron depletions; strongly acid.

Range in Characteristics

Rock fragment content: 0 to 5 percent in the A, E, and B horizons; 0 to 15 percent in the C horizon
Reaction: Extremely acid to strongly acid, except in limed areas

Ap horizon:
Hue—10YR or 2.5Y
Value—2 to 6
Chroma—1 to 4
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam, or silt loam

E horizon (if it occurs):
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 or 4
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam, or silt loam

BA or BE horizon (if it occurs):
Hue—5YR to 2.5Y
Value—4 or 5
Chroma—4 to 8
Texture—loamy sand, sandy loam, or fine sandy loam

Bt horizon (upper part):
Hue—7.5YR to 2.5Y
Value—5 or 6
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, or sandy clay loam
Redoximorphic features—iron masses in shades of brown, red, or yellow

Bt horizon (lower part):
Hue—7.5YR to 5Y
Value—4 to 7
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, or sandy clay loam
Redoximorphic features—iron masses in shades of brown, red, or yellow and iron depletions in shades of olive or gray

BC horizon:
Hue—5YR to 2.5Y
Value—4 or 5
Chroma—4 to 8
Texture—sandy loam, fine sandy loam, sandy clay loam, or clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

C horizon (if it occurs):
Hue—10YR or 2.5Y
Value—5 to 8
Chroma—2 to 8
Texture—loamy sand to clay; typically stratified
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

State Series

Physiographic province: Southern Coastal Plain
Landform: Stream terraces
Parent material: Loamy alluvial sediments
Drainage class: Well drained

Slowest permeability class: Moderate
Slope: 0 to 6 percent

Associated Soils

- Bojac soils, which have less clay in the subsoil than the State soils
- Craven soils, which are moderately well drained and have more clay in the subsoil than the State soils
- Munden soils, which are moderately well drained and have less clay in the subsoil than the State soils
- Tetotum soils, which are moderately well drained
- Tarboro soils, which are somewhat excessively drained and have less clay than the State soils

Taxonomic Classification

Fine-loamy, mixed, semiactive, thermic Typic Hapludults

Typical Pedon

State fine sandy loam, 0 to 2 percent slopes; 0.6 mile south on Highway VA-633 from its junction with Highway VA-620, about 700 feet northeast along a field road, 525 feet north of the field road, in cropland:

Ap—0 to 8 inches; brown (10YR 5/3) fine sandy loam; weak fine granular structure; very friable, nonsticky, nonplastic; many very fine and fine and few medium and coarse roots; few fine tubular pores; strongly acid; abrupt smooth boundary.

E—8 to 17 inches; light yellowish brown (10YR 6/4) fine sandy loam; moderate fine platy structure; friable, nonsticky, nonplastic; common very fine and fine roots; hard and compact in place; few fine vesicular pores; strongly acid; clear wavy boundary.

Bt1—17 to 28 inches; yellowish brown (10YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; few fine tubular and vesicular pores; common distinct discontinuous clay films on all faces of peds; common fine mica flakes; very strongly acid; clear smooth boundary.

Bt2—28 to 36 inches; yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; very friable, nonsticky, slightly plastic; few very fine and fine roots; few fine tubular pores; few faint discontinuous clay films on all faces of peds; common fine mica flakes; very strongly acid; clear smooth boundary.

C1—36 to 46 inches; yellowish brown (10YR 5/8) loamy fine sand; weak fine granular structure; very friable, slightly sticky, nonplastic; few very fine and fine roots; few fine tubular pores; common fine mica flakes; very strongly acid; clear smooth boundary.

C2—46 to 56 inches; brownish yellow (10YR 6/6) and very pale brown (10YR 7/3) loamy sand; weak fine granular structure; very friable, nonsticky, nonplastic; few fine prominent (7.5YR 5/8) lamellae; few fine and medium mica flakes; very strongly acid; clear smooth boundary.

C3—56 to 62 inches; very pale brown (10YR 7/3) and olive yellow (2.5Y 6/6) loamy fine sand; single grain; loose; very strongly acid.

Range in Characteristics

Solum thickness: 30 to 60 inches or more
Rock fragment content: 0 to 2 percent in the A, E, and B horizons; 0 to 15 percent in the C horizon
Reaction: Extremely acid to strongly acid in the A, E, and B horizons, except in limed areas; extremely acid to slightly acid in the C horizon

Ap horizon:
Hue—7.5YR to 2.5Y
Value—3 to 6
Chroma—2 to 6
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam, or silt loam

E horizon:
Hue—7.5YR to 2.5Y
Value—5 to 7
Chroma—3 to 8
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam, or silt loam

BE horizon (if it occurs):
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy loam, fine sandy loam, loam, silt loam, or sandy clay loam

Bt horizon (upper part):
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy loam, loam, silt loam, sandy clay loam, or clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red

Bt horizon (lower part):
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Texture—sandy loam, loam, silt loam, sandy clay loam, or clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray

BC horizon (if it occurs):
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Texture—sandy loam, fine sandy loam, loam, or sandy clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray

C horizon:
Hue—7.5YR to 2.5Y
Value—4 to 7
Chroma—2 to 8
Texture—sand, loamy sand, loamy fine sand, or sandy loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of gray

Suffolk Series

Physiographic province: Southern Coastal Plain
Landform: Marine terraces
Parent material: Loamy marine sediments
Drainage class: Well drained

Slowest permeability class: Moderate
Slope: 0 to 10 percent

Associated Soils

- Emporia soils, which have more clay in the lower part of the subsoil and in the substratum than the Suffolk soils
- Faceville soils, which have more clay in the subsoil than the Suffolk soils
- Mattaponi soils, which are moderately well drained and have more clay in the subsoil than the Suffolk soils
- Rumford soils, which have less clay in the subsoil than the Suffolk soils
- Slagle soils, which are moderately well drained

Taxonomic Classification

Fine-loamy, siliceous, semiactive, thermic Typic Hapludults

Typical Pedon

Suffolk sandy loam, 0 to 2 percent slopes; about 1.4 miles north on Highway VA-721 from St. Stephens Church, 0.6 mile northeast along a farm lane, 210 feet northeast of the farm lane, in cropland:

Ap—0 to 8 inches; brown (10YR 4/3) sandy loam; weak fine granular structure; very friable; many fine and medium roots; common fine vesicular pores; moderately acid; abrupt smooth boundary.

E—8 to 16 inches; yellowish brown (10YR 5/4) sandy loam; moderate medium granular structure; very friable; few very fine and medium roots; common very fine vesicular pores; moderately acid; clear smooth boundary.

BE—16 to 21 inches; yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; very friable; few very fine and medium roots; few very fine and fine vesicular pores; moderately acid; clear smooth boundary.

Bt1—21 to 28 inches; dark yellowish brown (10YR 4/6) sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; common fine tubular pores; few distinct clay films on all faces of peds; partially decomposed tree roots 1 inch in diameter; moderately acid; clear smooth boundary.

Bt2—28 to 37 inches; strong brown (7.5YR 4/6) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common fine tubular pores; common distinct clay films on all faces of peds; moderately acid; abrupt smooth boundary.

BC—37 to 43 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; very friable, slightly sticky, slightly plastic; few fine roots; few fine vesicular pores; few distinct clay films on all faces of peds; moderately acid; abrupt smooth boundary.

C1—43 to 59 inches; yellowish brown (10YR 5/8) loamy sand; weak medium granular structure; very friable, nonsticky, nonplastic; few fine roots; many fine distinct white (10YR 8/2) sand lenses along root channels; few fine vesicular pores; moderately acid; gradual smooth boundary.

C2—59 to 65 inches; very pale brown (10YR 8/2), brownish yellow (10YR 6/6), and yellowish brown (10YR 5/8) sand; single grain; loose; moderately acid.

Range in Characteristics

Solum thickness: 30 to 50 inches
Rock fragment content: 0 to 5 percent in the A, E, and B horizons; 0 to 10 percent in the C horizon
Reaction: Extremely acid to moderately acid, except in limed areas

Ap horizon:
Hue—7.5YR to 2.5Y
Value—3 to 6
Chroma—1 to 4
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

E horizon:
Hue—7.5YR to 2.5Y
Value—5 to 7
Chroma—3 to 6
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

BE horizon:
Hue—7.5YR to 2.5Y
Value—5 to 7
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, or loam

Bt horizon:
Hue—7.5YR to 10YR; some pedons have a subhorizon with hue of 5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Texture—sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam

BC horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 8
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

C horizon:
Hue—7.5YR to 2.5Y
Value—5 to 7
Chroma—2 to 8
Texture—dominantly sand, fine sand, loamy sand, or loamy fine sand; thin substrata of sandy loam occur in some pedons

Tarboro Series

Physiographic province: Southern Coastal Plain
Landform: Stream terraces
Parent material: Sandy alluvial sediments
Drainage class: Somewhat excessively drained
Slowest permeability class: Rapid
Slope: 0 to 6 percent

Associated Soils

- Augusta soils, which are somewhat poorly drained and have more clay in the subsoil than the Tarboro soils
- Bojac soils, which are well drained and have more clay in the subsoil than the Tarboro soils
- Munden and Tetotum soils, which are moderately well drained and have more clay in the subsoil than the Tarboro soils

Taxonomic Classification

Mixed, thermic Typic Udipsamments

Typical Pedon

Tarboro sand, 0 to 6 percent slopes, rarely flooded; 0.8 mile south of the junction of Highways VA-639 and VA-628 on Highway VA-628, about 150 feet west of Highway VA-628, in cropland:

Ap—0 to 7 inches; brown (10YR 4/3) sand; single grain; loose; common fine and medium roots; moderately acid; abrupt smooth boundary.
C1—7 to 22 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few fine and medium roots; moderately acid; gradual wavy boundary.
C2—22 to 32 inches; yellowish brown (10YR 5/6) sand; single grain; loose; 10 percent rounded quartz gravel; strongly acid; gradual wavy boundary.
C3—32 to 48 inches; yellowish brown (10YR 5/6) and reddish yellow (7.5YR 6/6) sand; single grain; loose; common reddish yellow (7.5YR 6/6) coatings on sand grains; strongly acid; gradual wavy boundary.
C4—48 to 58 inches; brownish yellow (10YR 6/6) and reddish yellow (7.5YR 6/6) sand; single grain; loose; strongly acid; gradual wavy boundary.
C5—58 to 62 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few reddish yellow (7.5YR 6/6) lamellae; some stratified fine gravel; strongly acid.

Range in Characteristics

Sandy material thickness: 80 inches or more
Reaction: Strongly acid to slightly acid

Ap horizon:
Hue—10YR or 2.5Y
Value—3 to 8
Chroma—2 to 6
Texture—sand, loamy sand, or loamy fine sand

C horizon:
Hue—7.5YR to 2.5Y
Value—4 to 7
Chroma—3 to 8
Texture—sand, loamy sand, or loamy fine sand

Tetotum Series

Physiographic province: Southern Coastal Plain
Landform: Stream terraces
Parent material: Loamy alluvial sediments
Drainage class: Moderately well drained
Slowest permeability class: Moderate
Slope: 0 to 10 percent

Associated Soils

- Augusta soils, which are somewhat poorly drained
- Wahee soils, which are somewhat poorly drained and have more clay in the subsoil than the Tetotum soils
- State soils, which are well drained
- Bojac soils, which are well drained and have less clay in the subsoil than the Tetotum soils
- Munden soils, which have less clay in the subsoil than the Tetotum soils
- Tarboro soils, which are somewhat excessively drained and have less clay than the Tetotum soils

Taxonomic Classification

Fine-loamy, mixed, semiactive, thermic Aquic Hapludults

Typical Pedon

Tetotum fine sandy loam, 0 to 2 percent slopes, rarely flooded; about 0.5 mile east of the Lord Delaware Bridge on Highway VA-33, about 0.4 mile north on a farm lane to a farmhouse, 0.3 mile east on a field road, in cropland:

Ap—0 to 8 inches; brown (10YR 4/3) fine sandy loam; weak medium granular structure; very friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; strongly acid; abrupt smooth boundary.

E—8 to 12 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak medium granular structure; very friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; strongly acid; gradual wavy boundary.

Bt1—12 to 18 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable, moderately sticky, moderately plastic; common fine and medium roots; few distinct clay films on all faces of peds; common medium faint light yellowish brown (10YR 6/4) and common fine distinct strong brown (7.5YR 5/8) masses of oxidized iron; strongly acid; gradual wavy boundary.

Bt2—18 to 25 inches; yellowish brown (10YR 5/8) loam; moderate medium subangular blocky structure; friable, moderately sticky, moderately plastic; few fine and medium roots; few distinct clay films on all faces of peds; common fine distinct strong brown (7.5YR 5/8) masses of oxidized iron; strongly acid; gradual wavy boundary.

Bt3—25 to 32 inches; yellowish brown (10YR 5/8) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few faint clay films on all faces of peds; common medium distinct light yellowish brown (10YR 6/4) masses of oxidized iron and light brownish gray (2.5Y 6/2) iron depletions; strongly acid; gradual wavy boundary.

BC—32 to 49 inches; yellowish brown (10YR 5/8), light yellowish brown (10YR 6/4), and light brownish gray (2.5Y 6/2) sandy loam; weak medium subangular blocky structure; very friable, slightly sticky, slightly plastic; few faint clay films on all faces of peds; strongly acid; gradual wavy boundary.

C1—49 to 56 inches; yellow (10YR 7/6) and yellowish brown (10YR 5/8) sand; single grain; loose; strongly acid; gradual wavy boundary.

C2—56 to 62 inches; yellowish brown (10YR 5/8) and yellow (10YR 7/6) sand; single grain; loose; strongly acid.

Range in Characteristics

Solum thickness: 40 to 60 inches or more
Reaction: Extremely acid to strongly acid, except in limed areas

Ap horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, loam, or silt loam

E horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, loam, or silt loam

BE horizon (if it occurs):
Hue—10YR or 2.5Y

Value—4 to 7
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, loam, silt loam, or sandy clay loam

Bt horizon (upper part):
Hue—7.5YR to 2.5Y
Value—4 to 7
Chroma—4 to 8
Texture—loam or clay loam; subhorizons of silt loam, sandy clay loam, or silty clay loam occur in some pedons
Redoximorphic features—iron masses in shades of brown, red, or yellow

Bt horizon (lower part):
Hue—7.5YR to 5Y
Value—5 to 7
Chroma—3 to 8
Texture—loam or clay loam; subhorizons of silt loam, sandy clay loam, or silty clay loam occur in some pedons
Redoximorphic features—iron masses in shades of brown, red, or yellow and iron depletions in shades of olive or gray

BC horizon:
Hue—7.5YR to 5Y
Value—5 to 7
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, loam, or sandy clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

BCg horizon (if it occurs):
Hue—7.5YR to 5Y
Value—5 to 7
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, loam, or sandy clay loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

C horizon:
Hue—7.5YR to 5Y
Value—5 to 7
Chroma—3 to 8
Texture—commonly stratified sand, loamy sand, sandy loam, or fine sandy loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Tomotley Series

Physiographic province: Southern Coastal Plain
Landform: Stream terraces
Parent material: Loamy alluvial sediments
Drainage class: Poorly drained
Slowest permeability class: Moderately slow
Slope: 0 to 2 percent

Associated Soils

- Augusta soils, which are somewhat poorly drained

- Wahee soils, which are somewhat poorly drained and have more clay in the subsoil than the Tomotley soils
- Bibb and Kinston soils, which do not have developed subsoils
- Levy and Rappahannock soils, which are very poorly drained and have more clay in the subsoil than the Tomotley soils

Taxonomic Classification

Fine-loamy, mixed, semiactive, thermic Typic Endoaquults

Typical Pedon

Tomotley fine sandy loam, 0 to 2 percent slopes, rarely flooded; about 0.1 mile north on Highway VA-617 from the junction of Highways VA-614 and VA-617, about 75 feet northeast of Highway VA-617, in woodland:

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; very friable, slightly sticky, slightly plastic; many fine and medium and common coarse roots; common fine and medium tubular pores; few medium faint brown (10YR 5/3) masses of oxidized iron; strongly acid; clear smooth boundary.

BEg—5 to 11 inches; grayish brown (10YR 5/2) loam; moderate fine subangular blocky structure; very friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; common fine and medium and few coarse tubular pores; common medium distinct yellowish brown (10YR 5/4) masses of oxidized iron; strongly acid; clear smooth boundary.

Btg1—11 to 19 inches; gray (10YR 5/1) sandy loam; moderate medium subangular blocky structure; firm, moderately sticky, moderately plastic; common fine and few medium roots; common fine and medium tubular pores; common distinct clay films on all faces of peds; common medium prominent yellowish brown (10YR 5/6) masses of oxidized iron; strongly acid; gradual smooth boundary.

Btg2—19 to 33 inches; gray (10YR 6/1) sandy clay loam; weak medium subangular blocky structure; firm, moderately sticky, moderately plastic; few fine and medium roots; common fine and medium tubular pores; common distinct clay films on all faces of peds; few fine prominent strong brown (7.5YR 4/6) and common medium prominent yellowish brown (10YR 5/6) masses of oxidized iron; strongly acid; gradual smooth boundary.

BCg—33 to 45 inches; light brownish gray (2.5Y 6/2) sandy clay loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few faint clay films on all faces of peds; few medium distinct dark yellowish brown (10YR 4/4) masses of oxidized iron; 3 percent rounded quartz gravel; very strongly acid; gradual smooth boundary.

Cg—45 to 62 inches; gray (10YR 6/1) sandy loam; massive; common medium prominent yellowish brown (10YR 5/4) masses of oxidized iron; 5 percent rounded quartz gravel; very strongly acid.

Range in Characteristics

Solum thickness: 30 to 60 inches or more
Rock fragment content: 0 to 5 percent throughout the profile
Reaction: Extremely acid to strongly acid in the A, E, and B horizons, except in limed areas; extremely acid to moderately acid in the BC and C horizons

A horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—1 or 2
Texture—loamy sand, sandy loam, fine sandy loam, loam, or silt loam

Eg horizon (if it occurs):
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—1 or 2
Texture—loamy sand, sandy loam, fine sandy loam, loam, or silt loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

BEg horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, loam, or silt loam
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Btg horizon:
Hue—neutral or 10YR to 5Y
Value—4 to 7
Chroma—0 to 2
Texture—sandy loam, fine sandy loam, loam, or sandy clay loam; horizon is silt loam or silty clay loam in some pedons; horizon is sandy clay or clay below a depth of 40 inches in some pedons
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

BCg horizon:
Hue—neutral or 10YR to 5Y
Value—4 to 8
Chroma—0 to 2
Texture—fine sandy loam, sandy loam, loam, clay loam, sandy clay loam, silt loam, or sandy clay; horizon commonly has thin strata or pockets of contrasting textures
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Cg horizon:
Hue—neutral or 10YR to 5Y
Value—4 to 8
Chroma—0 to 2
Texture—dominantly sandy loam, fine sandy loam, sandy clay loam, or clay loam; commonly stratified and ranging from sand to clay
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Wahee Series

Physiographic province: Southern Coastal Plain
Landform: Stream terraces
Parent material: Clayey alluvial sediments
Drainage class: Somewhat poorly drained
Slowest permeability class: Slow
Slope: 0 to 2 percent

Associated Soils

- Augusta soils, which have less clay in the subsoil than the Wahee soils

- Craven soils, which are moderately well drained
- Roanoke soils, which are poorly drained
- Tetotum soils, which are moderately well drained and have less clay in the subsoil than the Wahee soils
- Tomotley soils, which are poorly drained and have less clay in the subsoil than the Wahee soils

Taxonomic Classification

Fine, mixed, semiactive, thermic Aeric Endoaquults

Typical Pedon

Wahee fine sandy loam, 0 to 2 percent slopes, rarely flooded; near King and Queen Court House fire station, 375 feet southwest of the junction of Highways VA-14 and VA-617 on Highway VA-14, about 300 feet southwest of Highway VA-14, just east of a power line, in cropland:

Ap—0 to 5 inches; dark brown (10YR 3/3) fine sandy loam; weak fine granular structure; very friable, slightly sticky, slightly plastic; common fine and medium roots; moderately acid; abrupt smooth boundary.

E—5 to 11 inches; pale brown (10YR 6/3) sandy loam; weak fine granular structure; very friable, slightly sticky, slightly plastic; common fine and medium roots; few fine vesicular pores; common medium faint grayish brown (10YR 5/2) iron depletions; moderately acid; abrupt smooth boundary.

Btg1—11 to 19 inches; light brownish gray (10YR 6/2) clay; moderate medium subangular blocky structure; friable, moderately sticky, moderately plastic; common fine and few medium roots; many faint clay films on all faces of peds; common fine distinct brownish yellow (10YR 6/6) masses of oxidized iron; strongly acid; clear wavy boundary.

Btg2—19 to 38 inches; light brownish gray (10YR 6/2) clay; moderate medium subangular blocky structure; friable, moderately sticky, moderately plastic; few fine and medium roots; common faint clay films on all faces of peds; strongly acid; gradual wavy boundary.

Cg1—38 to 48 inches; grayish brown (2.5Y 5/2) loamy sand; massive; friable; few fine lenses of sandy clay; very strongly acid; gradual wavy boundary.

Cg2—48 to 62 inches; grayish brown (2.5Y 5/2) loamy coarse sand; single grain; loose; very strongly acid.

Range in Characteristics

Solum thickness: 30 to 60 inches or more
Reaction: Very strongly acid to moderately acid in the A and E horizons, except in limed areas; extremely acid to strongly acid in the B, BC, and C horizons

Ap horizon:
Hue—neutral or 10YR or 2.5Y
Value—2 to 5
Chroma—0 to 3
Texture—sandy loam, fine sandy loam, loam, or silt loam

E horizon:
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, loam, or silt loam

Bt horizon (if it occurs):
Hue—10YR or 2.5Y

Value—5 to 7
Chroma—3 to 8
Texture—sandy clay loam, clay loam, sandy clay, clay, or silty clay

Btg horizon:
Hue—neutral or 10YR to 5Y
Value—4 to 7
Chroma—0 to 2
Texture—clay loam, sandy clay, clay, or silty clay
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

BCg horizon (if it occurs):
Hue—neutral or 10YR to 5Y
Value—4 to 7
Chroma—0 to 2
Texture—fine sandy loam, sandy clay loam, clay loam, silty clay loam, or sandy clay
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Cg horizon:
Hue—neutral or 10YR to 5Y
Value—5 to 7
Chroma—0 to 2
Texture—sand to clay; commonly stratified
Redoximorphic features—iron masses in shades of brown, yellow, or red and iron depletions in shades of olive or gray

Formation of the Soils

In this section the factors and processes that have affected the formation and morphology of the soils in King and Queen County are described.

Factors of Soil Formation

The characteristics of the soil at any given point depend upon the interaction of five soil-forming factors—parent material, climate, plants and animals, relief, and time *(7)*.

Climate, plants, and animals are the active forces of soil formation. They act on the parent material that has accumulated through the deposition of sediments and slowly change it into soil. Although all of the soil-forming factors affect the formation of every soil, the relative importance of each factor differs from place to place. In extreme cases one factor may dominate the formation of a soil and fix most of its properties. In general, however, the combined action of the five factors affect the character of each soil.

Parent Material

The unconsolidated mass from which a soil forms is the parent material. It is largely responsible for the chemical and mineralogical composition of the soil and the rate at which soil-forming processes take place.

The parent materials in King and Queen County are alluvial and have been transported and deposited by marine and fluvial action. Episodes of deposition have occurred at different geologic times, and sediments have combined from different sources. These different episodes have resulted in three distinct areas of soils in the survey area. The largest and oldest area consists of uplands at the highest elevations in the county. The loamy Emporia, Rumford, Slagle, and Suffolk soils formed in sediments in this area.

The second area consists of fluvial terraces along the rivers and streams. These terraces are at the lower elevations in the county. The loamy Bojac, Munden, State, and Tetotum soils and areas of the clayey Roanoke soils formed in the sediments of these terraces.

The third area consists of flood plains and marshes along the major rivers and streams. Bibb and Kinston soils formed in sediments on flood plains. Levy and Rappahannock soils are the dominant soils in marshes and swamps. These soils on flood plains and in marshes vary considerably in texture, have little soil development, and are continuously wet or flooded.

Climate

Climate affects the physical, chemical, and biological relationships in soils, principally through the influence of precipitation and temperature. Water dissolves minerals, supports biological activity, and transports mineral and organic residue through the solum. Temperature determines the type and rate of physical, chemical, and biological activities.

Precipitation causes the downward leaching of lime, free carbonates, and other soluble minerals from upland soils, such as Emporia, Rumford, and Suffolk soils. Water percolating through the soil also moves clay from the surface layer to the subsoil. Soils in King and Queen County typically have more clay in the subsoil than in the surface layer. Exceptions are soils that formed in recent alluvium, in sand, or on very steep slopes. Alluvial areas are recharged with sediments from the surrounding eroded uplands. Examples of soils in such areas are Bibb, Kinston, and Levy.

Climate also influences the formation of blocky structure in the subsoil of well developed soils. The development of peds (aggregates) in the subsoil is caused partly by changes in volume of the soil mass that are primarily the result of alternating periods of wetting and drying.

Plant and Animal Life

Micro-organisms, vegetation, animals, and humans are major factors in the formation of soils. Vegetation is generally responsible for the amount of organic matter and nutrients and the color of the surface layer. Earthworms, cicada, and burrowing animals help to keep the soil open and porous. Micro-organisms decompose the vegetation and dead animal matter, thus releasing nutrients for plant food. Humans have changed the soil by mixing the upper layers.

Before human settlement, native vegetation, mainly oaks, hickories, and pines, was the major living organism affecting soil development. Most hardwoods use a large amount of the available calcium and other bases and constantly recycle them through leaf fall and decay. This process has prevented the soils in the survey area from becoming as leached as they would have been under a coniferous forest cover. In addition, since the soils form under forest vegetation, rapid decay of organic matter and constant recycling of nutrients have prevented organic matter accumulation in large quantities. The climate favors rapid decay of plant materials, oxidation of organic matter, and leaching of nutrients.

Humans have influenced soil development by clearing forests, cultivating crops, introducing new plants, and changing natural drainage. The most important changes caused by humans are the mixing of the upper layers of the soils to form a plow layer, the accelerated erosion caused by the cultivation of steep slopes, and changes in soil fertility from applications of lime and fertilizer.

Relief

The underlying geologic formations, the geologic history of the general region, and the effects of dissection by rivers and streams largely determine the relief of an area. Relief, or topography, affects the formation of soils by influencing the quantity of infiltrating water, the rate of surface water runoff, the rate of drainage in the soil, the soil temperature, and the rate of geologic erosion. Relief can alter the effects of climate on the parent material to the extent that several different kinds of soils may form from the same kind of parent material. Relief also affects the amount of radiant energy absorbed by the soils, which in turn affects the type of native vegetation on the soils.

Relief in the survey area ranges from nearly level to very steep. The nearly level soils are common on upland flats, on flood plains of streams, on terraces, and in marshes. Most of the nearly level soils are often wet because of frequent flooding or a seasonal high water table, and the surface water runoff is usually slow. These soils typically have a subsoil or substratum that is gray or mottled gray, and they are somewhat poorly drained or poorly drained. Roanoke and Levy soils are examples of these soils.

The gently sloping to very steep soils generally are well drained or moderately well drained. On the gently sloping and sloping soils, geologic erosion is slight, surface water runoff is medium or rapid, and water infiltration is optimum. The translocation of bases and clay has usually occurred downward through the soil. The soils in such areas are mature and have well defined horizons. Craven and Emporia soils are examples of these soils. In the steeper areas, surface runoff is very rapid, water infiltration and the translocation of clay and bases through the soil are reduced, and the erosion hazard is severe. Soils that formed in these areas have weakly expressed horizons.

In upland areas where natural stream dissection has not created drainage outlets, moderately well drained soils have formed. Relief has modified the effects of the other soil-forming factors in these areas. For example, Emporia and Slagle soils formed in similar parent materials. Emporia soils are higher on the landscape and are well drained, and Slagle soils are lower on the landscape and are moderately well drained.

Time

As a factor of soil formation, time generally is related to the degree of development or degree of horizon differentiation within the soil. A soil that has little or no horizon development is considered a young soil, and one that has strongly developed horizons is considered an old or mature soil.

The oldest soils in King and Queen County are those that formed on well drained uplands at the higher elevations. These soils, such as Emporia and Suffolk soils, have a strong degree of horizon differentiation. Conversely, Bibb and Kinston soils formed in recent alluvium and show little or no horizon development. They are commonly stratified and have an irregular distribution of organic matter in the profile.

Morphology of the Soils

The results of the soil-forming factors are shown by the different layers, or soil horizons, in a soil profile. The soil profile extends from the surface down to materials that are little altered by the soil-forming processes.

Most soils have four major horizons—the A, E, B, and C horizons. These major horizons may be further subdivided by the use of numbers and letters to indicate changes within a horizon. For example, a Bt horizon is a B horizon that has an accumulation of clay.

The A horizon is the surface layer and has the largest accumulation of organic matter. It is also the layer of maximum leaching and elevation of clay and iron. If considerable leaching has taken place and organic matter has not darkened the material, this horizon is called an E horizon.

The B horizon underlies the A or E horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, and other compounds leached from the surface layer. In some soils the B horizon formed by alteration in place rather than by illuviation. This alteration can be caused by oxidation and reduction of iron or by the weathering of clay minerals. The B horizon commonly has blocky structure. It generally is firmer and lighter in color than the A and E horizons but darker than the C horizon.

The C horizon is below the B horizon or, in some cases, below the A horizon. It consists of materials that are little altered by the soil-forming processes, but it can be modified by weathering.

Processes of Soil Horizon Differentiation

In King and Queen County several processes are involved in the formation of soil horizons. Among these are the accumulation of organic matter, the leaching of soluble salts, the reduction and transfer of iron, the formation of soil structure, and the formation and translocation of clay minerals. These processes are continually taking place, generally at the same time throughout the profile. Such processes have been going on for thousands of years.

The accumulation and incorporation of organic matter take place with the decomposition of plant residue. These additions darken the surface layer and help to form the A horizon. In many places, much of the surface layer has been eroded away or has been mixed with the materials from underlying layers through cultivation. Organic matter, once lost, normally takes a long time to replace. In King and Queen County, the organic matter content of the surface layer ranges from low in sandy soils, such as Tarboro soils, to high in marsh soils, such as Rappahannock soils. Most soils in the county have a low or medium amount of organic matter.

For soils to have distinct subsoil horizons, some of the lime and soluble salts must be leached before the translocation of clay minerals. Among the factors that affect this leaching are the kinds of salts originally present, the depth to which the soil solution percolates, and the texture of the soil profile.

Well drained and moderately well drained soils in the survey area have a yellowish brown to red subsoil. These colors are caused mainly by thin coatings of iron oxides on sand and silt grains, although in some soils the colors are inherited from the materials in which they formed. The structure is weak to moderate subangular blocky, and the subsoil contains more clay than the overlying surface horizons.

The reduction and transfer of iron, called gleying, takes place mainly in the wetter, more poorly drained soils. Moderately well drained soils, such as Slagle and Munden soils, have yellowish brown and strong brown redoximorphic features, which indicate the segregation of iron. Poorly drained soils, such as Roanoke and Tomotley soils, have a grayish subsoil and underlying materials, which indicate reduction and transfer of iron by removal in solution.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl. A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bottom land. An informal term loosely applied to various portions of a flood plain.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. See Redoximorphic features.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A dense, compact, slowly permeable subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. A claypan is commonly hard when dry and plastic and sticky when wet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility). See Linear extensibility.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conglomerate. A coarse-grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Corrosion Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crusts, soil. Relatively thin, somewhat continuous layers of the soil surface that often restrict water movement, air entry, and seedling emergence from the soil. They generally are less than 2 inches thick and are massive.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than

1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep soils, 20 to 40 inches; shallow soils, 10 to 20 inches; and very shallow soils, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flood plain. The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers or streams; produced by stream or river action.

Footslope. The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard to reclaim (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

L horizon.—A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Iron depletions. See Redoximorphic features.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

K_{sat}. Saturated hydraulic conductivity. (See Permeability.)

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Masses. See Redoximorphic features.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. A kind of map unit that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. See Redoximorphic features.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse-grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. See Redoximorphic features.

Redoximorphic depletions. See Redoximorphic features.

Redoximorphic features. Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features. The redoximorphic features are defined as follows:

1. *Redoximorphic concentrations.*—These are zones of apparent accumulation of iron-manganese oxides and include nodules and concretions, masses, and pore

linings. *Nodules and concretions* are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure. *Masses* are noncemented concentrations of substances within the soil matrix. *Pore linings* are zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.

2. *Redoximorphic depletions.*—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out. They include iron depletions and clay depletions. *Iron depletions* are zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix. *Clay depletions* are zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).

3. *Reduced matrix.*—This is a soil matrix that has low chroma in situ but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix. See Redoximorphic features.

Regolith. All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief. The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Rill. A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser. The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (K_{sat}). The amount of water that would move vertically through a unit area of saturated soil in unit time under unit hydraulic gradient. Terms describing saturated hydraulic conductivity are measured in inches per hour or in micrometers per second or µm/sec. To convert µm/sec to in/hr multiply µm/sec by 0.1417; to convert in/hr to µm/sec multiply by 7.0572. Terms are as follows:

Very low	0.0 to 0.001417 in/hr *(0.0 to 0.01 μm/sec)*
Low	0.001417 to 0.01417 in/hr *(0.01 to 0.1 μm/sec)*
Moderately low	0.01417 to 0.1417 in/hr *(0.1 to 1.0 μm/sec)*
Moderately high	0.1417 to 1.417 in/hr *(1.0 to 10 μm/sec)*
High	1.417 to 14.17 in/hr *(10 to 100 μm/sec)*
Very high	more than 14.17 in/hr *(more than 100 μm/sec)*

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope (geomorphology). A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic). Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 2 percent
Gently sloping	2 to 6 percent
Moderately sloping	6 to 10 percent
Strongly sloping	10 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	45 percent and higher

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace (conservation). An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread. The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Upland. An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Weathering. All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded. Refers to soil material consisting of coarse-grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.—Temperature and Precipitation

(Recorded in the period 1971-2000 at Walkerton, Virginia)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temp. higher than--	Minimum temp. lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snow-fall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January--	47.4	26.3	36.8	73	-1	83	3.73	2.33	5.11	7	4.3
February-	51.6	28.3	40.0	77	4	115	3.14	1.70	4.50	6	4.1
March----	60.6	35.4	48.0	85	15	275	4.23	2.34	5.87	7	0.9
April----	71.2	43.6	57.4	91	25	522	3.02	1.83	4.13	6	0.0
May------	78.0	53.8	65.9	93	35	803	4.06	2.41	5.61	6	0.0
June-----	85.0	62.5	73.7	96	45	1,012	3.58	1.52	5.29	6	0.0
July-----	88.6	67.0	77.8	99	51	1,172	4.52	2.36	6.77	6	0.0
August---	87.1	65.4	76.2	98	49	1,121	3.53	1.68	5.19	5	0.0
September	81.3	58.5	69.9	95	39	898	3.96	1.60	5.80	5	0.0
October--	70.9	45.9	58.4	87	25	569	3.36	1.45	5.30	5	0.0
November-	61.1	37.0	49.0	81	16	293	3.18	1.75	4.51	6	0.2
December-	51.4	29.6	40.5	75	5	127	3.35	1.77	4.92	6	1.4
Yearly:											
Average	69.5	46.1	57.8	---	---	---	---	---	---	---	---
Extreme	102	-12	---	100	-4	---	---	---	---	---	---
Total--	---	---	---	---	---	6,990	43.65	37.32	49.02	71	11.1

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.—Freeze Dates in Spring and Fall

(Recorded in the period 1971-2000 at Walkerton, Virginia)

Probability	Temperature		
	24 OF or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 5	Apr. 17	Apr. 26
2 years in 10 later than--	Mar. 31	Apr. 13	Apr. 22
5 years in 10 later than--	Mar. 21	Apr. 4	Apr. 15
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 29	Oct. 15	Oct. 8
2 years in 10 earlier than--	Nov. 4	Oct. 20	Oct. 12
5 years in 10 earlier than-	Nov. 16	Oct. 30	Oct. 21

Table 3.—Growing Season

(Recorded in the period 1971-2000 at Walkerton, Virginia)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	216	187	171
8 years in 10	224	195	177
5 years in 10	239	209	188
2 years in 10	253	223	200
1 year in 10	261	230	206

Table 4.—Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
1A	Augusta fine sandy loam, 0 to 2 percent slopes, rarely flooded	707	0.3
2A	Bojac loamy sand, 0 to 2 percent slopes, rarely flooded	852	0.4
2B	Bojac loamy sand, 2 to 6 percent slopes, rarely flooded	2,135	1.0
3A	Craven fine sandy loam, 0 to 2 percent slopes	519	0.2
3B	Craven fine sandy loam, 2 to 6 percent slopes	2,084	1.0
3C	Craven fine sandy loam, 6 to 10 percent slopes	1,876	0.9
4A	Emporia sandy loam, 0 to 2 percent slopes	4,212	2.0
4B	Emporia sandy loam, 2 to 6 percent slopes	39,592	19.0
4C	Emporia sandy loam, 6 to 10 percent slopes	6,952	3.3
5D	Emporia-Slagle-Rumford complex, 6 to 15 percent slopes	32,421	15.5
5E	Emporia-Slagle-Rumford complex, 15 to 50 percent slopes	36,248	17.4
6A	Faceville fine sandy loam, 0 to 2 percent slopes	179	*
6B	Faceville fine sandy loam, 2 to 6 percent slopes	201	*
7A	Kinston and Bibb soils, 0 to 2 percent slopes, occasionally flooded	7,701	3.7
8A	Levy silt loam, 0 to 2 percent slopes, very frequently flooded	3,953	1.9
9A	Mattaponi fine sandy loam, 0 to 2 percent slopes	101	*
9B	Mattaponi fine sandy loam, 2 to 6 percent slopes	628	0.3
9C	Mattaponi fine sandy loam, 6 to 10 percent slopes	64	*
10A	Munden loamy sand, 0 to 2 percent slopes	786	0.4
10B	Munden loamy sand, 2 to 6 percent slopes	357	0.2
11A	Pits, gravel	177	*
12A	Rappahannock muck, 0 to 1 percent slopes, very frequently flooded	4,240	2.0
13A	Roanoke loam, 0 to 2 percent slopes, rarely flooded	571	0.3
14B	Rumford loamy sand, 0 to 6 percent slopes	5,595	2.7
14C	Rumford loamy sand, 6 to 10 percent slopes	923	0.4
15A	Slagle sandy loam, 0 to 2 percent slopes	2,470	1.2
15B	Slagle sandy loam, 2 to 6 percent slopes	16,333	7.8
15C	Slagle sandy loam, 6 to 10 percent slopes	3,247	1.6
16A	State fine sandy loam, 0 to 2 percent slopes	1,969	0.9
16B	State fine sandy loam, 2 to 6 percent slopes	3,606	1.7
17A	Suffolk sandy loam, 0 to 2 percent slopes	1,391	0.7
17B	Suffolk sandy loam, 2 to 6 percent slopes	7,692	3.7
17C	Suffolk sandy loam, 6 to 10 percent slopes	321	0.2
18B	Tarboro sand, 0 to 6 percent slopes, rarely flooded	3,362	1.6
19A	Tetotum fine sandy loam, 0 to 2 percent slopes, rarely flooded	3,004	1.4
19B	Tetotum fine sandy loam, 2 to 6 percent slopes, rarely flooded	3,640	1.7
19C	Tetotum fine sandy loam, 6 to 10 percent slopes	151	*
20A	Tomotley fine sandy loam, 0 to 2 percent slopes, rarely flooded	1,340	0.6
21A	Wahee fine sandy loam, 0 to 2 percent slopes, rarely flooded	191	*
W	Water	6,909	3.3
	Total	208,700	100.0

* Less than 0.1 percent.

Table 5.—Land Capability, Virginia Soil Management Group, and Yields per Acre of Crops and Pasture, Part I

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Virginia Soil Management Group	Barley	Corn	Grass-legume hay	Pasture
			Bu	Bu	Tons	AUM
1A:						
Augusta-----------	4w	Z	50	100	---	5.0
2A:						
Bojac-------------	2w	DD	70	85	3.5	6.0
2B:						
Bojac-------------	2e	DD	70	85	3.5	6.0
3A:						
Craven------------	2w	HH	60	85	3.0	6.0
3B:						
Craven------------	2e	HH	60	85	3.0	6.0
3C:						
Craven------------	3e	HH	53	75	2.6	5.0
4A:						
Emporia-----------	1	R	70	120	4.0	8.5
4B:						
Emporia-----------	2e	R	70	120	4.0	8.5
4C:						
Emporia-----------	3e	R	62	106	3.5	7.5
5D:						
Emporia-----------	4e	R	56	96	3.2	7.0
Slagle------------	4e	K	64	104	3.6	6.0
Rumford-----------	4e	DD	56	68	2.8	5.0
5E:						
Emporia-----------	7e	R	---	---	---	5.5
Slagle------------	6e	K	---	---	---	6.0
Rumford-----------	7e	DD	---	---	---	5.0
6A:						
Faceville---------	1	R	70	120	4.0	10.0
6B:						
Faceville---------	2e	R	70	120	4.0	10.0
7A:						
Kinston-----------	6w	OO	---	---	---	---
Bibb--------------	6w	EE	---	---	---	---
8A:						
Levy--------------	7w	PP	---	---	---	---

Table 5.—Land Capability, Virginia Soil Management Group, and Yields per Acre of Crops and Pasture, Part I

Map symbol and soil name	Land capability	Virginia Soil Management Group	Barley	Corn	Grass-legume hay	Pasture
			Bu	Bu	Tons	AUM
9A:						
Mattaponi---------	2w	R	70	120	4.0	6.5
9B:						
Mattaponi---------	2e	R	70	120	4.0	6.5
9C:						
Mattaponi---------	3e	R	62	106	3.5	6.0
10A:						
Munden------------	2w	F	80	140	4.0	7.0
10B:						
Munden------------	2e	F	80	140	4.0	7.0
11A.						
Pits, gravel						
12A:						
Rappahannock------	7w	PP	---	---	---	---
13A:						
Roanoke-----------	4w	NN	30	65	---	5.2
14B:						
Rumford-----------	2s	DD	70	85	3.5	7.0
14C:						
Rumford-----------	3e	DD	62	75	3.1	6.0
15A:						
Slagle------------	2w	K	80	130	4.5	8.0
15B:						
Slagle------------	2e	K	80	130	4.5	8.0
15C:						
Slagle------------	3e	K	70	114	4.0	7.0
16A:						
State-------------	1	B	90	160	4.5	8.5
16B:						
State-------------	2e	B	90	160	4.5	8.5
17A:						
Suffolk-----------	1	T	70	110	3.5	6.0
17B:						
Suffolk-----------	2e	T	70	110	3.5	6.0
17C:						
Suffolk-----------	3e	T	62	97	3.1	5.5
18B:						
Tarboro-----------	3s	II	60	65	---	2.0
19A:						
Tetotum-----------	2w	K	80	130	4.5	8.0

Table 5.—Land Capability, Virginia Soil Management Group, and Yields per Acre of Crops and Pasture, Part I

Map symbol and soil name	Land capability	Virginia Soil Management Group	Barley	Corn	Grass-legume hay	Pasture
			Bu	Bu	Tons	AUM
19B:						
Tetotum-----------	2e	K	80	130	4.5	8.0
19C:						
Tetotum-----------	3e	K	70	114	4.0	7.5
20A:						
Tomotley----------	4w	OO	30	65	2.0	3.0
21A:						
Wahee-------------	4w	OO	30	65	2.0	3.0
W.						
Water						

Table 5.—Land Capability, Virginia Soil Management Group, and Yields per Acre of Crops and Pasture, Part II

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Virginia Soil Management Group	Peanuts	Soybeans	Wheat
			Lbs	Bu	Bu
1A:					
Augusta-----------	4w	Z	2800	35	40
2A:					
Bojac-------------	2w	DD	3700	25	56
2B:					
Bojac-------------	2e	DD	3700	25	56
3A:					
Craven------------	2w	HH	2900	25	48
3B:					
Craven------------	2e	HH	2900	25	48
3C:					
Craven------------	3e	HH	2500	22	42
4A:					
Emporia-----------	1	R	4000	40	56
4B:					
Emporia-----------	2e	R	4000	40	56
4C:					
Emporia-----------	3e	R	3500	35	49
5D:					
Emporia-----------	4e	R	3200	32	45
Slagle------------	4e	K	3600	32	51
Rumford-----------	4e	DD	3000	20	45
5E:					
Emporia-----------	7e	R	---	---	---
Slagle------------	6e	K	---	---	---
Rumford-----------	7e	DD	---	---	---
6A:					
Faceville---------	1	R	4000	40	56
6B:					
Faceville---------	2e	R	4000	40	56
7A:					
Kinston-----------	6w	OO	---	---	---
Bibb--------------	6w	EE	---	---	---
8A:					
Levy--------------	7w	PP	---	---	---

Table 5.—Land Capability, Virginia Soil Management Group, and Yields per Acre of Crops and Pasture, Part II

Map symbol and soil name	Land capability	Virginia Soil Management Group	Peanuts	Soybeans	Wheat
			Lbs	Bu	Bu
9A:					
Mattaponi----------	2w	R	---	40	56
9B:					
Mattaponi----------	2e	R	---	40	56
9C:					
Mattaponi----------	3e	R	---	35	49
10A:					
Munden------------	2w	F	---	40	64
10B:					
Munden------------	2e	F	---	40	64
11A.					
Pits, gravel					
12A:					
Rappahannock------	7w	PP	---	---	---
13A:					
Roanoke-----------	4w	NN	---	20	24
14B:					
Rumford-----------	2s	DD	3000	25	56
14C:					
Rumford-----------	3e	DD	2500	22	49
15A:					
Slagle------------	2w	K	3500	40	64
15B:					
Slagle------------	2e	K	3500	40	64
15C:					
Slagle------------	3e	K	3000	35	56
16A:					
State-------------	1	B	3300	50	64
16B:					
State-------------	2e	B	3300	50	64
17A:					
Suffolk-----------	1	T	4000	40	56
17B:					
Suffolk-----------	2e	T	4000	40	56
17C:					
Suffolk-----------	3e	T	3500	35	49
18B:					
Tarboro-----------	3s	II	2000	20	48
19A:					
Tetotum-----------	2w	K	4000	40	64

Table 5.—Land Capability, Virginia Soil Management Group, and Yields per Acre of Crops and Pasture, Part II

Map symbol and soil name	Land capability	Virginia Soil Management Group	Peanuts	Soybeans	Wheat
			Lbs	Bu	Bu
19B:					
Tetotum-----------	2e	K	4000	40	64
19C:					
Tetotum-----------	3e	K	3500	35	56
20A:					
Tomotley----------	4w	OO	---	20	24
21A:					
Wahee-------------	4w	OO	---	20	24
W.					
Water					

Table 6.—Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Map unit name
1A	Augusta fine sandy loam, 0 to 2 percent slopes, rarely flooded (if drained)
3A	Craven fine sandy loam, 0 to 2 percent slopes
3B	Craven fine sandy loam, 2 to 6 percent slopes
4A	Emporia sandy loam, 0 to 2 percent slopes
4B	Emporia sandy loam, 2 to 6 percent slopes
6A	Faceville fine sandy loam, 0 to 2 percent slopes
6B	Faceville fine sandy loam, 2 to 6 percent slopes
9A	Mattaponi fine sandy loam, 0 to 2 percent slopes
9B	Mattaponi fine sandy loam, 2 to 6 percent slopes
10A	Munden loamy sand, 0 to 2 percent slopes
15A	Slagle sandy loam, 0 to 2 percent slopes
15B	Slagle sandy loam, 2 to 6 percent slopes
16A	State fine sandy loam, 0 to 2 percent slopes
16B	State fine sandy loam, 2 to 6 percent slopes
17A	Suffolk sandy loam, 0 to 2 percent slopes
17B	Suffolk sandy loam, 2 to 6 percent slopes
19A	Tetotum fine sandy loam, 0 to 2 percent slopes, rarely flooded
19B	Tetotum fine sandy loam, 2 to 6 percent slopes, rarely flooded

Table 7.—Hydric Soils List

Map symbol	Soil name
7A	Kinston and Bibb soils, 0 to 2 percent slopes, occasionally flooded
8A	Levy silt loam, 0 to 2 percent slopes, very frequently flooded
12A	Rappahannock muck, 0 to 1 percent slopes, very frequently flooded
13A	Roanoke loam, 0 to 2 percent slopes, rarely flooded
20A	Tomotley fine sandy loam, 0 to 2 percent slopes, rarely flooded

Table 8.—Agricultural Waste Management, Part I

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste		Application of sewage sludge	
		Rating class and limiting features	Value	Rating class and limiting features	Value
1A:					
Augusta	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too acid	0.32	Too acid	0.91
				Flooding	0.40
2A:					
Bojac	80	Very limited		Very limited	
		Filtering capacity	0.99	Filtering capacity	0.99
		Too acid	0.43	Too acid	0.99
				Flooding	0.40
2B:					
Bojac	80	Very limited		Very limited	
		Filtering capacity	0.99	Filtering capacity	0.99
		Too acid	0.43	Too acid	0.99
				Flooding	0.40
3A:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone	0.86	Too acid	0.91
		Too acid	0.32	Depth to saturated zone	0.86
3B:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone	0.86	Too acid	0.91
		Too acid	0.32	Depth to saturated zone	0.86
3C:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone	0.86	Too acid	0.91
		Too acid	0.32	Depth to saturated zone	0.86
4A:					
Emporia	80	Somewhat limited		Somewhat limited	
		Too acid	0.11	Too acid	0.42
		Depth to saturated zone	0.09	Depth to saturated zone	0.09

Table 8.—Agricultural Waste Management, Part I—Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste		Application of sewage sludge	
		Rating class and limiting features	Value	Rating class and limiting features	Value
4B:					
Emporia-------------	80	Somewhat limited		Somewhat limited	
		Too acid	0.11	Too acid	0.42
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
4C:					
Emporia-------------	80	Somewhat limited		Somewhat limited	
		Too acid	0.11	Too acid	0.42
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
		Slope	0.01	Slope	0.01
5D:					
Emporia-------------	35	Somewhat limited		Somewhat limited	
		Slope	0.37	Too acid	0.42
		Too acid	0.11	Slope	0.37
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
Slagle--------------	30	Very limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Slope	0.37	Too acid	0.91
		Too acid	0.32	Slope	0.37
Rumford-------------	15	Very limited		Very limited	
		Filtering capacity	0.99	Filtering capacity	0.99
		Slope	0.37	Too acid	0.91
		Too acid	0.32	Slope	0.37
5E:					
Emporia-------------	35	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Too acid	0.11	Too acid	0.42
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
Slagle--------------	30	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.32	Too acid	0.91
Rumford-------------	15	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Filtering capacity	0.99	Filtering capacity	0.99
		Too acid	0.32	Too acid	0.91
6A:					
Faceville-----------	80	Very limited		Very limited	
		Filtering capacity	0.99	Filtering capacity	0.99
		Too acid	0.32	Too acid	0.91
		Low adsorption	0.19		

Table 8.—Agricultural Waste Management, Part I—Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value
6B:					
Faceville	80	Very limited		Very limited	
		Filtering capacity	0.99	Filtering capacity	0.99
		Too acid	0.32	Too acid	0.91
		Low adsorption	0.19		
7A:					
Kinston	45	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Leaching	0.70	Flooding	1.00
		Flooding	0.60	Too acid	0.91
Bibb	35	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	0.60	Flooding	1.00
		Runoff	0.40	Too acid	0.91
8A:					
Levy	80	Very limited		Very limited	
		Slow water movement	1.00	Ponding	1.00
		Ponding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Flooding	1.00
9A:					
Mattaponi	80	Somewhat limited		Somewhat limited	
		Too acid	0.32	Too acid	0.91
		Slow water movement	0.30	Slow water movement	0.22
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
9B:					
Mattaponi	80	Somewhat limited		Somewhat limited	
		Too acid	0.32	Too acid	0.91
		Slow water movement	0.30	Slow water movement	0.22
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
9C:					
Mattaponi	80	Somewhat limited		Somewhat limited	
		Too acid	0.32	Too acid	0.91
		Slow water movement	0.30	Slow water movement	0.22
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
10A:					
Munden	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.11	Too acid	0.42

Table 8.—Agricultural Waste Management, Part I—Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value
10B:					
Munden	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.11	Too acid	0.42
11A:					
Pits, gravel	80	Not rated		Not rated	
12A:					
Rappahannock	80	Very limited		Very limited	
		Ponding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Flooding	1.00
13A:					
Roanoke	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.89	Too acid	0.91
		Runoff	0.40	Slow water movement	0.78
14B:					
Rumford	80	Very limited		Very limited	
		Filtering capacity	0.99	Filtering capacity	0.99
		Too acid	0.32	Too acid	0.91
14C:					
Rumford	80	Very limited		Very limited	
		Filtering capacity	0.99	Filtering capacity	0.99
		Too acid	0.32	Too acid	0.91
		Slope	0.01	Slope	0.01
15A:					
Slagle	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.32	Too acid	0.91
15B:					
Slagle	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.32	Too acid	0.91
15C:					
Slagle	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.32	Too acid	0.91
		Slope	0.01	Slope	0.01
16A:					
State	80	Somewhat limited		Somewhat limited	
		Too acid	0.32	Too acid	0.91

Table 8.—Agricultural Waste Management, Part I—Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste		Application of sewage sludge	
		Rating class and limiting features	Value	Rating class and limiting features	Value
16B:					
State---------------	80	Somewhat limited		Somewhat limited	
		Too acid	0.32	Too acid	0.91
17A:					
Suffolk-------------	80	Somewhat limited		Somewhat limited	
		Too acid	0.11	Too acid	0.42
17B:					
Suffolk-------------	80	Somewhat limited		Somewhat limited	
		Too acid	0.11	Too acid	0.42
17C:					
Suffolk-------------	80	Somewhat limited		Somewhat limited	
		Too acid	0.11	Too acid	0.42
		Slope	0.01	Slope	0.01
18B:					
Tarboro-------------	80	Very limited		Very limited	
		Filtering capacity	1.00	Filtering capacity	1.00
		Droughty	1.00	Droughty	1.00
		Leaching	0.45	Too acid	0.42
19A:					
Tetotum-------------	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.32	Too acid	0.91
				Flooding	0.40
19B:					
Tetotum-------------	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.32	Too acid	0.91
				Flooding	0.40
19C:					
Tetotum-------------	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.32	Too acid	0.91
		Slope	0.01	Slope	0.01
20A:					
Tomotley------------	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too acid	0.73	Too acid	1.00
		Leaching	0.70	Flooding	0.40

Table 8.—Agricultural Waste Management, Part I—Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste		Application of sewage sludge	
		Rating class and limiting features	Value	Rating class and limiting features	Value
21A:					
Wahee	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Slow water movement	1.00
		Runoff	0.40	Too acid	0.42
W:					
Water	100	Not rated		Not rated	

Table 8.—Agricultural Waste Management, Part II

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Disposal of wastewater by irrigation: Rating class and limiting features	Value	Overland flow of wastewater: Rating class and limiting features	Value
1A:					
Augusta	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Too acid	0.91	Depth to saturated zone	1.00
				Too acid	0.91
2A:					
Bojac	80	Very limited		Very limited	
		Filtering capacity	0.99	Seepage	1.00
				Too acid	0.99
		Too acid	0.99	Flooding	0.40
2B:					
Bojac	80	Very limited		Very limited	
		Filtering capacity	0.99	Seepage	1.00
				Too acid	0.99
		Too acid	0.99	Flooding	0.40
		Too steep for surface application	0.08		
3A:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Seepage	1.00
				Too acid	0.91
		Too acid	0.91	Depth to saturated zone	0.86
		Depth to saturated zone	0.86		
3B:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Seepage	1.00
				Too acid	0.91
		Too acid	0.91	Depth to saturated zone	0.86
		Depth to saturated zone	0.86		
3C:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Seepage	1.00
				Too acid	0.91
		Too steep for surface application	1.00	Depth to saturated zone	0.86
		Too acid	0.91		
4A:					
Emporia	80	Somewhat limited		Very limited	
		Too acid	0.42	Seepage	1.00
		Depth to saturated zone	0.09	Too acid	0.42
				Depth to saturated zone	0.09

Table 8.—Agricultural Waste Management, Part II—Continued

Map symbol and soil name	Pct. of map unit	Disposal of wastewater by irrigation		Overland flow of wastewater	
		Rating class and limiting features	Value	Rating class and limiting features	Value
4B:					
Emporia	80	Somewhat limited		Very limited	
		Too acid	0.42	Seepage	1.00
		Depth to saturated zone	0.09	Too acid	0.42
		Too steep for surface application	0.08	Depth to saturated zone	0.09
					0
4C:					
Emporia	80	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Too acid	0.42	Too acid	0.42
		Too steep for sprinkler application	0.10	Too steep for surface application	0.22
5D:					
Emporia	35	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Too steep for sprinkler application	0.60	Too steep for surface application	0.94
		Too acid	0.42	Too acid	0.42
Slagle	30	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.91	Too steep for surface application	0.94
Rumford	15	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Filtering capacity	0.99	Too steep for surface application	0.94
		Too acid	0.91	Too acid	0.91
5E:					
Emporia	35	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Too steep for sprinkler application	1.00	Too steep for surface application	1.00
		Too acid	0.42	Too acid	0.42

Table 8.—Agricultural Waste Management, Part II—Continued

Map symbol and soil name	Pct. of map unit	Disposal of wastewater by irrigation: Rating class and limiting features	Value	Overland flow of wastewater: Rating class and limiting features	Value
5E:					
Slagle	30	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Too steep for sprinkler application	1.00	Too steep for surface application	1.00
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
Rumford	15	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Too steep for sprinkler application	1.00	Too steep for surface application	1.00
		Filtering capacity	0.99	Too acid	0.91
6A:					
Faceville	80	Very limited		Very limited	
		Filtering capacity	0.99	Seepage	1.00
		Too acid	0.91	Too acid	0.91
		Low adsorption	0.19	Low adsorption	0.19
6B:					
Faceville	80	Very limited		Very limited	
		Filtering capacity	0.99	Seepage	1.00
		Too acid	0.91	Too acid	0.91
		Low adsorption	0.19	Low adsorption	0.19
7A:					
Kinston	45	Very limited		Very limited	
		Depth to saturated zone	1.00	Flooding	1.00
		Too acid	0.91	Seepage	1.00
		Flooding	0.60	Depth to saturated zone	1.00
Bibb	35	Very limited		Very limited	
		Depth to saturated zone	1.00	Flooding	1.00
		Too acid	0.91	Depth to saturated zone	1.00
		Flooding	0.60	Seepage	1.00
8A:					
Levy	80	Very limited		Very limited	
		Ponding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Ponding	1.00
		Flooding	1.00	Depth to saturated zone	1.00

Table 8.—Agricultural Waste Management, Part II—Continued

Map symbol and soil name	Pct. of map unit	Disposal of wastewater by irrigation		Overland flow of wastewater	
		Rating class and limiting features	Value	Rating class and limiting features	Value
9A:					
Mattaponi-----------	80	Somewhat limited		Very limited	
		Too acid	0.91	Seepage	1.00
		Slow water movement	0.22	Too acid	0.91
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
9B:					
Mattaponi-----------	80	Somewhat limited		Very limited	
		Too acid	0.91	Seepage	1.00
		Slow water movement	0.22	Too acid	0.91
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
9C:					
Mattaponi-----------	80	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Too acid	0.91	Too acid	0.91
		Slow water movement	0.22	Too steep for surface application	0.22
10A:					
Munden--------------	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Seepage	1.00
		Too acid	0.42	Depth to saturated zone	0.99
				Too acid	0.42
10B:					
Munden--------------	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Seepage	1.00
		Too acid	0.42	Depth to saturated zone	0.99
		Too steep for surface application	0.08	Too acid	0.42
11A:					
Pits, gravel--------	80	Not rated		Not rated	
12A:					
Rappahannock--------	80	Very limited		Very limited	
		Ponding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Ponding	1.00
		Flooding	1.00	Depth to saturated zone	1.00
13A:					
Roanoke-------------	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too acid	0.91	Seepage	1.00
		Slow water movement	0.78	Too acid	0.91

Table 8.—Agricultural Waste Management, Part II—Continued

Map symbol and soil name	Pct. of map unit	Disposal of wastewater by irrigation: Rating class and limiting features	Value	Overland flow of wastewater: Rating class and limiting features	Value
14B:					
Rumford	80	Very limited		Very limited	
		Filtering capacity	0.99	Seepage	1.00
		Too acid	0.91	Too acid	0.91
14C:					
Rumford	80	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Filtering capacity	0.99	Too acid	0.91
		Too acid	0.91	Too steep for surface application	0.22
15A:					
Slagle	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Seepage	1.00
		Too acid	0.91	Depth to saturated zone	0.99
				Too acid	0.91
15B:					
Slagle	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Seepage	1.00
		Too acid	0.91	Depth to saturated zone	0.99
		Too steep for surface application	0.08	Too acid	0.91
15C:					
Slagle	80	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.91	Too acid	0.91
16A:					
State	80	Somewhat limited		Very limited	
		Too acid	0.91	Seepage	1.00
				Too acid	0.91
16B:					
State	80	Somewhat limited		Very limited	
		Too acid	0.91	Seepage	1.00
		Too steep for surface application	0.08	Too acid	0.91
17A:					
Suffolk	80	Somewhat limited		Very limited	
		Too acid	0.42	Seepage	1.00
				Too acid	0.42

Table 8.—Agricultural Waste Management, Part II—Continued

Map symbol and soil name	Pct. of map unit	Disposal of wastewater by irrigation: Rating class and limiting features	Value	Overland flow of wastewater: Rating class and limiting features	Value
17B:					
Suffolk	80	Somewhat limited		Very limited	
		Too acid	0.42	Seepage	1.00
		Too steep for surface application	0.08	Too acid	0.42
17C:					
Suffolk	80	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Too acid	0.42	Too acid	0.42
		Too steep for sprinkler application	0.10	Too steep for surface application	0.22
18B:					
Tarboro	80	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Droughty	1.00	Too acid	0.42
		Too acid	0.42	Flooding	0.40
19A:					
Tetotum	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Seepage	1.00
		Too acid	0.91	Depth to saturated zone	0.99
				Too acid	0.91
19B:					
Tetotum	80	Very limited		Very limited	
		Depth to saturated zone	0.99	Seepage	1.00
		Too acid	0.91	Depth to saturated zone	0.99
		Too steep for surface application	0.08	Too acid	0.91
19C:					
Tetotum	80	Very limited		Very limited	
		Too steep for surface application	1.00	Seepage	1.00
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too acid	0.91	Too acid	0.91
20A:					
Tomotley	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
		Too acid	1.00	Depth to saturated zone	1.00
				Too acid	1.00

Table 8.—Agricultural Waste Management, Part II—Continued

Map symbol and soil name	Pct. of map unit	Disposal of wastewater by irrigation		Overland flow of wastewater	
		Rating class and limiting features	Value	Rating class and limiting features	Value
21A:					
Wahee	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Seepage	1.00
		Too acid	0.42	Too acid	0.42
W:					
Water	100	Not rated		Not rated	

Table 8.—Agricultural Waste Management, Part III

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Rapid infiltration of wastewater: Rating class and limiting features	Value	Slow rate treatment of wastewater: Rating class and limiting features	Value
1A:					
Augusta	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Too acid	0.91
2A:					
Bojac	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Filtering capacity	0.99
		Slow water movement	0.32	Too acid	0.99
2B:					
Bojac	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Filtering capacity	0.99
		Slow water movement	0.32	Too acid	0.99
				Too steep for surface application	0.08
3A:					
Craven	80	Very limited		Somewhat limited	
		Slow water movement	1.00	Slow water movement	0.94
		Depth to saturated zone	1.00	Too acid	0.91
		Too acid	0.07	Depth to saturated zone	0.86
3B:					
Craven	80	Very limited		Somewhat limited	
		Slow water movement	1.00	Slow water movement	0.94
		Depth to saturated zone	1.00	Too acid	0.91
		Too acid	0.07	Depth to saturated zone	0.86
3C:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Too steep for surface application	1.00
		Depth to saturated zone	1.00	Slow water movement	0.94
		Slope	1.00	Too acid	0.91

Table 8.—Agricultural Waste Management, Part III—Continued

Map symbol and soil name	Pct. of map unit	Rapid infiltration of wastewater: Rating class and limiting features	Value	Slow rate treatment of wastewater: Rating class and limiting features	Value
4A:					
Emporia	80	Very limited		Somewhat limited	
		Slow water movement	1.00	Too acid	0.42
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
		Too acid	0.07		
4B:					
Emporia	80	Very limited		Somewhat limited	
		Slow water movement	1.00	Too acid	0.42
		Depth to saturated zone	0.09	Depth to saturated zone	0.09
		Too acid	0.07	Too steep for surface application	0.08
4C:					
Emporia	80	Very limited		Very limited	
		Slow water movement	1.00	Too steep for surface application	1.00
		Slope	1.00	Too acid	0.42
		Depth to saturated zone	0.09	Too steep for sprinkler irrigation	0.22
5D:					
Emporia	35	Very limited		Very limited	
		Slow water movement	1.00	Too steep for surface application	1.00
		Slope	1.00	Too steep for sprinkler irrigation	0.94
		Depth to saturated zone	0.09	Too acid	0.42
Slagle	30	Very limited		Very limited	
		Slow water movement	1.00	Too steep for surface application	1.00
		Slope	1.00	Depth to saturated zone	0.99
		Depth to saturated zone	0.99	Too steep for sprinkler irrigation	0.94
Rumford	15	Very limited		Very limited	
		Slope	1.00	Too steep for surface application	1.00
		Slow water movement	0.32	Filtering capacity	0.99
				Too steep for sprinkler irrigation	0.94

Table 8.—Agricultural Waste Management, Part III—Continued

Map symbol and soil name	Pct. of map unit	Rapid infiltration of wastewater: Rating class and limiting features	Value	Slow rate treatment of wastewater: Rating class and limiting features	Value
5E:					
Emporia	35	Very limited		Very limited	
		Slope	1.00	Too steep for surface application	1.00
		Slow water movement	1.00	Too steep for sprinkler irrigation	1.00
		Depth to saturated zone	0.09	Too acid	0.42
Slagle	30	Very limited		Very limited	
		Slope	1.00	Too steep for surface application	1.00
		Slow water movement	1.00	Too steep for sprinkler irrigation	1.00
		Depth to saturated zone	0.99	Depth to saturated zone	0.99
Rumford	15	Very limited		Very limited	
		Slope	1.00	Too steep for surface application	1.00
		Slow water movement	0.32	Too steep for sprinkler irrigation	1.00
				Filtering capacity	0.99
6A:					
Faceville	80	Very limited		Very limited	
		Slow water movement	1.00	Filtering capacity	0.99
				Too acid	0.91
				Low adsorption	0.19
6B:					
Faceville	80	Very limited		Very limited	
		Slow water movement	1.00	Filtering capacity	0.99
				Too acid	0.91
				Low adsorption	0.19
7A:					
Kinston	45	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Too acid	0.91
		Flooding	0.60	Flooding	0.60
Bibb	35	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Too acid	0.91
		Flooding	0.60	Flooding	0.60

Table 8.—Agricultural Waste Management, Part III—Continued

Map symbol and soil name	Pct. of map unit	Rapid infiltration of wastewater: Rating class and limiting features	Value	Slow rate treatment of wastewater: Rating class and limiting features	Value
8A:					
Levy	80	Very limited		Very limited	
		Ponding	1.00	Ponding	1.00
		Flooding	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Flooding	1.00
9A:					
Mattaponi	80	Very limited		Somewhat limited	
		Slow water movement	1.00	Too acid	0.91
		Depth to saturated zone	0.09	Slow water movement	0.15
		Too acid	0.07	Depth to saturated zone	0.09
9B:					
Mattaponi	80	Very limited		Somewhat limited	
		Slow water movement	1.00	Too acid	0.91
		Depth to saturated zone	0.09	Slow water movement	0.15
		Too acid	0.07	Depth to saturated zone	0.09
9C:					
Mattaponi	80	Very limited		Very limited	
		Slow water movement	1.00	Too steep for surface application	1.00
		Slope	1.00	Too acid	0.91
		Depth to saturated zone	0.09	Too steep for sprinkler irrigation	0.22
10A:					
Munden	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	0.99
		Slow water movement	0.62	Too acid	0.42
10B:					
Munden	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	0.99
		Slow water movement	0.62	Too acid	0.42
				Too steep for surface application	0.08
11A:					
Pits, gravel	80	Not rated		Not rated	
12A:					
Rappahannock	80	Very limited		Very limited	
		Ponding	1.00	Ponding	1.00
		Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Flooding	1.00

Table 8.—Agricultural Waste Management, Part III—Continued

Map symbol and soil name	Pct. of map unit	Rapid infiltration of wastewater: Rating class and limiting features	Value	Slow rate treatment of wastewater: Rating class and limiting features	Value
13A:					
Roanoke	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Too acid	0.91
		Too acid	0.07	Slow water movement	0.60
14B:					
Rumford	80	Somewhat limited		Very limited	
		Slow water movement	0.32	Filtering capacity	0.99
				Too acid	0.91
14C:					
Rumford	80	Very limited		Very limited	
		Slope	1.00	Too steep for surface application	1.00
		Slow water movement	0.32	Filtering capacity	0.99
				Too acid	0.91
15A:					
Slagle	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	0.99
		Depth to saturated zone	0.99	Too acid	0.91
15B:					
Slagle	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	0.99
		Depth to saturated zone	0.99	Too acid	0.91
				Too steep for surface application	0.08
15C:					
Slagle	80	Very limited		Very limited	
		Slow water movement	1.00	Too steep for surface application	1.00
		Slope	1.00	Depth to saturated zone	0.99
		Depth to saturated zone	0.99	Too acid	0.91
16A:					
State	80	Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Too acid	0.91
		Slow water movement	1.00		
		Too acid	0.07		

Table 8.—Agricultural Waste Management, Part III—Continued

Map symbol and soil name	Pct. of map unit	Rapid infiltration of wastewater: Rating class and limiting features	Value	Slow rate treatment of wastewater: Rating class and limiting features	Value
16B:					
State	80	Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Too acid	0.91
		Slow water movement	1.00	Too steep for surface application	0.08
		Too acid	0.07		
17A:					
Suffolk	80	Very limited		Somewhat limited	
		Slow water movement	1.00	Too acid	0.42
17B:					
Suffolk	80	Very limited		Somewhat limited	
		Slow water movement	1.00	Too acid	0.42
				Too steep for surface application	0.08
17C:					
Suffolk	80	Very limited		Very limited	
		Slow water movement	1.00	Too steep for surface application	1.00
		Slope	1.00	Too acid	0.42
				Too steep for sprinkler irrigation	0.22
18B:					
Tarboro	80	Not limited		Very limited	
				Filtering capacity	1.00
				Too acid	0.42
19A:					
Tetotum	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	0.99
		Slow water movement	1.00	Too acid	0.91
19B:					
Tetotum	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	0.99
		Slow water movement	1.00	Too acid	0.91
				Too steep for surface application	0.08
19C:					
Tetotum	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Too steep for surface application	1.00
		Slow water movement	1.00	Depth to saturated zone	0.99
		Slope	1.00	Too acid	0.91

Table 8.—Agricultural Waste Management, Part III—Continued

Map symbol and soil name	Pct. of map unit	Rapid infiltration of wastewater: Rating class and limiting features	Value	Slow rate treatment of wastewater: Rating class and limiting features	Value
20A:					
Tomotley-----------	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Too acid	1.00
		Too acid	0.42		
21A:					
Wahee---------------	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Slow water movement	0.94
		Too acid	0.07	Too acid	0.42
W:					
Water---------------	100	Not rated		Not rated	

Table 9.—Forestland Productivity

(Absence of an entry indicates that information was not available or that trees do not commonly grow on the soil)

Map symbol and soil name	Potential productivity: Common trees	Site index	Volume of wood fiber	Trees to manage
			cu ft/ac	
1A:				
Augusta	American sycamore	90	100	American sycamore, cherrybark oak, loblolly pine, sweetgum, yellow-poplar
	loblolly pine	90	129	
	southern red oak	80	57	
	sweetgum	90	100	
	white oak	80	57	
2A:				
Bojac	loblolly pine	80	114	loblolly pine, sweetgum
	southern red oak	65	43	
	sweetgum	80	86	
2B:				
Bojac	loblolly pine	80	114	loblolly pine, sweetgum
	southern red oak	65	43	
	sweetgum	80	86	
3A:				
Craven	loblolly pine	88	129	loblolly pine
	southern red oak	90	72	
	white oak	90	72	
	willow oak	85	86	
3B:				
Craven	loblolly pine	88	129	loblolly pine
	southern red oak	90	72	
	white oak	90	72	
	willow oak	85	86	
3C:				
Craven	loblolly pine	88	129	loblolly pine
	southern red oak	90	72	
	white oak	90	72	
	willow oak	85	86	
4A:				
Emporia	loblolly pine	75	100	loblolly pine, sweetgum
	southern red oak	70	57	
4B:				
Emporia	loblolly pine	75	100	loblolly pine, sweetgum
	southern red oak	70	57	
4C:				
Emporia	loblolly pine	75	100	loblolly pine, sweetgum
	southern red oak	70	57	
5D:				
Emporia	loblolly pine	75	100	loblolly pine, sweetgum
	southern red oak	70	57	
Slagle	loblolly pine	86	129	loblolly pine, sweetgum, yellow-poplar
	southern red oak	76	57	
	sweetgum	86	100	
	water oak	76	72	
	yellow-poplar	90	86	

Table 9.—Forestland Productivity—Continued

Map symbol and soil name	Potential productivity: Common trees	Site index	Volume of wood fiber	Trees to manage
			cu ft/ac	
5D:				
Rumford	loblolly pine	80	114	loblolly pine
	southern red oak	65	43	
	Virginia pine	70	114	
5E:				
Emporia	loblolly pine	75	100	loblolly pine, sweetgum
	southern red oak	70	57	
Slagle	loblolly pine	86	129	loblolly pine, sweetgum, yellow-poplar
	southern red oak	76	57	
	sweetgum	86	100	
	water oak	76	72	
	yellow-poplar	90	86	
Rumford	loblolly pine	80	114	loblolly pine
	southern red oak	65	43	
	Virginia pine	70	114	
6A:				
Faceville	loblolly pine	82	114	loblolly pine
	longleaf pine	65	72	
6B:				
Faceville	loblolly pine	82	114	loblolly pine
	longleaf pine	65	72	
7A:				
Kinston	cherrybark oak	95	57	American sycamore, cherrybark oak, eastern cottonwood, green ash, loblolly pine, sweetgum, yellow-poplar
	eastern cottonwood	100	129	
	loblolly pine	100	129	
	sweetgum	95	114	
	white oak	90	57	
Bibb	Atlantic white cedar	---	---	eastern cottonwood, loblolly pine, sweetgum, yellow-poplar
	blackgum	---	---	
	loblolly pine	100	157	
	sweetgum	90	100	
	water oak	90	86	
	yellow-poplar	---	---	
8A:				
Levy	baldcypress	100	---	baldcypress, sweetgum
	sweetgum	85	86	
9A:				
Mattaponi	loblolly pine	80	114	loblolly pine, shortleaf pine
	sweetgum	76	72	
	Virginia pine	70	114	
	white oak	70	57	
9B:				
Mattaponi	loblolly pine	80	114	loblolly pine, shortleaf pine
	sweetgum	76	72	
	Virginia pine	70	114	
	white oak	70	57	

Table 9.—Forestland Productivity—Continued

Map symbol and soil name	Potential productivity: Common trees	Site index	Volume of wood fiber	Trees to manage
			cu ft/ac	
9C:				
Mattaponi	loblolly pine	80	114	loblolly pine, shortleaf pine
	sweetgum	76	72	
	Virginia pine	70	114	
	white oak	70	57	
10A:				
Munden	loblolly pine	90	129	loblolly pine
	sweetgum	90	100	
	white oak	76	57	
10B:				
Munden	loblolly pine	90	129	loblolly pine
	sweetgum	90	100	
	white oak	76	57	
11A.				
Pits, gravel				
12A.				
Rappahannock				
13A:				
Roanoke	sweetgum	90	100	sweetgum
	white oak	75	57	
	willow oak	76	57	
14B:				
Rumford	loblolly pine	80	114	loblolly pine
	southern red oak	65	43	
	Virginia pine	70	114	
14C:				
Rumford	loblolly pine	80	114	loblolly pine
	southern red oak	65	43	
	Virginia pine	70	114	
15A:				
Slagle	loblolly pine	86	129	loblolly pine, sweetgum, yellow-poplar
	southern red oak	76	57	
	sweetgum	86	100	
	water oak	76	72	
	yellow-poplar	90	86	
15B:				
Slagle	loblolly pine	86	129	loblolly pine, sweetgum, yellow-poplar
	southern red oak	76	57	
	sweetgum	86	100	
	water oak	76	72	
	yellow-poplar	90	86	
15C:				
Slagle	loblolly pine	86	129	loblolly pine, sweetgum, yellow-poplar
	southern red oak	76	57	
	sweetgum	86	100	
	water oak	76	72	
	yellow-poplar	90	86	

Table 9.—Forestland Productivity—Continued

Map symbol and soil name	Potential productivity: Common trees	Site index	Volume of wood fiber	Trees to manage
			cu ft/ac	
16A:				
State	loblolly pine	86	129	black walnut, loblolly pine, yellow-poplar
	southern red oak	85	72	
	Virginia pine	85	129	
	yellow-poplar	100	114	
16B:				
State	loblolly pine	86	129	black walnut, loblolly pine, yellow-poplar
	southern red oak	85	72	
	Virginia pine	85	129	
	yellow-poplar	100	114	
17A:				
Suffolk	loblolly pine	82	114	loblolly pine
	shortleaf pine	72	114	
	southern red oak	70	57	
17B:				
Suffolk	loblolly pine	82	114	loblolly pine
	shortleaf pine	72	114	
	southern red oak	70	57	
17C:				
Suffolk	loblolly pine	82	114	loblolly pine
	shortleaf pine	72	114	
	southern red oak	70	57	
18B:				
Tarboro	loblolly pine	72	100	loblolly pine, longleaf pine
19A:				
Tetotum	loblolly pine	88	129	loblolly pine
	southern red oak	76	57	
	sweetgum	85	86	
19B:				
Tetotum	loblolly pine	88	129	loblolly pine
	southern red oak	76	57	
	sweetgum	85	86	
19C:				
Tetotum	loblolly pine	88	129	loblolly pine
	southern red oak	76	57	
	sweetgum	85	86	
20A:				
Tomotley	loblolly pine	97	143	loblolly pine
	water oak	78	72	
	willow oak	86	86	
21A:				
Wahee	loblolly pine	86	129	American sycamore, loblolly pine, sweetgum, water oak
	sweetgum	90	100	
W.				
Water				

Table 10.—Forestland Management, Part I

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Limitations affecting construction of haul roads and log landings		Suitability for log landings		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1A:							
Augusta---------	80	Slight		Moderately suited		Moderate	
				Wetness	0.50	Low strength	0.50
2A:							
Bojac-----------	80	Slight		Well suited		Moderate	
						Low strength	0.50
2B:							
Bojac-----------	80	Slight		Well suited		Moderate	
						Low strength	0.50
3A:							
Craven----------	80	Moderate		Moderately suited		Severe	
		Low strength	0.50	Low strength	0.50	Low strength	1.00
3B:							
Craven----------	80	Moderate		Moderately suited		Severe	
		Low strength	0.50	Low strength	0.50	Low strength	1.00
3C:							
Craven----------	80	Moderate		Moderately suited		Severe	
		Low strength	0.50	Slope	0.50	Low strength	1.00
				Low strength	0.50		
4A:							
Emporia---------	80	Slight		Well suited		Moderate	
						Low strength	0.50
4B:							
Emporia---------	80	Slight		Well suited		Moderate	
						Low strength	0.50
4C:							
Emporia---------	80	Slight		Moderately suited		Moderate	
				Slope	0.50	Low strength	0.50
5D:							
Emporia---------	35	Slight		Moderately suited		Moderate	
				Slope	0.50	Low strength	0.50
Slagle----------	30	Slight		Moderately suited		Moderate	
				Slope	0.50	Low strength	0.50
Rumford---------	15	Moderate		Moderately suited		Moderate	
		Sandiness	0.50	Slope	0.50	Low strength	0.50
				Sandiness	0.50		

Table 10.—Forestland Management, Part I—Continued

Map symbol and soil name	Pct. of map unit	Limitations affecting construction of haul roads and log landings		Suitability for log landings		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
5E:							
Emporia	35	Severe		Poorly suited		Moderate	
		Slope	1.00	Slope	1.00	Low strength	0.50
Slagle	30	Moderate		Poorly suited		Moderate	
		Slope	0.50	Slope	1.00	Low strength	0.50
Rumford	15	Severe		Poorly suited		Moderate	
		Slope	1.00	Slope	1.00	Low strength	0.50
				Sandiness	0.50		
6A:							
Faceville	80	Slight		Well suited		Moderate	
						Low strength	0.50
6B:							
Faceville	80	Slight		Well suited		Moderate	
						Low strength	0.50
7A:							
Kinston	45	Severe		Poorly suited		Severe	
		Flooding	1.00	Flooding	1.00	Low strength	1.00
		Low strength	0.50	Wetness	1.00		
				Low strength	0.50		
Bibb	35	Severe		Poorly suited		Moderate	
		Flooding	1.00	Flooding	1.00	Low strength	0.50
				Wetness	1.00		
8A:							
Levy	80	Severe		Poorly suited		Severe	
		Flooding	1.00	Ponding	1.00	Low strength	1.00
		Wetness	1.00	Flooding	1.00	Wetness	0.50
		Low strength	0.50	Wetness	1.00		
9A:							
Mattaponi	80	Slight		Well suited		Moderate	
						Low strength	0.50
9B:							
Mattaponi	80	Slight		Well suited		Moderate	
						Low strength	0.50
9C:							
Mattaponi	80	Slight		Moderately suited		Moderate	
				Slope	0.50	Low strength	0.50
10A:							
Munden	80	Moderate		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
10B:							
Munden	80	Moderate		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
11A:							
Pits, gravel	80	Not rated		Not rated		Not rated	

Table 10.—Forestland Management, Part I—Continued

Map symbol and soil name	Pct. of map unit	Limitations affecting construction of haul roads and log landings: Rating class and limiting features	Value	Suitability for log landings: Rating class and limiting features	Value	Soil rutting hazard: Rating class and limiting features	Value
12A:							
Rappahannock----	80	Severe		Poorly suited		Severe	
		Flooding	1.00	Ponding	1.00	Low strength	1.00
		Wetness	1.00	Flooding	1.00	Wetness	0.50
				Low strength	1.00		
13A:							
Roanoke---------	80	Moderate		Poorly suited		Severe	
		Low strength	0.50	Wetness	1.00	Low strength	1.00
				Low strength	0.50		
14B:							
Rumford---------	80	Moderate		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
14C:							
Rumford---------	80	Moderate		Moderately suited		Moderate	
		Sandiness	0.50	Slope	0.50	Low strength	0.50
				Sandiness	0.50		
15A:							
Slagle----------	80	Slight		Well suited		Moderate	
						Low strength	0.50
15B:							
Slagle----------	80	Slight		Well suited		Moderate	
						Low strength	0.50
15C:							
Slagle----------	80	Slight		Moderately suited		Moderate	
				Slope	0.50	Low strength	0.50
16A:							
State-----------	80	Slight		Well suited		Moderate	
						Low strength	0.50
16B:							
State-----------	80	Slight		Well suited		Moderate	
						Low strength	0.50
17A:							
Suffolk---------	80	Slight		Well suited		Moderate	
						Low strength	0.50
17B:							
Suffolk---------	80	Slight		Well suited		Moderate	
						Low strength	0.50
17C:							
Suffolk---------	80	Slight		Moderately suited		Moderate	
				Slope	0.50	Low strength	0.50
18B:							
Tarboro---------	80	Moderate		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50

Table 10.—Forestland Management, Part I—Continued

Map symbol and soil name	Pct. of map unit	Limitations affecting construction of haul roads and log landings		Suitability for log landings		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
19A:							
Tetotum----------	80	Moderate		Moderately suited		Severe	
		Low strength	0.50	Sandiness	0.50	Low strength	1.00
		Sandiness	0.50	Low strength	0.50		
19B:							
Tetotum----------	80	Moderate		Moderately suited		Severe	
		Low strength	0.50	Sandiness	0.50	Low strength	1.00
		Sandiness	0.50	Low strength	0.50		
19C:							
Tetotum----------	80	Moderate		Moderately suited		Severe	
		Low strength	0.50	Slope	0.50	Low strength	1.00
		Sandiness	0.50	Sandiness	0.50		
				Low strength	0.50		
20A:							
Tomotley---------	80	Slight		Poorly suited		Severe	
				Wetness	1.00	Low strength	1.00
				Low strength	0.50		
21A:							
Wahee------------	80	Moderate		Moderately suited		Severe	
		Low strength	0.50	Wetness	0.50	Low strength	1.00
				Low strength	0.50		
W:							
Water------------	100	Not rated		Not rated		Not rated	

Table 10.—Forestland Management, Part II

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion: Rating class and limiting features	Value	Hazard of erosion on roads and trails: Rating class and limiting features	Value	Suitability for roads (natural surface): Rating class and limiting features	Value
1A:							
Augusta	80	Slight		Slight		Moderately suited	
						Wetness	0.50
2A:							
Bojac	80	Slight		Slight		Well suited	
2B:							
Bojac	80	Slight		Slight		Well suited	
3A:							
Craven	80	Slight		Slight		Moderately suited	
						Low strength	0.50
3B:							
Craven	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
3C:							
Craven	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
4A:							
Emporia	80	Slight		Slight		Well suited	
4B:							
Emporia	80	Slight		Moderate		Well suited	
				Slope/erodibility	0.50		
4C:							
Emporia	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
5D:							
Emporia	35	Slight		Severe		Moderately suited	
				Slope/erodibility	0.95	Slope	0.50
Slagle	30	Slight		Severe		Moderately suited	
				Slope/erodibility	0.95	Slope	0.50
Rumford	15	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Sandiness	0.50
5E:							
Emporia	35	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
Slagle	30	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00

Table 10.—Forestland Management, Part II—Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion: Rating class and limiting features	Value	Hazard of erosion on roads and trails: Rating class and limiting features	Value	Suitability for roads (natural surface): Rating class and limiting features	Value
5E:							
Rumford----------	15	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Sandiness	0.50
6A:							
Faceville--------	80	Slight		Slight		Well suited	
6B:							
Faceville--------	80	Slight		Moderate		Well suited	
				Slope/erodibility	0.50		
7A:							
Kinston----------	45	Slight		Slight		Poorly suited	
						Flooding	1.00
						Wetness	1.00
						Low strength	0.50
Bibb-------------	35	Slight		Slight		Poorly suited	
						Flooding	1.00
						Wetness	1.00
8A:							
Levy-------------	80	Slight		Slight		Poorly suited	
						Ponding	1.00
						Flooding	1.00
						Wetness	1.00
9A:							
Mattaponi--------	80	Slight		Slight		Well suited	
9B:							
Mattaponi--------	80	Slight		Moderate		Well suited	
				Slope/erodibility	0.50		
9C:							
Mattaponi--------	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
10A:							
Munden-----------	80	Slight		Slight		Moderately suited	
						Sandiness	0.50
10B:							
Munden-----------	80	Slight		Slight		Moderately suited	
						Sandiness	0.50
11A:							
Pits, gravel-----	80	Not rated		Not rated		Not rated	
12A:							
Rappahannock-----	80	Very severe		Very severe		Poorly suited	
		Organic matter content high	1.00	Organic matter content high	1.00	Ponding	1.00
						Flooding	1.00
						Low strength	1.00
13A:							
Roanoke----------	80	Slight		Slight		Poorly suited	
						Wetness	1.00
						Low strength	0.50

Table 10.—Forestland Management, Part II—Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion: Rating class and limiting features	Value	Hazard of erosion on roads and trails: Rating class and limiting features	Value	Suitability for roads (natural surface): Rating class and limiting features	Value
14B:							
Rumford----------	80	Slight		Slight		Moderately suited	
						Sandiness	0.50
14C:							
Rumford----------	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Sandiness	0.50
15A:							
Slagle-----------	80	Slight		Slight		Well suited	
15B:							
Slagle-----------	80	Slight		Moderate		Well suited	
				Slope/erodibility	0.50		
15C:							
Slagle-----------	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
16A:							
State------------	80	Slight		Slight		Well suited	
16B:							
State------------	80	Slight		Moderate		Well suited	
				Slope/erodibility	0.50		
17A:							
Suffolk----------	80	Slight		Slight		Well suited	
17B:							
Suffolk----------	80	Slight		Slight		Well suited	
17C:							
Suffolk----------	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
18B:							
Tarboro----------	80	Slight		Slight		Moderately suited	
						Sandiness	0.50
19A:							
Tetotum----------	80	Slight		Slight		Moderately suited	
						Sandiness	0.50
						Low strength	0.50
19B:							
Tetotum----------	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Sandiness	0.50
						Low strength	0.50
19C:							
Tetotum----------	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Sandiness	0.50
						Low strength	0.50

Table 10.—Forestland Management, Part II—Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
20A:							
Tomotley--------	80	Slight		Slight		Poorly suited	
						Wetness	1.00
						Low strength	0.50
21A:							
Wahee-----------	80	Slight		Slight		Moderately suited	
						Wetness	0.50
						Low strength	0.50
W:							
Water-----------	100	Not rated		Not rated		Not rated	

Table 10.—Forestland Management, Part III

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Suitability for hand planting: Rating class and limiting features	Value	Suitability for mechanical planting: Rating class and limiting features	Value	Suitability for use of harvesting equipment: Rating class and limiting features	Value
1A:							
Augusta	80	Moderately suited		Moderately suited		Well suited	
		Stickiness; high plasticity index	0.50	Stickiness; high plasticity index	0.50		
2A:							
Bojac	80	Well suited		Well suited		Well suited	
2B:							
Bojac	80	Well suited		Well suited		Well suited	
3A:							
Craven	80	Poorly suited		Poorly suited		Moderately suited	
		Stickiness; high plasticity index	0.75	Stickiness; high plasticity index	0.75	Low strength	0.50
3B:							
Craven	80	Poorly suited		Poorly suited		Moderately suited	
		Stickiness; high plasticity index	0.75	Stickiness; high plasticity index	0.75	Low strength	0.50
3C:							
Craven	80	Poorly suited		Poorly suited		Moderately suited	
		Stickiness; high plasticity index	0.75	Stickiness; high plasticity index	0.75	Low strength	0.50
				Slope	0.50		
4A:							
Emporia	80	Well suited		Well suited		Well suited	
4B:							
Emporia	80	Well suited		Well suited		Well suited	
4C:							
Emporia	80	Well suited		Moderately suited		Well suited	
				Slope	0.50		
5D:							
Emporia	35	Well suited		Moderately suited		Well suited	
				Slope	0.50		
Slagle	30	Well suited		Moderately suited		Well suited	
				Slope	0.50		
Rumford	15	Moderately suited		Moderately suited		Moderately suited	
		Sandiness	0.50	Slope	0.50	Sandiness	0.50
				Sandiness	0.50		
5E:							
Emporia	35	Well suited		Unsuited		Moderately suited	
				Slope	1.00	Slope	0.50
Slagle	30	Well suited		Poorly suited		Moderately suited	
				Slope	0.75	Slope	0.50

Table 10.—Forestland Management, Part III—Continued

Map symbol and soil name	Pct. of map unit	Suitability for hand planting: Rating class and limiting features	Value	Suitability for mechanical planting: Rating class and limiting features	Value	Suitability for use of harvesting equipment: Rating class and limiting features	Value
5E:							
Rumford	15	Moderately suited		Unsuited		Moderately suited	
		Sandiness	0.50	Slope	1.00	Slope	0.50
				Sandiness	0.50	Sandiness	0.50
6A:							
Faceville	80	Well suited		Well suited		Well suited	
6B:							
Faceville	80	Well suited		Well suited		Well suited	
7A:							
Kinston	45	Moderately suited		Moderately suited		Moderately suited	
		Stickiness; high plasticity index	0.50	Stickiness; high plasticity index	0.50	Low strength	0.50
Bibb	35	Well suited		Well suited		Well suited	
8A:							
Levy	80	Poorly suited		Poorly suited		Poorly suited	
		Wetness	0.75	Wetness	0.75	Wetness	1.00
		Stickiness; high plasticity index	0.75	Stickiness; high plasticity index	0.75	Low strength	0.50
9A:							
Mattaponi	80	Poorly suited		Poorly suited		Well suited	
		Stickiness; high plasticity index	0.75	Stickiness; high plasticity index	0.75		
9B:							
Mattaponi	80	Poorly suited		Poorly suited		Well suited	
		Stickiness; high plasticity index	0.75	Stickiness; high plasticity index	0.75		
9C:							
Mattaponi	80	Poorly suited		Poorly suited		Well suited	
		Stickiness; high plasticity index	0.75	Stickiness; high plasticity index	0.75		
				Slope	0.50		
10A:							
Munden	80	Moderately suited		Moderately suited		Moderately suited	
		Sandiness	0.50	Sandiness	0.50	Sandiness	0.50
10B:							
Munden	80	Moderately suited		Moderately suited		Moderately suited	
		Sandiness	0.50	Sandiness	0.50	Sandiness	0.50
11A:							
Pits, gravel	80	Not rated		Not rated		Not rated	
12A:							
Rappahannock	80	Poorly suited		Poorly suited		Poorly suited	
		Wetness	0.75	Wetness	0.75	Low strength	1.00
						Wetness	1.00
13A:							
Roanoke	80	Poorly suited		Poorly suited		Moderately suited	
		Stickiness; high plasticity index	0.75	Stickiness; high plasticity index	0.75	Low strength	0.50

Table 10.—Forestland Management, Part III—Continued

Map symbol and soil name	Pct. of map unit	Suitability for hand planting: Rating class and limiting features	Value	Suitability for mechanical planting: Rating class and limiting features	Value	Suitability for use of harvesting equipment: Rating class and limiting features	Value
14B:							
Rumford	80	Moderately suited		Moderately suited		Moderately suited	
		Sandiness	0.50	Sandiness	0.50	Sandiness	0.50
14C:							
Rumford	80	Moderately suited		Moderately suited		Moderately suited	
		Sandiness	0.50	Slope	0.50	Sandiness	0.50
				Sandiness	0.50		
15A:							
Slagle	80	Well suited		Well suited		Well suited	
15B:							
Slagle	80	Well suited		Well suited		Well suited	
15C:							
Slagle	80	Well suited		Moderately suited		Well suited	
				Slope	0.50		
16A:							
State	80	Well suited		Well suited		Well suited	
16B:							
State	80	Well suited		Well suited		Well suited	
17A:							
Suffolk	80	Well suited		Well suited		Well suited	
17B:							
Suffolk	80	Well suited		Well suited		Well suited	
17C:							
Suffolk	80	Well suited		Moderately suited		Well suited	
				Slope	0.50		
18B:							
Tarboro	80	Moderately suited		Moderately suited		Moderately suited	
		Sandiness	0.50	Sandiness	0.50	Sandiness	0.50
19A:							
Tetotum	80	Moderately suited		Moderately suited		Moderately suited	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
						Sandiness	0.50
19B:							
Tetotum	80	Moderately suited		Moderately suited		Moderately suited	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
						Sandiness	0.50
19C:							
Tetotum	80	Moderately suited		Moderately suited		Moderately suited	
		Sandiness	0.50	Slope	0.50	Low strength	0.50
				Sandiness	0.50	Sandiness	0.50
20A:							
Tomotley	80	Well suited		Well suited		Moderately suited	
						Low strength	0.50

Table 10.—Forestland Management, Part III—Continued

Map symbol and soil name	Pct. of map unit	Suitability for hand planting: Rating class and limiting features	Value	Suitability for mechanical planting: Rating class and limiting features	Value	Suitability for use of harvesting equipment: Rating class and limiting features	Value
21A:							
Wahee-----------	80	Poorly suited		Poorly suited		Moderately suited	
		Stickiness; high plasticity index	0.75	Stickiness; high plasticity index	0.75	Low strength	0.50
W:							
Water-----------	100	Not rated		Not rated		Not rated	

Table 10.—Forestland Management, Part IV

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (surface)		Suitability for mechanical site preparation (deep)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
1A:					
Augusta	80	Well suited		Well suited	
2A:					
Bojac	80	Well suited		Well suited	
2B:					
Bojac	80	Well suited		Well suited	
3A:					
Craven	80	Poorly suited		Well suited	
		Stickiness; high plasticity index	0.50		
3B:					
Craven	80	Poorly suited		Well suited	
		Stickiness; high plasticity index	0.50		
3C:					
Craven	80	Poorly suited		Well suited	
		Stickiness; high plasticity index	0.50		
4A:					
Emporia	80	Well suited		Well suited	
4B:					
Emporia	80	Well suited		Well suited	
4C:					
Emporia	80	Well suited		Well suited	
5D:					
Emporia	35	Well suited		Well suited	
Slagle	30	Well suited		Well suited	
Rumford	15	Well suited		Well suited	
5E:					
Emporia	35	Poorly suited		Poorly suited	
		Slope	0.50	Slope	0.50
Slagle	30	Poorly suited		Poorly suited	
		Slope	0.50	Slope	0.50
Rumford	15	Poorly suited		Poorly suited	
		Slope	0.50	Slope	0.50
6A:					
Faceville	80	Well suited		Well suited	

Table 10.—Forestland Management, Part IV—Continued

Map symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (surface): Rating class and limiting features	Value	Suitability for mechanical site preparation (deep): Rating class and limiting features	Value
6B:					
Faceville	80	Well suited		Well suited	
7A:					
Kinston	45	Well suited		Well suited	
Bibb	35	Well suited		Well suited	
8A:					
Levy	80	Unsuited		Unsuited	
		Wetness	0.75	Wetness	1.00
		Stickiness; high plasticity index	0.50		
9A:					
Mattaponi	80	Poorly suited		Well suited	
		Stickiness; high plasticity index	0.50		
9B:					
Mattaponi	80	Poorly suited		Well suited	
		Stickiness; high plasticity index	0.50		
9C:					
Mattaponi	80	Poorly suited		Well suited	
		Stickiness; high plasticity index	0.50		
10A:					
Munden	80	Well suited		Well suited	
10B:					
Munden	80	Well suited		Well suited	
11A:					
Pits, gravel	80	Not rated		Not rated	
12A:					
Rappahannock	80	Unsuited		Unsuited	
		Wetness	0.75	Wetness	1.00
13A:					
Roanoke	80	Poorly suited		Well suited	
		Stickiness; high plasticity index	0.50		
14B:					
Rumford	80	Well suited		Well suited	
14C:					
Rumford	80	Well suited		Well suited	
15A:					
Slagle	80	Well suited		Well suited	
15B:					
Slagle	80	Well suited		Well suited	

Table 10.—Forestland Management, Part IV—Continued

Map symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (surface): Rating class and limiting features	Value	Suitability for mechanical site preparation (deep): Rating class and limiting features	Value
15C:					
Slagle	80	Well suited		Well suited	
16A:					
State	80	Well suited		Well suited	
16B:					
State	80	Well suited		Well suited	
17A:					
Suffolk	80	Well suited		Well suited	
17B:					
Suffolk	80	Well suited		Well suited	
17C:					
Suffolk	80	Well suited		Well suited	
18B:					
Tarboro	80	Well suited		Well suited	
19A:					
Tetotum	80	Well suited		Well suited	
19B:					
Tetotum	80	Well suited		Well suited	
19C:					
Tetotum	80	Well suited		Well suited	
20A:					
Tomotley	80	Well suited		Well suited	
21A:					
Wahee	80	Poorly suited		Well suited	
		Stickiness; high plasticity index	0.50		
W:					
Water	100	Not rated		Not rated	

Table 10.—Forestland Management, Part V

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
1A:					
Augusta	80	Moderate		Low	
		Texture/rock fragments	0.50		
2A:					
Bojac	80	High		Low	
		Texture/rock fragments	1.00		
2B:					
Bojac	80	High		Low	
		Texture/rock fragments	1.00		
3A:					
Craven	80	Moderate		Low	
		Texture/rock fragments	0.50		
3B:					
Craven	80	Moderate		Low	
		Texture/rock fragments	0.50		
3C:					
Craven	80	Moderate		Low	
		Texture/rock fragments	0.50		
4A:					
Emporia	80	Moderate		Low	
		Texture/rock fragments	0.50		
4B:					
Emporia	80	Moderate		Low	
		Texture/rock fragments	0.50		
4C:					
Emporia	80	Moderate		Low	
		Texture/rock fragments	0.50		
5D:					
Emporia	35	Moderate		Low	
		Texture/rock fragments	0.50		
Slagle	30	Moderate		Low	
		Texture/rock fragments	0.50		

Table 10.—Forestland Management, Part V—Continued

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire: Rating class and limiting features	Value	Potential for seedling mortality: Rating class and limiting features	Value
5D:					
Rumford	15	High		Low	
		Texture/rock fragments	1.00		
5E:					
Emporia	35	Moderate		Low	
		Texture/rock fragments	0.50		
Slagle	30	Moderate		Low	
		Texture/rock fragments	0.50		
Rumford	15	High		Low	
		Texture/rock fragments	1.00		
6A:					
Faceville	80	Moderate		Low	
		Texture/rock fragments	0.50		
6B:					
Faceville	80	Moderate		Low	
		Texture/rock fragments	0.50		
7A:					
Kinston	45	Low		High	
		Texture/surface depth/rock fragments	0.10	Wetness	1.00
Bibb	35	Low		High	
		Texture/rock fragments	0.10	Wetness	1.00
8A:					
Levy	80	Low		High	
		Texture/surface depth/rock fragments	0.10	Wetness	1.00
9A:					
Mattaponi	80	Moderate		Low	
		Texture/rock fragments	0.50		
9B:					
Mattaponi	80	Moderate		Low	
		Texture/rock fragments	0.50		
9C:					
Mattaponi	80	Moderate		Low	
		Texture/rock fragments	0.50		

Table 10.—Forestland Management, Part V—Continued

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire: Rating class and limiting features	Value	Potential for seedling mortality: Rating class and limiting features	Value
10A:					
Munden	80	High		Low	
		Texture/rock fragments	1.00		
10B:					
Munden	80	High		Low	
		Texture/rock fragments	1.00		
11A:					
Pits, gravel	80	Not rated		Not rated	
12A:					
Rappahannock	80	Low		High	
				Wetness	1.00
13A:					
Roanoke	80	Moderate		High	
		Texture/rock fragments	0.50	Wetness	1.00
14B:					
Rumford	80	High		Low	
		Texture/rock fragments	1.00		
14C:					
Rumford	80	High		Low	
		Texture/rock fragments	1.00		
15A:					
Slagle	80	Moderate		Low	
		Texture/rock fragments	0.50		
15B:					
Slagle	80	Moderate		Low	
		Texture/rock fragments	0.50		
15C:					
Slagle	80	Moderate		Low	
		Texture/rock fragments	0.50		
16A:					
State	80	Moderate		Low	
		Texture/rock fragments	0.50		
16B:					
State	80	Moderate		Low	
		Texture/rock fragments	0.50		

Table 10.—Forestland Management, Part V—Continued

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire: Rating class and limiting features	Value	Potential for seedling mortality: Rating class and limiting features	Value
17A:					
Suffolk	80	Moderate		Low	
		Texture/rock fragments	0.50		
17B:					
Suffolk	80	High		Low	
		Texture/rock fragments	1.00		
17C:					
Suffolk	80	High		Low	
		Texture/rock fragments	1.00		
18B:					
Tarboro	80	High		Low	
		Texture/rock fragments	1.00		
19A:					
Tetotum	80	Moderate		Low	
		Texture/rock fragments	0.50		
19B:					
Tetotum	80	Moderate		Low	
		Texture/rock fragments	0.50		
19C:					
Tetotum	80	Moderate		Low	
		Texture/rock fragments	0.50		
20A:					
Tomotley	80	Low		High	
		Texture/rock fragments	0.10	Wetness	1.00
21A:					
Wahee	80	Low		High	
		Texture/rock fragments	0.10	Wetness	1.00
W:					
Water	100	Not rated		Not rated	

Table 11.—Recreational Development, Part I

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value	Playgrounds: Rating class and limiting features	Playgrounds: Value
1A:							
Augusta---------	80	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Depth to saturated zone	0.75	Depth to saturated zone	0.98
		Depth to saturated zone	0.98	Too sandy	0.01	Too sandy	0.01
		Too sandy	0.01				
2A:							
Bojac-----------	80	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Too sandy	0.33	Too sandy	0.33
		Too sandy	0.33				
2B:							
Bojac-----------	80	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Too sandy	0.33	Slope	0.50
		Too sandy	0.33			Too sandy	0.33
3A:							
Craven----------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.94	Slow water movement	0.94	Slow water movement	0.94
3B:							
Craven----------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.94	Slow water movement	0.94	Slow water movement	0.94
						Slope	0.50
3C:							
Craven----------	80	Somewhat limited		Somewhat limited		Very limited	
		Slow water movement	0.94	Slow water movement	0.94	Slope	1.00
		Slope	0.01	Slope	0.01	Slow water movement	0.94
4A:							
Emporia---------	80	Not limited		Not limited		Not limited	
4B:							
Emporia---------	80	Not limited		Not limited		Somewhat limited	
						Slope	0.50
4C:							
Emporia---------	80	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.01	Slope	0.01	Slope	1.00
5D:							
Emporia---------	35	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.37	Slope	0.37	Slope	1.00
Slagle----------	30	Somewhat limited		Somewhat limited		Very limited	
		Depth to saturated zone	0.39	Slope	0.37	Slope	1.00
		Slope	0.37	Depth to saturated zone	0.19	Depth to saturated zone	0.39

Table 11.—Recreational Development, Part I—Continued

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Value	Picnic areas: Rating class and limiting features	Value	Playgrounds: Rating class and limiting features	Value
5D:							
Rumford	15	Somewhat limited		Somewhat limited		Very limited	
		Too sandy	0.81	Too sandy	0.81	Slope	1.00
		Slope	0.37	Slope	0.37	Too sandy	0.81
5E:							
Emporia	35	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
Slagle	30	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Depth to saturated zone	0.39
Rumford	15	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Too sandy	0.81	Too sandy	0.81	Too sandy	0.81
6A:							
Faceville	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.01	Too sandy	0.01	Too sandy	0.01
6B:							
Faceville	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.01	Too sandy	0.01	Slope	0.50
						Too sandy	0.01
7A:							
Kinston	45	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00			Flooding	0.60
Bibb	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00			Flooding	0.60
8A:							
Levy	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Ponding	1.00	Depth to saturated zone	1.00
				Depth to saturated zone	1.00		
		Flooding	1.00			Flooding	1.00
		Ponding	1.00	Sodium content	1.00	Ponding	1.00
9A:							
Mattaponi	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.15	Slow water movement	0.15	Slow water movement	0.15
9B:							
Mattaponi	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.15	Slow water movement	0.15	Slope	0.50
						Slow water movement	0.15

Table 11.—Recreational Development, Part I—Continued

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Value	Picnic areas: Rating class and limiting features	Value	Playgrounds: Rating class and limiting features	Value
9C:							
Mattaponi-------	80	Somewhat limited		Somewhat limited		Very limited	
		Slow water movement	0.15	Slow water movement	0.15	Slope	1.00
		Slope	0.01	Slope	0.01	Slow water movement	0.15
10A:							
Munden----------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.84	Too sandy	0.84	Too sandy	0.84
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Depth to saturated zone	0.39
10B:							
Munden----------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.84	Too sandy	0.84	Too sandy	0.84
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Slope	0.50
						Depth to saturated zone	0.39
11A:							
Pits, gravel----	80	Not rated		Not rated		Not rated	
12A:							
Rappahannock----	80	Not rated		Not rated		Not rated	
13A:							
Roanoke---------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Slow water movement	0.60	Slow water movement	0.60
		Slow water movement	0.60				
14B:							
Rumford---------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.81	Too sandy	0.81	Too sandy	0.81
						Slope	0.12
14C:							
Rumford---------	80	Somewhat limited		Somewhat limited		Very limited	
		Too sandy	0.81	Too sandy	0.81	Slope	1.00
		Slope	0.01	Slope	0.01	Too sandy	0.81
15A:							
Slagle----------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Depth to saturated zone	0.39
15B:							
Slagle----------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Slope	0.50
						Depth to saturated zone	0.39
15C:							
Slagle----------	80	Somewhat limited		Somewhat limited		Very limited	
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Slope	1.00
		Slope	0.01	Slope	0.01	Depth to saturated zone	0.39

Table 11.—Recreational Development, Part I—Continued

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value	Playgrounds: Rating class and limiting features	Playgrounds: Value
16A:							
State	80	Not limited		Not limited		Not limited	
16B:							
State	80	Not limited		Not limited		Somewhat limited	
						Slope	0.50
17A:							
Suffolk	80	Not limited		Not limited		Not limited	
17B:							
Suffolk	80	Not limited		Not limited		Somewhat limited	
						Slope	0.50
17C:							
Suffolk	80	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.01	Slope	0.01	Slope	1.00
18B:							
Tarboro	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Too sandy	1.00	Too sandy	1.00
		Too sandy	1.00			Slope	0.12
19A:							
Tetotum	80	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Depth to saturated zone	0.19	Depth to saturated zone	0.39
		Depth to saturated zone	0.39				
19B:							
Tetotum	80	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Depth to saturated zone	0.19	Slope	0.50
		Depth to saturated zone	0.39			Depth to saturated zone	0.39
19C:							
Tetotum	80	Somewhat limited		Somewhat limited		Very limited	
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Slope	1.00
		Slope	0.01	Slope	0.01	Depth to saturated zone	0.39
20A:							
Tomotley	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Too sandy	0.01	Too sandy	0.01
		Too sandy	0.01				
21A:							
Wahee	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	0.99	Depth to saturated zone	1.00
		Flooding	1.00	Slow water movement	0.94	Slow water movement	0.94
		Slow water movement	0.94	Too sandy	0.01	Too sandy	0.01
W:							
Water	100	Not rated		Not rated		Not rated	

Table 11.—Recreational Development, Part II

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Paths and trails		Off-road motorcycle trails		Golf fairways	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1A:							
Augusta---------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
		Too sandy	0.01	Too sandy	0.01		
2A:							
Bojac-----------	80	Somewhat limited		Somewhat limited		Not limited	
		Too sandy	0.33	Too sandy	0.33		
2B:							
Bojac-----------	80	Somewhat limited		Somewhat limited		Not limited	
		Too sandy	0.33	Too sandy	0.33		
3A:							
Craven----------	80	Not limited		Not limited		Not limited	
3B:							
Craven----------	80	Not limited		Not limited		Not limited	
3C:							
Craven----------	80	Not limited		Not limited		Somewhat limited	
						Slope	0.01
4A:							
Emporia---------	80	Not limited		Not limited		Not limited	
4B:							
Emporia---------	80	Not limited		Not limited		Not limited	
4C:							
Emporia---------	80	Not limited		Not limited		Somewhat limited	
						Slope	0.01
5D:							
Emporia---------	35	Not limited		Not limited		Somewhat limited	
						Slope	0.37
Slagle----------	30	Not limited		Not limited		Somewhat limited	
						Slope	0.37
						Depth to saturated zone	0.19
Rumford---------	15	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.81	Too sandy	0.81	Slope	0.37
5E:							
Emporia---------	35	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Slope	0.56	Slope	1.00
Slagle----------	30	Somewhat limited		Not limited		Very limited	
		Slope	0.50			Slope	1.00
						Depth to saturated zone	0.19

Table 11.—Recreational Development, Part II—Continued

Map symbol and soil name	Pct. of map unit	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
5E:							
Rumford	15	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Too sandy	0.81	Slope	1.00
		Too sandy	0.81	Slope	0.56		
6A:							
Faceville	80	Somewhat limited		Somewhat limited		Not limited	
		Too sandy	0.01	Too sandy	0.01		
6B:							
Faceville	80	Somewhat limited		Somewhat limited		Not limited	
		Too sandy	0.01	Too sandy	0.01		
7A:							
Kinston	45	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Flooding	0.60
Bibb	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Flooding	0.60
8A:							
Levy	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Ponding	1.00
		Ponding	1.00	Ponding	1.00	Flooding	1.00
		Flooding	0.60	Flooding	0.60	Depth to saturated zone	1.00
9A:							
Mattaponi	80	Not limited		Not limited		Not limited	
9B:							
Mattaponi	80	Not limited		Not limited		Not limited	
9C:							
Mattaponi	80	Not limited		Not limited		Somewhat limited	
						Slope	0.01
10A:							
Munden	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.84	Too sandy	0.84	Depth to saturated zone	0.19
10B:							
Munden	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.84	Too sandy	0.84	Depth to saturated zone	0.19
11A:							
Pits, gravel	80	Not rated		Not rated		Not rated	
12A:							
Rappahannock	80	Not rated		Not rated		Not rated	

Table 11.—Recreational Development, Part II—Continued

Map symbol and soil name	Pct. of map unit	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
13A:							
Roanoke---------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
14B:							
Rumford---------	80	Somewhat limited		Somewhat limited		Not limited	
		Too sandy	0.81	Too sandy	0.81		
14C:							
Rumford---------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.81	Too sandy	0.81	Slope	0.01
15A:							
Slagle----------	80	Not limited		Not limited		Somewhat limited	
						Depth to saturated zone	0.19
15B:							
Slagle----------	80	Not limited		Not limited		Somewhat limited	
						Depth to saturated zone	0.19
15C:							
Slagle----------	80	Not limited		Not limited		Somewhat limited	
						Depth to saturated zone	0.19
						Slope	0.01
16A:							
State-----------	80	Not limited		Not limited		Not limited	
16B:							
State-----------	80	Not limited		Not limited		Not limited	
17A:							
Suffolk---------	80	Not limited		Not limited		Not limited	
17B:							
Suffolk---------	80	Not limited		Not limited		Not limited	
17C:							
Suffolk---------	80	Not limited		Not limited		Somewhat limited	
						Slope	0.01
18B:							
Tarboro---------	80	Very limited		Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00	Droughty	1.00
						Too sandy	0.50
19A:							
Tetotum---------	80	Not limited		Not limited		Somewhat limited	
						Depth to saturated zone	0.19
19B:							
Tetotum---------	80	Not limited		Not limited		Somewhat limited	
						Depth to saturated zone	0.19

Table 11.—Recreational Development, Part II—Continued

Map symbol and soil name	Pct. of map unit	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
19C:							
Tetotum----------	80	Not limited		Not limited		Somewhat limited	
						Depth to saturated zone	0.19
						Slope	0.01
20A:							
Tomotley---------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too sandy	0.01	Too sandy	0.01		
21A:							
Wahee------------	80	Somewhat limited		Somewhat limited		Very limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.99	Depth to saturated zone	0.99
		Too sandy	0.01	Too sandy	0.01		
W:							
Water------------	100	Not rated		Not rated		Not rated	

Table 12.—Building Site Development, Part I

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1A:							
Augusta---------	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98
2A:							
Bojac-----------	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
				Depth to saturated zone	0.15		
2B:							
Bojac-----------	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
				Depth to saturated zone	0.15		
3A:							
Craven----------	80	Somewhat limited		Very limited		Somewhat limited	
		Shrink-swell	0.50	Depth to saturated zone	0.99	Shrink-swell	0.50
				Shrink-swell	0.50		
3B:							
Craven----------	80	Somewhat limited		Very limited		Somewhat limited	
		Shrink-swell	0.50	Depth to saturated zone	0.99	Shrink-swell	0.50
				Shrink-swell	0.50		
3C:							
Craven----------	80	Somewhat limited		Very limited		Very limited	
		Shrink-swell	0.50	Depth to saturated zone	0.99	Slope	1.00
		Slope	0.01	Shrink-swell	0.50	Shrink-swell	0.50
				Slope	0.01		
4A:							
Emporia---------	80	Not limited		Somewhat limited		Not limited	
				Depth to saturated zone	0.82		
4B:							
Emporia---------	80	Not limited		Somewhat limited		Not limited	
				Depth to saturated zone	0.82		
4C:							
Emporia---------	80	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.01	Depth to saturated zone	0.82	Slope	1.00
				Slope	0.01		

Table 12.—Building Site Development, Part I—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
5D:							
Emporia----------	35	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.37	Depth to saturated zone	0.82	Slope	1.00
				Slope	0.37		
Slagle-----------	30	Somewhat limited		Very limited		Very limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Slope	1.00
		Slope	0.37	Slope	0.37	Depth to saturated zone	0.39
Rumford----------	15	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.37	Slope	0.37	Slope	1.00
5E:							
Emporia----------	35	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
				Depth to saturated zone	0.82		
Slagle-----------	30	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39
Rumford----------	15	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
6A:							
Faceville--------	80	Not limited		Not limited		Not limited	
6B:							
Faceville--------	80	Not limited		Not limited		Not limited	
7A:							
Kinston----------	45	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
Bibb-------------	35	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
8A:							
Levy-------------	80	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
9A:							
Mattaponi--------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.50	Depth to saturated zone	0.82	Shrink-swell	0.50
				Shrink-swell	0.50		

Table 12.—Building Site Development, Part I—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
9B:							
Mattaponi-------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.50	Depth to saturated zone	0.82	Shrink-swell	0.50
				Shrink-swell	0.50		
9C:							
Mattaponi-------	80	Somewhat limited		Somewhat limited		Very limited	
		Shrink-swell	0.50	Depth to saturated zone	0.82	Slope	1.00
		Slope	0.01			Shrink-swell	0.50
				Shrink-swell	0.50		
				Slope	0.01		
10A:							
Munden----------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39
10B:							
Munden----------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39
11A:							
Pits, gravel----	80	Not rated		Not rated		Not rated	
12A:							
Rappahannock----	80	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
13A:							
Roanoke---------	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
14B:							
Rumford---------	80	Not limited		Not limited		Not limited	
14C:							
Rumford---------	80	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.01	Slope	0.01	Slope	1.00
15A:							
Slagle----------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39
15B:							
Slagle----------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39

Table 12.—Building Site Development, Part I—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
15C:							
Slagle	80	Somewhat limited		Very limited		Very limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Slope	1.00
		Slope	0.01	Slope	0.01	Depth to saturated zone	0.39
16A:							
State	80	Not limited		Somewhat limited		Not limited	
				Depth to saturated zone	0.15		
16B:							
State	80	Not limited		Somewhat limited		Not limited	
				Depth to saturated zone	0.15		
17A:							
Suffolk	80	Not limited		Not limited		Not limited	
17B:							
Suffolk	80	Not limited		Not limited		Not limited	
17C:							
Suffolk	80	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.01	Slope	0.01	Slope	1.00
18B:							
Tarboro	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
19A:							
Tetotum	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39
19B:							
Tetotum	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39
19C:							
Tetotum	80	Somewhat limited		Very limited		Very limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Slope	1.00
		Slope	0.01	Slope	0.01	Depth to saturated zone	0.39
20A:							
Tomotley	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
21A:							
Wahee	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
W:							
Water	100	Not rated		Not rated		Not rated	

Table 12.—Building Site Development, Part II

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1A:							
Augusta----------	80	Very limited		Very limited		Somewhat limited	
		Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
		Depth to saturated zone	0.75	Cutbanks cave	0.10		
		Flooding	0.40				
2A:							
Bojac------------	80	Somewhat limited		Very limited		Not limited	
		Flooding	0.40	Cutbanks cave	1.00		
				Depth to saturated zone	0.15		
2B:							
Bojac------------	80	Somewhat limited		Very limited		Not limited	
		Flooding	0.40	Cutbanks cave	1.00		
				Depth to saturated zone	0.15		
3A:							
Craven-----------	80	Very limited		Very limited		Not limited	
		Low strength	1.00	Cutbanks cave	1.00		
		Shrink-swell	0.50	Depth to saturated zone	0.99		
				Too clayey	0.28		
3B:							
Craven-----------	80	Very limited		Very limited		Not limited	
		Low strength	1.00	Cutbanks cave	1.00		
		Shrink-swell	0.50	Depth to saturated zone	0.99		
				Too clayey	0.28		
3C:							
Craven-----------	80	Very limited		Very limited		Somewhat limited	
		Low strength	1.00	Cutbanks cave	1.00	Slope	0.01
		Shrink-swell	0.50	Depth to saturated zone	0.99		
		Slope	0.01	Too clayey	0.28		
4A:							
Emporia----------	80	Very limited		Somewhat limited		Not limited	
		Low strength	1.00	Depth to saturated zone	0.82		
				Cutbanks cave	0.10		
4B:							
Emporia----------	80	Very limited		Somewhat limited		Not limited	
		Low strength	1.00	Depth to saturated zone	0.82		
				Cutbanks cave	0.10		

Table 12.—Building Site Development, Part II—Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
4C:							
Emporia----------	80	Very limited		Somewhat limited		Somewhat limited	
		Low strength	1.00	Depth to saturated zone	0.82	Slope	0.01
		Slope	0.01	Cutbanks cave	0.10		
				Slope	0.01		
5D:							
Emporia----------	35	Very limited		Somewhat limited		Somewhat limited	
		Low strength	1.00	Depth to saturated zone	0.82	Slope	0.37
		Slope	0.37	Slope	0.37		
				Cutbanks cave	0.10		
Slagle-----------	30	Somewhat limited		Very limited		Somewhat limited	
		Slope	0.37	Depth to saturated zone	1.00	Slope	0.37
		Depth to saturated zone	0.19	Slope	0.37	Depth to saturated zone	0.19
				Cutbanks cave	0.10		
Rumford----------	15	Somewhat limited		Very limited		Somewhat limited	
		Slope	0.37	Cutbanks cave	1.00	Slope	0.37
				Slope	0.37		
5E:							
Emporia----------	35	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Low strength	1.00	Depth to saturated zone	0.82		
				Cutbanks cave	0.10		
Slagle-----------	30	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Depth to saturated zone	0.19	Depth to saturated zone	1.00	Depth to saturated zone	0.19
				Cutbanks cave	0.10		
Rumford----------	15	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
				Cutbanks cave	1.00		
6A:							
Faceville--------	80	Not limited		Somewhat limited		Not limited	
				Cutbanks cave	0.10		
6B:							
Faceville--------	80	Not limited		Somewhat limited		Not limited	
				Cutbanks cave	0.10		
7A:							
Kinston----------	45	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Flooding	0.60	Flooding	0.60
		Low strength	1.00	Cutbanks cave	0.10		

Table 12.—Building Site Development, Part II—Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
7A:							
Bibb------------	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Cutbanks cave	1.00	Flooding	0.60
				Flooding	0.60		
8A:							
Levy------------	80	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Flooding	1.00	Flooding	1.00
		Flooding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
9A:							
Mattaponi-------	80	Very limited		Somewhat limited		Not limited	
		Low strength	1.00	Depth to saturated zone	0.82		
		Shrink-swell	0.50	Too clayey	0.50		
				Cutbanks cave	0.10		
9B:							
Mattaponi-------	80	Very limited		Somewhat limited		Not limited	
		Low strength	1.00	Depth to saturated zone	0.82		
		Shrink-swell	0.50	Too clayey	0.50		
				Cutbanks cave	0.10		
9C:							
Mattaponi-------	80	Very limited		Somewhat limited		Somewhat limited	
		Low strength	1.00	Depth to saturated zone	0.82	Slope	0.01
		Shrink-swell	0.50	Too clayey	0.50		
		Slope	0.01	Cutbanks cave	0.10		
10A:							
Munden----------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.19	Depth to saturated zone	1.00	Depth to saturated zone	0.19
				Cutbanks cave	1.00		
10B:							
Munden----------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.19	Depth to saturated zone	1.00	Depth to saturated zone	0.19
				Cutbanks cave	1.00		
11A:							
Pits, gravel----	80	Not rated		Not rated		Not rated	
12A:							
Rappahannock----	80	Very limited		Very limited		Not rated	
		Ponding	1.00	Ponding	1.00		
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
		Flooding	1.00	Organic matter content	1.00		

Table 12.—Building Site Development, Part II—Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
13A:							
Roanoke----------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Low strength	1.00	Cutbanks cave	1.00		
		Shrink-swell	0.50	Too clayey	0.12		
14B:							
Rumford----------	80	Not limited		Very limited		Not limited	
				Cutbanks cave	1.00		
14C:							
Rumford----------	80	Somewhat limited		Very limited		Somewhat limited	
		Slope	0.01	Cutbanks cave	1.00	Slope	0.01
				Slope	0.01		
15A:							
Slagle-----------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.19	Depth to saturated zone	1.00	Depth to saturated zone	0.19
				Cutbanks cave	0.10		
15B:							
Slagle-----------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.19	Depth to saturated zone	1.00	Depth to saturated zone	0.19
				Cutbanks cave	0.10		
15C:							
Slagle-----------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.19	Depth to saturated zone	1.00	Depth to saturated zone	0.19
		Slope	0.01	Cutbanks cave	0.10	Slope	0.01
				Slope	0.01		
16A:							
State------------	80	Not limited		Very limited		Not limited	
				Cutbanks cave	1.00		
				Depth to saturated zone	0.15		
16B:							
State------------	80	Not limited		Very limited		Not limited	
				Cutbanks cave	1.00		
				Depth to saturated zone	0.15		
17A:							
Suffolk----------	80	Not limited		Very limited		Not limited	
				Cutbanks cave	1.00		
17B:							
Suffolk----------	80	Not limited		Very limited		Not limited	
				Cutbanks cave	1.00		
17C:							
Suffolk----------	80	Somewhat limited		Very limited		Somewhat limited	
		Slope	0.01	Cutbanks cave	1.00	Slope	0.01
				Slope	0.01		

Table 12.—Building Site Development, Part II—Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
18B:							
Tarboro---------	80	Somewhat limited		Very limited		Very limited	
		Flooding	0.40	Cutbanks cave	1.00	Droughty	1.00
						Too sandy	0.50
19A:							
Tetotum---------	80	Very limited		Very limited		Somewhat limited	
		Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.19
		Flooding	0.40	Cutbanks cave	1.00		
		Depth to saturated zone	0.19				
19B:							
Tetotum---------	80	Very limited		Very limited		Somewhat limited	
		Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.19
		Flooding	0.40	Cutbanks cave	1.00		
		Depth to saturated zone	0.19				
19C:							
Tetotum---------	80	Very limited		Very limited		Somewhat limited	
		Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.19
		Depth to saturated zone	0.19	Cutbanks cave	1.00	Slope	0.01
		Slope	0.01	Slope	0.01		
20A:							
Tomotley--------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	0.40	Cutbanks cave	0.10		
21A:							
Wahee-----------	80	Very limited		Very limited		Very limited	
		Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.99
		Depth to saturated zone	0.99	Cutbanks cave	1.00		
		Shrink-swell	0.50	Too clayey	0.50		
W:							
Water-----------	100	Not rated		Not rated		Not rated	

Table 13.—Sanitary Facilities, Part I

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
1A:					
Augusta	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.50	Seepage	0.50
		Flooding	0.40	Flooding	0.40
2A:					
Bojac	80	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
		Depth to saturated zone	0.40	Flooding	0.40
		Flooding	0.40		
2B:					
Bojac	80	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
		Depth to saturated zone	0.40	Flooding	0.40
		Flooding	0.40	Slope	0.32
3A:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	1.00
		Seepage, bottom layer	1.00		
3B:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Slope	0.32
3C:					
Craven	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Slope	1.00
		Seepage, bottom layer	1.00	Seepage	1.00

Table 13.—Sanitary Facilities, Part I—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Septic tank absorption fields: Value	Sewage lagoons: Rating class and limiting features	Sewage lagoons: Value
4A:					
Emporia-------------	80	Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Seepage	0.50
		Slow water movement	0.50		
4B:					
Emporia-------------	80	Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Seepage	0.50
				Slope	0.32
		Slow water movement	0.50		
4C:					
Emporia-------------	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
				Seepage	0.50
		Slow water movement	0.50		
		Slope	0.01		
5D:					
Emporia-------------	35	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
				Seepage	0.50
		Slow water movement	0.50		
		Slope	0.37		
Slagle--------------	30	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
				Depth to saturated zone	0.75
		Slow water movement	0.99	Seepage	0.50
		Slope	0.37		0
Rumford-------------	15	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	1.00
		Slope	0.37		
5E:					
Emporia-------------	35	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
				Seepage	0.50
		Slope	1.00		
		Slow water movement	0.50		
Slagle--------------	30	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
				Depth to saturated zone	0.75
		Slope	1.00		
		Slow water movement	0.99	Seepage	0.50
Rumford-------------	15	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Seepage, bottom layer	1.00	Seepage	1.00

Table 13.—Sanitary Facilities, Part I—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
6A:					
Faceville-----------	80	Somewhat limited		Somewhat limited	
		Slow water movement	0.50	Seepage	0.50
6B:					
Faceville-----------	80	Somewhat limited		Somewhat limited	
		Slow water movement	0.50	Seepage	0.50
				Slope	0.32
7A:					
Kinston-------------	45	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.50	Seepage	0.50
Bibb----------------	35	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
8A:					
Levy----------------	80	Very limited		Very limited	
		Flooding	1.00	Ponding	1.00
		Slow water movement	1.00	Flooding	1.00
		Ponding	1.00	Depth to saturated zone	1.00
9A:					
Mattaponi-----------	80	Very limited		Not limited	
		Depth to saturated zone	1.00		
		Slow water movement	1.00		
9B:					
Mattaponi-----------	80	Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Slope	0.32
		Slow water movement	1.00		
9C:					
Mattaponi-----------	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
		Slow water movement	1.00		
		Slope	0.01		
10A:					
Munden--------------	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00

Table 13.—Sanitary Facilities, Part I—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
10B:					
Munden--------------	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	0.32
11A:					
Pits, gravel--------	80	Not rated		Not rated	
12A:					
Rappahannock--------	80	Very limited		Very limited	
		Flooding	1.00	Ponding	1.00
		Ponding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
13A:					
Roanoke-------------	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	1.00	Seepage	1.00
				Flooding	0.40
		Seepage, bottom layer	1.00		
14B:					
Rumford-------------	80	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	0.08
14C:					
Rumford-------------	80	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	1.00
		Slope	0.01		
15A:					
Slagle--------------	80	Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	0.75
		Slow water movement	0.99	Seepage	0.50
15B:					
Slagle--------------	80	Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	0.75
		Slow water movement	0.99	Seepage	0.50
				Slope	0.32
15C:					
Slagle--------------	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Slope	1.00
				Depth to saturated zone	0.75
		Slow water movement	0.99	Seepage	0.50
		Slope	0.01		

Table 13.—Sanitary Facilities, Part I—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
16A:					
State	80	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
		Slow water movement	0.50		
		Depth to saturated zone	0.40		
16B:					
State	80	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	0.32
		Slow water movement	0.50		
		Depth to saturated zone	0.40		
17A:					
Suffolk	80	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
		Slow water movement	0.50		
17B:					
Suffolk	80	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	0.32
		Slow water movement	0.50		
17C:					
Suffolk	80	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	1.00
		Slow water movement	0.50		
		Slope	0.01		
18B:					
Tarboro	80	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
				Flooding	0.40
		Seepage, bottom layer	1.00	Slope	0.08
		Flooding	0.40		
19A:					
Tetotum	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
				Flooding	0.40
		Slow water movement	0.50		

Table 13.—Sanitary Facilities, Part I—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
19B:					
Tetotum	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
				Flooding	0.40
		Slow water movement	0.50		
19C:					
Tetotum	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	1.00
		Slow water movement	0.50		
20A:					
Tomotley	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.50	Seepage	0.99
				Flooding	0.40
		Flooding	0.40		
21A:					
Wahee	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	1.00
				Flooding	0.40
		Seepage, bottom layer	1.00		
W:					
Water	100	Not rated		Not rated	

Table 13.—Sanitary Facilities, Part II

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1A:							
Augusta---------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.99
		Too clayey	0.50	Flooding	0.40	Too clayey	0.50
		Flooding	0.40				
2A:							
Bojac-----------	80	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Seepage	0.50
		Seepage, bottom layer	1.00	Seepage	1.00		
		Flooding	0.40	Flooding	0.40		
2B:							
Bojac-----------	80	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Seepage	0.50
		Seepage, bottom layer	1.00	Seepage	1.00		
		Flooding	0.40	Flooding	0.40		
3A:							
Craven----------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	1.00
		Too clayey	1.00			Depth to saturated zone	0.47
		Seepage, bottom layer	1.00				
3B:							
Craven----------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	1.00
		Too clayey	1.00			Depth to saturated zone	0.47
		Seepage, bottom layer	1.00				
3C:							
Craven----------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	1.00
		Too clayey	1.00	Slope	0.01	Depth to saturated zone	0.47
		Seepage, bottom layer	1.00			Slope	0.01
4A:							
Emporia---------	80	Somewhat limited		Not limited		Not limited	
		Depth to saturated zone	0.09				

Table 13.—Sanitary Facilities, Part II—Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
4B:							
Emporia	80	Somewhat limited		Not limited		Not limited	
		Depth to saturated zone	0.09				
4C:							
Emporia	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Depth to saturated zone	0.09	Slope	0.01	Slope	0.01
		Slope	0.01				
5D:							
Emporia	35	Somewhat limited		Somewhat limited		Somewhat limited	
		Slope	0.37	Slope	0.37	Slope	0.37
		Depth to saturated zone	0.09				
Slagle	30	Very limited		Somewhat limited		Somewhat limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.75	Depth to saturated zone	0.86
		Slope	0.37	Slope	0.37	Slope	0.37
Rumford	15	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
				Slope	0.37	Slope	0.37
		Slope	0.37				
5E:							
Emporia	35	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Depth to saturated zone	0.09				
Slagle	30	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Depth to saturated zone	0.99	Depth to saturated zone	0.75	Depth to saturated zone	0.86
Rumford	15	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
6A:							
Faceville	80	Somewhat limited		Not limited		Not limited	
		Too clayey	0.50				
6B:							
Faceville	80	Somewhat limited		Not limited		Not limited	
		Too clayey	0.50				
7A:							
Kinston	45	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
		Too clayey	0.50				

Table 13.—Sanitary Facilities, Part II—Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill: Rating class and limiting features	Value	Area sanitary landfill: Rating class and limiting features	Value	Daily cover for landfill: Rating class and limiting features	Value
7A:							
Bibb------------	35	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too sandy	1.00
		Too sandy	1.00	Seepage	1.00	Seepage	1.00
8A:							
Levy------------	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Ponding	1.00	Depth to saturated zone	1.00
		Ponding	1.00	Depth to saturated zone	1.00	Too clayey	1.00
9A:							
Mattaponi-------	80	Very limited		Not limited		Very limited	
		Too clayey	1.00			Too clayey	1.00
		Depth to saturated zone	0.09			Hard to compact	1.00
9B:							
Mattaponi-------	80	Very limited		Not limited		Very limited	
		Too clayey	1.00			Too clayey	1.00
		Depth to saturated zone	0.09			Hard to compact	1.00
9C:							
Mattaponi-------	80	Very limited		Somewhat limited		Very limited	
		Too clayey	1.00	Slope	0.01	Too clayey	1.00
		Depth to saturated zone	0.09			Hard to compact	1.00
		Slope	0.01			Slope	0.01
10A:							
Munden----------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too sandy	1.00
		Too sandy	1.00	Seepage	1.00	Seepage	1.00
		Seepage, bottom layer	1.00			Depth to saturated zone	0.86
10B:							
Munden----------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too sandy	1.00
		Too sandy	1.00	Seepage	1.00	Seepage	1.00
		Seepage, bottom layer	1.00			Depth to saturated zone	0.86
11A:							
Pits, gravel----	80	Not rated		Not rated		Not rated	
12A:							
Rappahannock----	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Ponding	1.00
		Depth to saturated zone	1.00	Ponding	1.00	Depth to saturated zone	1.00
		Ponding	1.00	Depth to saturated zone	1.00	Organic matter content	1.00

Table 13.—Sanitary Facilities, Part II—Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill: Rating class and limiting features	Value	Area sanitary landfill: Rating class and limiting features	Value	Daily cover for landfill: Rating class and limiting features	Value
13A:							
Roanoke----------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too clayey	1.00	Flooding	0.40	Too clayey	1.00
		Seepage, bottom layer	1.00			Hard to compact	1.00
14B:							
Rumford----------	80	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
14C:							
Rumford----------	80	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
		Slope	0.01	Slope	0.01	Slope	0.01
15A:							
Slagle-----------	80	Very limited		Somewhat limited		Somewhat limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.75	Depth to saturated zone	0.86
15B:							
Slagle-----------	80	Very limited		Somewhat limited		Somewhat limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.75	Depth to saturated zone	0.86
15C:							
Slagle-----------	80	Very limited		Somewhat limited		Somewhat limited	
		Depth to saturated zone	0.99	Depth to saturated zone	0.75	Depth to saturated zone	0.86
		Slope	0.01	Slope	0.01	Slope	0.01
16A:							
State------------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Seepage	1.00	Too sandy	0.50
		Too sandy	0.50				
16B:							
State------------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Seepage	1.00	Too sandy	0.50
		Too sandy	0.50				
17A:							
Suffolk----------	80	Very limited		Not limited		Not limited	
		Seepage, bottom layer	1.00				
17B:							
Suffolk----------	80	Very limited		Not limited		Not limited	
		Seepage, bottom layer	1.00				

Table 13.—Sanitary Facilities, Part II—Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
17C:							
Suffolk	80	Very limited		Somewhat limited		Somewhat limited	
		Seepage, bottom layer	1.00	Slope	0.01	Slope	0.01
		Slope	0.01				
18B:							
Tarboro	80	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Too sandy	1.00
		Too sandy	1.00	Flooding	0.40	Seepage	1.00
		Flooding	0.40				
19A:							
Tetotum	80	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.86
		Seepage, bottom layer	1.00	Flooding	0.40		
		Flooding	0.40				
19B:							
Tetotum	80	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.86
		Seepage, bottom layer	1.00	Flooding	0.40		
		Flooding	0.40				
19C:							
Tetotum	80	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.86
		Seepage, bottom layer	1.00	Slope	0.01	Slope	0.01
		Slope	0.01				
20A:							
Tomotley	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	0.40	Flooding	0.40		
21A:							
Wahee	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too clayey	1.00	Seepage	1.00	Too clayey	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Hard to compact	1.00
W:							
Water	100	Not rated		Not rated		Not rated	

Table 14.—Construction Materials, Part I

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The ratings given for the thickest layer are for the thickest layer above and excluding the bottom layer. The numbers in the value columns range from 0.00 to 0.99. The greater the value, the greater the likelihood that the bottom layer or thickest layer of the soil is a source of sand or gravel. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
1A:					
Augusta	80	Poor		Poor	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.00
2A:					
Bojac	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.02
		Thickest layer	0.00	Bottom layer	0.08
2B:					
Bojac	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.02
		Thickest layer	0.00	Bottom layer	0.08
3A:					
Craven	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.10
3B:					
Craven	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.10
3C:					
Craven	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.10
4A:					
Emporia	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
4B:					
Emporia	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
4C:					
Emporia	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
5D:					
Emporia	35	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Table 14.—Construction Materials, Part I—Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
5D:					
Slagle--------------	30	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Rumford-------------	15	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.05
		Thickest layer	0.00	Bottom layer	0.64
5E:					
Emporia-------------	35	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Slagle--------------	30	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Rumford-------------	15	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.05
		Thickest layer	0.00	Bottom layer	0.64
6A:					
Faceville-----------	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
6B:					
Faceville-----------	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
7A:					
Kinston-------------	45	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Bibb----------------	35	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.04
		Thickest layer	0.00	Bottom layer	0.51
8A:					
Levy----------------	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
9A:					
Mattaponi-----------	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
9B:					
Mattaponi-----------	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
9C:					
Mattaponi-----------	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Table 14.—Construction Materials, Part I—Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
10A:					
Munden	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.04
		Thickest layer	0.00	Bottom layer	0.45
10B:					
Munden	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.04
		Thickest layer	0.00	Bottom layer	0.45
11A:					
Pits, gravel	80	Not rated		Not rated	
12A:					
Rappahannock	80	Not rated		Fair	
				Thickest layer	0.00
				Bottom layer	0.02
13A:					
Roanoke	80	Poor		Poor	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.00
14B:					
Rumford	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.05
		Thickest layer	0.00	Bottom layer	0.64
14C:					
Rumford	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.05
		Thickest layer	0.00	Bottom layer	0.64
15A:					
Slagle	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
15B:					
Slagle	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
15C:					
Slagle	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
16A:					
State	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.03
16B:					
State	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.03

Table 14.—Construction Materials, Part I—Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
17A:					
Suffolk-------------	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.06
17B:					
Suffolk-------------	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.06
17C:					
Suffolk-------------	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.06
18B:					
Tarboro-------------	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.34
		Thickest layer	0.00	Bottom layer	0.69
19A:					
Tetotum-------------	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.51
19B:					
Tetotum-------------	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.51
19C:					
Tetotum-------------	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.51
20A:					
Tomotley------------	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.04
21A:					
Wahee---------------	80	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.10
W:					
Water---------------	100	Not rated		Not rated	

Table 14.—Construction Materials, Part II

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.00 to 0.99. The smaller the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
1A:							
Augusta----------	80	Fair		Poor		Fair	
		Organic matter content low	0.12	Low strength	0.00	Wetness depth	0.14
		Too acid	0.54	Wetness depth	0.14	Too acid	0.98
2A:							
Bojac------------	80	Poor		Good		Fair	
		Wind erosion	0.00			Too acid	0.92
		Organic matter content low	0.12				
		Too acid	0.39				
2B:							
Bojac------------	80	Poor		Good		Fair	
		Wind erosion	0.00			Too acid	0.92
		Organic matter content low	0.12				
		Too acid	0.39				
3A:							
Craven-----------	80	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Organic matter content low	0.12	Wetness depth	0.89	Wetness depth	0.89
				Shrink-swell	0.98	Too acid	0.98
		Too acid	0.54				
3B:							
Craven-----------	80	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Organic matter content low	0.12	Wetness depth	0.89	Wetness depth	0.89
				Shrink-swell	0.98	Too acid	0.98
		Too acid	0.54				
3C:							
Craven-----------	80	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Organic matter content low	0.12	Wetness depth	0.89	Wetness depth	0.89
				Shrink-swell	0.98	Too acid	0.98
		Too acid	0.54				
4A:							
Emporia----------	80	Fair		Poor		Fair	
		Organic matter content low	0.12	Low strength	0.00	Too acid	0.98
		Too acid	0.54				
4B:							
Emporia----------	80	Fair		Poor		Fair	
		Organic matter content low	0.12	Low strength	0.00	Too acid	0.98
		Too acid	0.54				

Table 14.—Construction Materials, Part II—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
4C:							
Emporia	80	Fair		Poor		Fair	
		Organic matter content low	0.12	Low strength	0.00	Too acid	0.98
		Too acid	0.54				
5D:							
Emporia	35	Fair		Poor		Fair	
		Organic matter content low	0.12	Low strength	0.00	Slope	0.63
						Too acid	0.98
		Too acid	0.54				
Slagle	30	Fair		Fair		Fair	
		Organic matter content low	0.12	Wetness depth	0.53	Wetness depth	0.53
						Slope	0.63
		Too acid	0.54			Too acid	0.98
Rumford	15	Poor		Good		Fair	
		Wind erosion	0.00			Slope	0.63
		Organic matter content low	0.08			Too acid	0.98
						Too sandy	0.99
		Too acid	0.54				
5E:							
Emporia	35	Fair		Poor		Poor	
		Organic matter content low	0.12	Slope	0.00	Slope	0.00
				Low strength	0.00	Too acid	0.98
		Too acid	0.54				
Slagle	30	Fair		Fair		Poor	
		Organic matter content low	0.12	Slope	0.50	Slope	0.00
				Wetness depth	0.53	Wetness depth	0.53
		Too acid	0.54			Too acid	0.98
Rumford	15	Poor		Poor		Poor	
		Wind erosion	0.00	Slope	0.00	Slope	0.00
		Organic matter content low	0.08			Too acid	0.98
						Too sandy	0.99
		Too acid	0.54				
6A:							
Faceville	80	Poor		Fair		Poor	
		Too clayey	0.00	Low strength	0.78	Too clayey	0.00
		Organic matter content low	0.02			Too acid	0.98
		Too acid	0.54				
6B:							
Faceville	80	Poor		Fair		Poor	
		Too clayey	0.00	Low strength	0.78	Too clayey	0.00
		Organic matter content low	0.02			Too acid	0.98
		Too acid	0.54				
7A:							
Kinston	45	Fair		Poor		Poor	
		Too acid	0.54	Wetness depth	0.00	Wetness depth	0.00
				Low strength	0.00	Too acid	0.98

Table 14.—Construction Materials, Part II—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
7A:							
Bibb	35	Fair		Poor		Poor	
		Too acid	0.54	Wetness depth	0.00	Wetness depth	0.00
		Organic matter content low	0.88			Hard to reclaim (rock fragments)	0.92
						Too acid	0.98
8A:							
Levy	80	Poor		Poor		Poor	
		Sodium content	0.00	Wetness depth	0.00	Wetness depth	0.00
		Too clayey	0.00	Low strength	0.00	Sodium content	0.00
		Too acid	0.50	Shrink-swell	0.12	Too clayey	0.00
9A:							
Mattaponi	80	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Organic matter content low	0.12	Shrink-swell	0.87	Too acid	0.68
		Too acid	0.16				
9B:							
Mattaponi	80	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Organic matter content low	0.12	Shrink-swell	0.87	Too acid	0.68
		Too acid	0.16				
9C:							
Mattaponi	80	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Organic matter content low	0.12	Shrink-swell	0.87	Too acid	0.68
		Too acid	0.16				
10A:							
Munden	80	Poor		Fair		Fair	
		Wind erosion	0.00	Wetness depth	0.53	Wetness depth	0.53
		Organic matter content low	0.02				
		Too acid	0.54				
10B:							
Munden	80	Poor		Fair		Fair	
		Wind erosion	0.00	Wetness depth	0.53	Wetness depth	0.53
		Organic matter content low	0.02				
		Too acid	0.54				
11A:							
Pits, gravel	80	Not rated		Not rated		Not rated	
12A:							
Rappahannock	80	Fair		Poor		Not rated	
		Salinity	0.97	Wetness depth	0.00		

Table 14.—Construction Materials, Part II—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
13A:							
Roanoke----------	80	Poor		Poor		Poor	
		Too clayey	0.00	Wetness depth	0.00	Wetness depth	0.00
		Too acid	0.16	Low strength	0.00	Too clayey	0.00
		Organic matter content low	0.50	Shrink-swell	0.96	Too acid	0.98
14B:							
Rumford----------	80	Poor		Good		Fair	
		Wind erosion	0.00			Too acid	0.98
		Organic matter content low	0.08			Too sandy	0.99
		Too acid	0.54				
14C:							
Rumford----------	80	Poor		Good		Fair	
		Wind erosion	0.00			Too acid	0.98
		Organic matter content low	0.08			Too sandy	0.99
		Too acid	0.54				
15A:							
Slagle-----------	80	Fair		Fair		Fair	
		Organic matter content low	0.12	Wetness depth	0.53	Wetness depth	0.53
						Too acid	0.98
		Too acid	0.54				
15B:							
Slagle-----------	80	Fair		Fair		Fair	
		Organic matter content low	0.12	Wetness depth	0.53	Wetness depth	0.53
						Too acid	0.98
		Too acid	0.54				
15C:							
Slagle-----------	80	Fair		Fair		Fair	
		Organic matter content low	0.12	Wetness depth	0.53	Wetness depth	0.53
						Too acid	0.98
		Too acid	0.54				
16A:							
State------------	80	Fair		Good		Fair	
		Organic matter content low	0.02			Too acid	0.68
		Too acid	0.50				
16B:							
State------------	80	Fair		Good		Fair	
		Organic matter content low	0.02			Too acid	0.68
		Too acid	0.50				
17A:							
Suffolk----------	80	Fair		Good		Good	
		Organic matter content low	0.12				
		Too acid	0.84				

Table 14.—Construction Materials, Part II—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
17B:							
Suffolk----------	80	Fair		Good		Good	
		Organic matter content low	0.12				
		Too acid	0.84				
17C:							
Suffolk----------	80	Fair		Good		Good	
		Organic matter content low	0.12				
		Too acid	0.84				
18B:							
Tarboro----------	80	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Wind erosion	0.00				
		Droughty	0.00				
19A:							
Tetotum----------	80	Fair		Poor		Fair	
		Organic matter content low	0.12	Low strength	0.00	Wetness depth	0.53
				Wetness depth	0.53	Too acid	0.98
		Too acid	0.54				
19B:							
Tetotum----------	80	Fair		Poor		Fair	
		Organic matter content low	0.12	Low strength	0.00	Wetness depth	0.53
				Wetness depth	0.53	Too acid	0.98
		Too acid	0.54				
19C:							
Tetotum----------	80	Fair		Poor		Fair	
		Organic matter content low	0.12	Low strength	0.00	Wetness depth	0.53
				Wetness depth	0.53	Too acid	0.98
		Too acid	0.54				
20A:							
Tomotley---------	80	Fair		Poor		Poor	
		Too acid	0.12	Wetness depth	0.00	Wetness depth	0.00
		Organic matter content low	0.88			Too acid	0.59
21A:							
Wahee------------	80	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Organic matter content low	0.12	Wetness depth	0.00	Wetness depth	0.00
				Shrink-swell	0.97	Too acid	0.98
		Too acid	0.50				
W:							
Water------------	100	Not rated		Not rated		Not rated	

Table 15.—Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
1A:							
Augusta---------	80	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.70	Depth to saturated zone	1.00	Slow refill	0.30
				Piping	0.05	Cutbanks cave	0.10
				Seepage	0.01		
2A:							
Bojac-----------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.08	Depth to water	1.00
2B:							
Bojac-----------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.08	Depth to water	1.00
3A:							
Craven----------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Depth to saturated zone	0.86	Cutbanks cave	1.00
				Seepage	0.10	Depth to saturated zone	0.06
				Piping	0.01		
3B:							
Craven----------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Depth to saturated zone	0.86	Cutbanks cave	1.00
				Seepage	0.10	Depth to saturated zone	0.06
				Piping	0.01		
3C:							
Craven----------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Depth to saturated zone	0.86	Cutbanks cave	1.00
				Seepage	0.10	Depth to saturated zone	0.06
				Piping	0.01		
4A:							
Emporia---------	80	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.70	Piping	0.57	Depth to water	1.00
				Depth to saturated zone	0.09		
4B:							
Emporia---------	80	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.70	Piping	0.57	Depth to water	1.00
				Depth to saturated zone	0.09		
4C:							
Emporia---------	80	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.70	Piping	0.57	Depth to water	1.00
				Depth to saturated zone	0.09		

Table 15.—Water Management—Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
5D:							
Emporia---------	35	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.70	Piping	0.57	Depth to water	1.00
		Slope	0.01	Depth to saturated zone	0.09		
Slagle----------	30	Somewhat limited		Very limited		Very limited	
		Seepage	0.70	Depth to saturated zone	0.99	Depth to water	1.00
		Slope	0.01				
Rumford---------	15	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.64	Depth to water	1.00
		Slope	0.01				
5E:							
Emporia---------	35	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.70	Piping	0.57	Depth to water	1.00
		Slope	0.64	Depth to saturated zone	0.09		
Slagle----------	30	Somewhat limited		Very limited		Very limited	
		Seepage	0.70	Depth to saturated zone	0.99	Depth to water	1.00
		Slope	0.12				
Rumford---------	15	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.64	Depth to water	1.00
		Slope	0.64				
6A:							
Faceville-------	80	Somewhat limited		Very limited		Very limited	
		Seepage	0.70	Piping	1.00	Depth to water	1.00
6B:							
Faceville-------	80	Somewhat limited		Very limited		Very limited	
		Seepage	0.70	Piping	1.00	Depth to water	1.00
7A:							
Kinston---------	45	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.70	Depth to saturated zone	1.00	Slow refill	0.30
						Cutbanks cave	0.10
				Piping	0.07		
Bibb------------	35	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
				Seepage	0.51		
8A:							
Levy------------	80	Not limited		Very limited		Very limited	
				Ponding	1.00	Slow refill	1.00
				Depth to saturated zone	1.00	Cutbanks cave	0.10
				Hard to pack	1.00		
9A:							
Mattaponi-------	80	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.05	Hard to pack	0.61	Depth to water	1.00
				Depth to saturated zone	0.09		

Table 15.—Water Management—Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
9B:							
Mattaponi-------	80	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.05	Hard to pack	0.61	Depth to water	1.00
				Depth to saturated zone	0.09		
9C:							
Mattaponi-------	80	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.05	Hard to pack	0.61	Depth to water	1.00
				Depth to saturated zone	0.09		
10A:							
Munden----------	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	0.99	Cutbanks cave	1.00
				Seepage	0.45	Depth to saturated zone	0.01
10B:							
Munden----------	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	0.99	Cutbanks cave	1.00
				Seepage	0.45	Depth to saturated zone	0.01
11A:							
Pits, gravel----	80	Not rated		Not rated		Not rated	
12A:							
Rappahannock----	80	Somewhat limited		Not rated		Somewhat limited	
		Seepage	0.70			Salinity and saturated zone	0.35
						Slow refill	0.30
						Cutbanks cave	0.10
13A:							
Roanoke---------	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
				Seepage	0.01		
14B:							
Rumford---------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.64	Depth to water	1.00
14C:							
Rumford---------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.64	Depth to water	1.00
15A:							
Slagle----------	80	Somewhat limited		Very limited		Very limited	
		Seepage	0.70	Depth to saturated zone	0.99	Depth to water	1.00
15B:							
Slagle----------	80	Somewhat limited		Very limited		Very limited	
		Seepage	0.70	Depth to saturated zone	0.99	Depth to water	1.00

Table 15.—Water Management—Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
15C:							
Slagle----------	80	Somewhat limited		Very limited		Very limited	
		Seepage	0.70	Depth to saturated zone	0.99	Depth to water	1.00
16A:							
State-----------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.03	Depth to water	1.00
16B:							
State-----------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.03	Depth to water	1.00
17A:							
Suffolk---------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.06	Depth to water	1.00
17B:							
Suffolk---------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.06	Depth to water	1.00
17C:							
Suffolk---------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.06	Depth to water	1.00
18B:							
Tarboro---------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.69	Depth to water	1.00
19A:							
Tetotum---------	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	0.99	Cutbanks cave	1.00
				Seepage	0.51	Depth to saturated zone	0.01
19B:							
Tetotum---------	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	0.99	Cutbanks cave	1.00
				Seepage	0.51	Depth to saturated zone	0.01
19C:							
Tetotum---------	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	0.99	Cutbanks cave	1.00
				Seepage	0.51	Depth to saturated zone	0.01
20A:							
Tomotley--------	80	Very limited		Very limited		Somewhat limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	0.10
				Seepage	0.04		
21A:							
Wahee-----------	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
				Seepage	0.10		
				Piping	0.04		
W:							
Water-----------	100	Not rated		Not rated		Not rated	

Table 16.—Engineering Properties

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1A:												
Augusta---------	0-9	Fine sandy loam, sandy loam, loam, silt loam	ML, SC-SM, SM	A-2-4, A-4	0	0	90-100	85-100	50-100	25-90	17-35	2-13
	9-60	Clay loam, sandy clay loam, loam	CL, SC-SM	A-6, A-7-6	0	0	90-100	85-100	70-100	30-80	29-44	13-25
	60-70	Sandy clay loam, clay loam, sandy loam	SC-SM, CL	A-2-4, A-4, A-6	0	0	90-100	85-100	50-100	25-80	20-44	6-25
2A:												
Bojac-----------	0-10	Loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam	SM, SC-SM	A-2-4	0	0	95-100	92-100	50-95	15-75	15-19	NP-3
	10-49	Fine sandy loam, loam, sandy loam	SC-SM	A-2-4, A-4	0	0	95-100	92-100	55-95	25-75	22-28	5-10
	49-62	Loamy sand, loamy fine sand	SC-SM	A-1-b, A-2-4	0	0	95-100	92-100	45-85	15-45	13-17	NP-1
2B:												
Bojac-----------	0-10	Loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam	SM, SC-SM	A-2-4	0	0	95-100	92-100	50-95	15-75	15-19	NP-3
	10-49	Fine sandy loam, loam, sandy loam	SC-SM	A-2-4, A-4	0	0	95-100	92-100	55-95	25-75	22-28	5-10
	49-62	Loamy sand, loamy fine sand	SC-SM	A-1-b, A-2-4	0	0	95-100	92-100	45-85	15-45	13-17	NP-1

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
3A:												
Craven----------	0-6	Fine sandy loam, loam, silt loam, very fine sandy loam	CL, ML, SC, SM	A-4	0	0	97-100	95-100	65-100	40-90	19-41	3-19
	6-31	Clay, clay loam, silty clay, silty clay loam	CL, CH	A-7	0	0	97-100	95-100	85-100	65-95	43-67	25-44
	31-45	Sandy clay loam, clay loam, clay, sandy clay, silty clay, silty clay loam	ML, CL, CH	A-7	0	0	97-100	95-100	75-100	35-95	31-67	13-44
	45-62	Loamy sand, sandy loam, sandy clay loam, loam	SM, SC-SM, SC	A-2-4, A-4, A-6	0	0	97-100	95-100	50-95	15-75	16-44	2-25
3B:												
Craven----------	0-6	Fine sandy loam, loam, silt loam, very fine sandy loam	CL, ML, SC, SM	A-4	0	0	97-100	95-100	65-100	40-90	19-41	3-19
	6-31	Clay, clay loam, silty clay, silty clay loam	CH, CL	A-7	0	0	97-100	95-100	85-100	65-95	43-67	25-44
	31-45	Sandy clay loam, clay loam, clay, sandy clay, silty clay, silty clay loam	CH, CL, ML	A-7	0	0	97-100	95-100	75-100	35-95	31-67	13-44
	45-62	Loamy sand, sandy loam, sandy clay loam, loam	SC, SC-SM, SM	A-2-4, A-4, A-6	0	0	97-100	95-100	50-95	15-75	16-44	2-25

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
3C:												
Craven----------	0-6	Fine sandy loam, loam, silt loam, very fine sandy loam	SM, SC, ML, CL	A-4	0	0	97-100	95-100	65-100	40-90	19-41	3-19
	6-31	Clay, clay loam, silty clay, silty clay loam	CL, CH	A-7	0	0	97-100	95-100	85-100	65-95	43-67	25-44
	31-45	Sandy clay loam, clay loam, clay, sandy clay, silty clay, silty clay loam	CH, CL, ML	A-7	0	0	97-100	95-100	75-100	35-95	31-67	13-44
	45-62	Loamy sand, sandy loam, sandy clay loam, loam	SC, SC-SM, SM	A-2-4, A-4, A-6	0	0	97-100	95-100	50-95	15-75	16-44	2-25
4A:												
Emporia---------	0-12	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, gravelly sandy loam	ML, SM, SC-SM	A-2-4, A-4	0	0	80-100	70-100	35-95	10-75	19-33	3-12
	12-42	Loam, fine sandy loam, sandy clay loam, clay loam, sandy loam, gravelly loam	CL, SC	A-6	0	0	80-100	70-100	40-100	20-80	27-44	12-25
	42-62	Sandy clay loam, sandy loam, fine sandy loam, loam, clay loam, sandy clay, clay, gravelly sandy loam	SC, CL, SM, ML	A-1-b, A-2-4, A-4, A-6	0	0	80-100	70-100	40-100	20-95	22-58	6-36

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
4B:												
Emporia----------	0-12	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, gravelly sandy loam	SM, ML, SC-SM	A-2-4, A-4	0	0	80-100	70-100	35-95	10-75	19-33	3-12
	12-42	Loam, fine sandy loam, sandy clay loam, clay loam, sandy loam, gravelly loam	SC, CL	A-6	0	0	80-100	70-100	40-100	20-80	27-44	12-25
	42-62	Sandy clay loam, sandy loam, fine sandy loam, loam, clay loam, sandy clay, clay, gravelly sandy loam	CL, ML, SC, SM	A-1-b, A-2-4, A-4, A-6	0	0	80-100	70-100	40-100	20-95	22-58	6-36

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
4C:												
Emporia---------	0-12	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, gravelly sandy loam	ML, SM, SC-SM	A-2-4, A-4	0	0	80-100	70-100	35-95	10-75	19-33	3-12
	12-42	Loam, fine sandy loam, sandy clay loam, clay loam, sandy loam, gravelly loam	CL, SC	A-6	0	0	80-100	70-100	40-100	20-80	27-44	12-25
	42-62	Sandy clay loam, sandy loam, fine sandy loam, loam, clay loam, sandy clay, clay, gravelly sandy loam	SM, SC, ML, CL	A-1-b, A-2-4, A-4, A-6	0	0	80-100	70-100	40-100	20-95	22-58	6-36

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
5D:												
Emporia---------	0-12	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, gravelly sandy loam	SC-SM, SM, ML	A-2-4, A-4	0	0	80-100	70-100	35-95	10-75	19-33	3-12
	12-42	Loam, fine sandy loam, sandy clay loam, clay loam, sandy loam, gravelly loam	SC, CL	A-6	0	0	80-100	70-100	40-100	20-80	27-44	12-25
	42-62	Sandy clay loam, sandy loam, fine sandy loam, loam, clay loam, sandy clay, clay, gravelly sandy loam	CL, SM, SC, ML	A-1-b, A-2-4, A-4, A-6	0	0	80-100	70-100	40-100	20-95	22-58	6-36
Slagle----------	0-8	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, silt loam	SC-SM, SC	A-4, A-2-4	0	0	95-100	92-100	45-100	15-90	17-33	2-12
	8-56	Sandy clay loam, fine sandy loam, sandy loam	SC-SM, SC, CL	A-6	0	0	95-100	92-100	55-90	25-55	27-43	12-24
	56-62	Sandy clay loam, clay loam, sandy loam, fine sandy loam, sandy clay	SC, CL	A-6, A-7-6, A-2-6	0	0	95-100	92-100	55-100	25-80	27-50	12-29

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
5D:												
Rumford---------	0-14	Loamy sand, loamy fine sand, sandy loam, fine sandy loam	SM, SC-SM	A-1-b, A-2-4	0	0	100	100	45-85	15-55	9-20	NP-4
	14-38	Sandy loam, fine sandy loam, sandy clay loam	SM, SC-SM	A-2-4, A-4	0	0	100	100	50-90	25-55	14-25	1-7
	38-55	Loamy sand, sandy loam, fine sandy loam	SM, SC-SM	A-2-4, A-4	0	0	100	100	50-90	25-55	14-25	1-7
	55-99	Sand, stratified sand to fine sandy loam	SP-SM, SM	A-1-b, A-2-4, A-3, A-4	0	0	100	100	20-70	2-40	9-23	NP-6
5E:												
Emporia---------	0-12	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, gravelly sandy loam	SC-SM, ML, SM	A-2-4, A-4	0	0	80-100	70-100	35-95	10-75	19-33	3-12
	12-42	Loam, fine sandy loam, sandy clay loam, clay loam, sandy loam, gravelly loam	CL, SC	A-6	0	0	80-100	70-100	40-100	20-80	27-44	12-25
	42-62	Sandy clay loam, sandy loam, fine sandy loam, loam, clay loam, sandy clay, clay, gravelly sandy loam	SM, SC, ML, CL	A-1-b, A-2-4, A-4, A-6	0	0	80-100	70-100	40-100	20-95	22-58	6-36

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
5E:												
Slagle----------	0-8	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, silt loam	SC, SC-SM	A-2-4, A-4	0	0	95-100	92-100	45-100	15-90	17-33	2-12
	8-56	Sandy clay loam, fine sandy loam, sandy loam	SC, SC-SM, CL	A-6	0	0	95-100	92-100	55-90	25-55	27-43	12-24
	56-62	Sandy clay loam, clay loam, sandy loam, fine sandy loam, sandy clay	CL, SC	A-6, A-7-6, A-2-6	0	0	95-100	92-100	55-100	25-80	27-50	12-29
Rumford---------	0-14	Loamy sand, loamy fine sand, sandy loam, fine sandy loam	SC-SM, SM	A-1-b, A-2-4	0	0	100	100	45-85	15-55	9-20	NP-4
	14-38	Sandy loam, fine sandy loam, sandy clay loam	SM, SC-SM	A-2-4, A-4	0	0	100	100	50-90	25-55	14-25	1-7
	38-55	Loamy sand, sandy loam, fine sandy loam	SM, SC-SM	A-2-4, A-4	0	0	100	100	50-90	25-55	14-25	1-7
	55-99	Sand, stratified sand to fine sandy loam	SP-SM, SM	A-1-b, A-2-4, A-3, A-4	0	0	100	100	20-70	2-40	9-23	NP-6

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
6A:												
Faceville-------	0-9	Fine sandy loam, sandy loam, loamy fine sand, loamy sand	SC-SM, SM	A-2-4, A-4	0	0	90-100	85-100	45-85	15-55	9-20	NP-2
	9-30	Sandy clay, clay loam, clay	ML, SM	A-4	0	0	90-100	85-100	70-100	40-95	20-42	5-9
	30-67	Clay loam, sandy clay, clay	ML	A-6, A-7, A-4	0	0	90-100	85-100	70-100	40-95	31-45	5-11
6B:												
Faceville-------	0-9	Fine sandy loam, sandy loam, loamy fine sand, loamy sand	SC-SM, SM	A-2-4, A-4	0	0	90-100	85-100	45-85	15-55	9-20	NP-2
	9-30	Sandy clay, clay loam, clay	ML, SM	A-4	0	0	90-100	85-100	70-100	40-95	20-42	5-9
	30-67	Clay loam, sandy clay, clay	ML	A-6, A-7, A-4	0	0	90-100	85-100	70-100	40-95	31-45	5-11
7A:												
Kinston---------	0-4	Fine sandy loam, loam, silt loam, sandy loam, loamy sand	SM, ML, SC-SM	A-2-4, A-4	0	0	98-100	95-100	50-100	15-90	20-40	2-12
	4-47	Clay loam, sandy clay loam, loam, sandy loam, fine sandy loam	CL	A-6	0	0	98-100	95-100	55-100	30-80	27-49	12-24
	47-62	Loam, clay loam, sandy clay loam, sandy loam, fine sandy loam, loamy fine sand, loamy sand, sand	CL	A-4, A-6	0	0	95-100	85-100	40-100	4-80	0-49	NP-24

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
7A:												
Bibb------------	0-6	Fine sandy loam, sandy loam, loam, silt loam, loamy sand	ML, SC-SM, SM, CL-ML	A-2-4, A-4	0	0-2	90-100	85-100	40-100	15-90	0-35	NP-12
	6-30	Sandy loam, fine sandy loam, loam, silt loam	CL-ML, ML, SC-SM, SM	A-2-4, A-4	0	0-2	65-100	55-100	35-100	15-90	18-35	2-12
	30-62	Gravelly sand, loamy sand, sand, sandy loam, loam, silt loam	CL-ML, ML, SC-SM, SM	A-2-4, A-4	0	0-2	65-100	55-100	30-100	3-90	0-31	NP-12
8A:												
Levy------------	0-4	Silt loam, silty clay loam, silty clay, clay, mucky silt loam	CH, ML, MH	A-7-6	0	0	100	100	90-100	70-95	43-79	14-35
	4-62	Silty clay, clay, clay loam, mucky silty clay	MH, CL, CH	A-7-6	0	0	100	100	90-100	70-95	49-84	25-43
9A:												
Mattaponi-------	0-8	Fine sandy loam, sandy loam, loam	SM, SC-SM	A-2-4, A-4	0	0	90-100	80-100	50-95	25-75	17-33	2-12
	8-52	Clay, sandy clay, clay loam	CH, CL	A-7-6	0	0	90-100	80-100	70-100	35-95	43-67	25-44
	52-62	Clay, sandy clay, clay loam, sandy clay loam	CH, CL	A-6, A-7-6	0	0	90-100	80-100	65-100	30-95	39-67	21-44

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
9B:												
Mattaponi-------	0-8	Fine sandy loam, sandy loam, loam	SC-SM, SM	A-2-4, A-4	0	0	90-100	80-100	50-95	25-75	17-33	2-12
	8-52	Clay, sandy clay, clay loam	CL, CH	A-7-6	0	0	90-100	80-100	70-100	35-95	43-67	25-44
	52-62	Clay, sandy clay, clay loam, sandy clay loam	CH, CL	A-6, A-7-6	0	0	90-100	80-100	65-100	30-95	39-67	21-44
9C:												
Mattaponi-------	0-8	Fine sandy loam, sandy loam, loam	SM, SC-SM	A-2-4, A-4	0	0	90-100	80-100	50-95	25-75	17-33	2-12
	8-52	Clay, sandy clay, clay loam	CL, CH	A-7-6	0	0	90-100	80-100	70-100	35-95	43-67	25-44
	52-62	Clay, sandy clay, clay loam, sandy clay loam	CL, CH	A-6, A-7-6	0	0	90-100	80-100	65-100	30-95	39-67	21-44
10A:												
Munden----------	0-8	Loamy sand, loamy fine sand, sandy loam, fine sandy loam	SC-SM, SM	A-2-4, A-4	0	0	100	100	50-85	15-55	0-28	NP-10
	8-33	Sandy loam, loam, fine sandy loam	SC, SC-SM	A-2-4, A-4	0	0	100	100	60-95	30-75	19-30	4-12
	33-42	Loamy sand, sand, fine sandy loam, loam	SP-SM, SC-SM, SM	A-2-4, A-3	0	0	100	100	50-95	5-75	0-31	NP-13
	42-70	Sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam	SW-SM, SM, SC-SM	A-2-4, A-3	0	0	100	90-100	45-85	4-55	0-27	NP-10

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
10B:												
Munden----------	0-8	Loamy sand, loamy fine sand, sandy loam, fine sandy loam	SC-SM, SM	A-2-4, A-4	0	0	100	100	50-85	15-55	0-28	NP-10
	8-33	Sandy loam, loam, fine sandy loam	SC-SM, SC	A-2-4, A-4	0	0	100	100	60-95	30-75	19-30	4-12
	33-42	Loamy sand, sand, fine sandy loam, loam	SC-SM, SM, SP-SM	A-2-4, A-3	0	0	100	100	50-95	5-75	0-31	NP-13
	42-70	Sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam	SC-SM, SM, SW-SM	A-2-4, A-3	0	0	100	90-100	45-85	4-55	0-27	NP-10
11A.												
Pits, gravel												
12A:												
Rappahannock----	0-12	Muck, mucky peat	PT	A-8	0	0	---	---	---	---	---	---
	12-39	Mucky peat, muck	PT	A-8	0	0	---	---	---	---	---	---
	39-62	Sandy loam, loamy sand	SM	A-2-4, A-4, A-6	0	0	100	100	50-75	15-40	20-40	2-12

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
13A:												
Roanoke---------	0-5	Loam, silt loam, fine sandy loam	SC-SM, CL-ML, CL, SC	A-4, A-6	0	0	100	100	70-100	40-90	21-41	6-19
	5-36	Clay, clay loam, silty clay, silty clay loam	CL, CH	A-7-6	0	0	100	100	90-100	70-95	43-68	25-44
	36-42	Sandy clay loam, clay loam, silty clay loam	CL, SC	A-7-6, A-6	0	0	100	100	80-100	35-95	31-50	13-29
	42-62	Stratified loamy sand to sandy loam to clay loam, sandy loam, stratified sand to clay	CL-ML, SC-SM, CH, SC	A-1-b, A-2-4, A-4, A-6, A-7-6	0	0	100	100	50-100	5-95	0-58	NP-36
14B:												
Rumford---------	0-14	Loamy sand, loamy fine sand, sandy loam, fine sandy loam	SC-SM, SM	A-1-b, A-2-4	0	0	100	100	45-85	15-55	9-20	NP-4
	14-38	Sandy loam, fine sandy loam, sandy clay loam	SM, SC-SM	A-2-4, A-4	0	0	100	100	50-90	25-55	14-25	1-7
	38-55	Loamy sand, sandy loam, fine sandy loam	SC-SM, SM	A-2-4, A-4	0	0	100	100	50-90	25-55	14-25	1-7
	55-99	Sand, stratified sand to fine sandy loam	SM, SP-SM	A-1-b, A-2-4, A-3, A-4	0	0	100	100	20-70	2-40	9-23	NP-6

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
14C:												
Rumford---------	0-14	Loamy sand, loamy fine sand, sandy loam, fine sandy loam	SC-SM, SM	A-1-b, A-2-4	0	0	100	100	45-85	15-55	9-20	NP-4
	14-38	Sandy loam, fine sandy loam, sandy clay loam	SC-SM, SM	A-2-4, A-4	0	0	100	100	50-90	25-55	14-25	1-7
	38-55	Loamy sand, sandy loam, fine sandy loam	SC-SM, SM	A-2-4, A-4	0	0	100	100	50-90	25-55	14-25	1-7
	55-99	Sand, stratified sand to fine sandy loam	SM, SP-SM	A-1-b, A-2-4, A-3, A-4	0	0	100	100	20-70	2-40	9-23	NP-6
15A:												
Slagle----------	0-8	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, silt loam	SC-SM, SC	A-4, A-2-4	0	0	95-100	92-100	45-100	15-90	17-33	2-12
	8-56	Sandy clay loam, fine sandy loam, sandy loam	CL, SC, SC-SM	A-6	0	0	95-100	92-100	55-90	25-55	27-43	12-24
	56-62	Sandy clay loam, clay loam, sandy loam, fine sandy loam, sandy clay	CL, SC	A-6, A-7-6, A-2-6	0	0	95-100	92-100	55-100	25-80	27-50	12-29

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
15B:												
Slagle----------	0-8	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, silt loam	SC-SM, SC	A-4, A-2-4	0	0	95-100	92-100	45-100	15-90	17-33	2-12
	8-56	Sandy clay loam, fine sandy loam, sandy loam	SC, SC-SM, CL	A-6	0	0	95-100	92-100	55-90	25-55	27-43	12-24
	56-62	Sandy clay loam, clay loam, sandy loam, fine sandy loam, sandy clay	SC, CL	A-6, A-7-6, A-2-6	0	0	95-100	92-100	55-100	25-80	27-50	12-29
15C:												
Slagle----------	0-8	Sandy loam, fine sandy loam, loam, loamy sand, loamy fine sand, silt loam	SC-SM, SC	A-4, A-2-4	0	0	95-100	92-100	45-100	15-90	17-33	2-12
	8-56	Sandy clay loam, fine sandy loam, sandy loam	SC-SM, SC, CL	A-6	0	0	95-100	92-100	55-90	25-55	27-43	12-24
	56-62	Sandy clay loam, clay loam, sandy loam, fine sandy loam, sandy clay	CL, SC	A-6, A-7-6, A-2-6	0	0	95-100	92-100	55-100	25-80	27-50	12-29

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
16A:												
State-----------	0-17	Fine sandy loam, sandy loam, loam, silt loam, loamy sand, loamy fine sand	ML, CL-ML, SC-SM, SM	A-2-4, A-4	0	0	97-100	95-100	50-100	15-90	17-35	2-13
	17-36	Sandy clay loam, clay loam, loam, silt loam, sandy loam	CL, SC	A-6	0	0	97-100	95-100	55-100	30-90	27-43	12-24
	36-62	Loamy fine sand, loamy sand, sand, sandy loam	SC-SM, SM, SP-SM	A-1-b, A-2-4, A-3, A-4	0	0	90-100	80-100	40-85	4-45	0-27	NP-10
16B:												
State-----------	0-17	Fine sandy loam, sandy loam, loam, silt loam, loamy sand, loamy fine sand	SM, SC-SM, CL-ML, ML	A-2-4, A-4	0	0	97-100	95-100	50-100	15-90	17-35	2-13
	17-36	Sandy clay loam, clay loam, loam, silt loam, sandy loam	SC, CL	A-6	0	0	97-100	95-100	55-100	30-90	27-43	12-24
	36-62	Loamy fine sand, loamy sand, sand, sandy loam	SM, SC-SM, SP-SM	A-1-b, A-2-4, A-3, A-4	0	0	90-100	80-100	40-85	4-45	0-27	NP-10

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
17A:												
Suffolk	0-8	Sandy loam, fine sandy loam, loamy sand, loamy fine sand	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	97-100	92-100	45-85	15-55	18-33	3-12
	8-43	Sandy clay loam, sandy loam, fine sandy loam, clay loam, loam	SC, CL	A-6	0	0	97-100	92-100	55-100	25-80	27-43	12-24
	43-65	Loamy fine sand, sand, loamy sand, fine sand	SM, SP, SC-SM	A-1-b, A-2-4, A-4	0	0	90-100	85-100	40-85	4-45	15-22	1-6
17B:												
Suffolk	0-8	Sandy loam, fine sandy loam, loamy sand, loamy fine sand	SC-SM, CL-ML, ML, SM	A-2-4, A-4	0	0	97-100	92-100	45-85	15-55	18-33	3-12
	8-43	Sandy clay loam, sandy loam, fine sandy loam, clay loam, loam	SC, CL	A-6	0	0	97-100	92-100	55-100	25-80	27-43	12-24
	43-65	Loamy fine sand, sand, loamy sand, fine sand	SC-SM, SP, SM	A-1-b, A-2-4, A-4	0	0	90-100	85-100	40-85	4-45	15-22	1-6

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
17C:												
Suffolk	0-8	Sandy loam, fine sandy loam, loamy sand, loamy fine sand	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0	0	97-100	92-100	45-85	15-55	18-33	3-12
	8-43	Sandy clay loam, sandy loam, fine sandy loam, clay loam, loam	SC, CL	A-6	0	0	97-100	92-100	55-100	25-80	27-43	12-24
	43-65	Loamy fine sand, sand, loamy sand, fine sand	SC-SM, SP, SM	A-1-b, A-2-4, A-4	0	0	90-100	85-100	40-85	4-45	15-22	1-6
18B:												
Tarboro	0-7	Sand, loamy sand, loamy fine sand	SM, SW-SM, SP-SC	A-2-4, A-3, A-1-b	0	0	100	100	50-85	5-45	0-26	NP-7
	7-62	Sand, loamy sand, loamy fine sand	SM, SP-SM, SW-SM	A-1-b, A-2-4, A-3	0	0	100	100	50-85	5-45	0-21	NP-4
19A:												
Tetotum	0-12	Fine sandy loam, loam, silt loam, sandy loam	SC-SM, CL-ML, SM	A-2-4, A-4	0	0	100	100	60-100	30-90	17-31	2-10
	12-32	Loam, clay loam, sandy clay loam, silty clay loam, silt loam	CL, SC	A-6, A-7-6	0	0	100	100	80-100	35-95	27-43	12-24
	32-49	Sandy loam, fine sandy loam, loam, sandy clay loam	SC, CL	A-6, A-2-6	0	0	100	100	60-95	30-75	24-43	9-24
	49-65	Sand, stratified sand to loamy sand to sandy loam to fine sandy loam	SC, SP-SM, ML, CL	A-2-4, A-4, A-1-b	0	0	100	100	50-85	5-55	0-31	NP-13

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
19B:												
Tetotum---------	0-12	Fine sandy loam, loam, silt loam, sandy loam	CL-ML, SC-SM, SM	A-2-4, A-4	0	0	100	100	60-100	30-90	17-31	2-10
	12-32	Loam, clay loam, sandy clay loam, silty clay loam, silt loam	CL, SC	A-6, A-7-6	0	0	100	100	80-100	35-95	27-43	12-24
	32-49	Sandy loam, fine sandy loam, loam, sandy clay loam	CL, SC	A-6, A-2-6	0	0	100	100	60-95	30-75	24-43	9-24
	49-65	Sand, stratified sand to loamy sand to sandy loam to fine sandy loam	SP-SM, CL, SC, ML	A-2-4, A-4, A-1-b	0	0	100	100	50-85	5-55	0-31	NP-13
19C:												
Tetotum---------	0-12	Fine sandy loam, loam, silt loam, sandy loam	CL-ML, SC-SM, SM	A-2-4, A-4	0	0	100	100	60-100	30-90	17-31	2-10
	12-32	Loam, clay loam, sandy clay loam, silty clay loam, silt loam	CL, SC	A-6, A-7-6	0	0	100	100	80-100	35-95	27-43	12-24
	32-49	Sandy loam, fine sandy loam, loam, sandy clay loam	CL, SC	A-6, A-2-6	0	0	100	100	60-95	30-75	24-43	9-24
	49-65	Sand, stratified sand to loamy sand to sandy loam to fine sandy loam	CL, ML, SC, SP-SM	A-2-4, A-4, A-1-b	0	0	100	100	50-85	5-55	0-31	NP-13

Table 16.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
20A:												
Tomotley--------	0-5	Fine sandy loam, sandy loam, loam, silt loam, loamy sand	SC-SM, SM, CL	A-2-4, A-4	0	0	95-100	92-100	45-100	15-90	18-43	2-13
	5-45	Sandy clay loam, sandy loam, fine sandy loam, loam, silty clay loam	CL, SC, SC-SM	A-6	0	0	95-100	92-100	55-100	25-95	28-45	12-24
	45-62	Sandy loam, fine sandy loam, sandy clay loam, clay loam, stratified sand to clay	SC-SM, SC, CL, CL-ML	A-4, A-6, A-7-6, A-2-4	0	0	95-100	92-100	45-100	4-95	0-53	NP-32
21A:												
Wahee-----------	0-11	Fine sandy loam, loam, silt loam, sandy loam	SC-SM, SM, CL	A-2-4, A-4	0	0	100	100	60-100	30-90	17-41	2-13
	11-38	Clay, clay loam, silty clay, sandy clay	CH, CL	A-7-6	0	0	100	100	85-100	45-95	43-67	25-44
	38-62	Loamy sand, stratified sand to clay	SC-SM, CL, CL-ML	A-2-4, A-4, A-6, A-1, A-7-6	0	0	100	100	50-100	5-95	0-59	NP-36
W.												
Water												

Table 17.—Physical Soil Properties

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodibility group	Wind erodibility index
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
1A:														
Augusta--------	0-9	20-80	5-75	5-20	1.40-1.70	14.00-42.00	0.10-0.20	0.0-2.9	0.5-2.0	.28	.28	4	3	86
	9-60	25-75	5-45	20-35	1.35-1.60	4.00-14.00	0.12-0.18	0.0-2.9	0.0-0.5	.24	.24			
	60-70	25-80	5-45	10-35	1.35-1.70	4.00-42.00	0.10-0.15	0.0-2.9	0.0-0.2	.15	.15			
2A:														
Bojac----------	0-10	30-88	2-45	3-15	1.20-1.50	42.00-141.00	0.05-0.10	0.0-2.9	0.5-1.0	.10	.10	4	2	134
	10-49	30-82	5-45	11-18	1.35-1.55	14.00-42.00	0.08-0.16	0.0-2.9	0.0-0.5	.32	.32			
	49-62	70-90	0-27	1-6	1.30-1.80	42.00-141.00	0.02-0.05	0.0-2.9	0.0-0.2	.10	.10			
2B:														
Bojac----------	0-10	30-88	2-45	3-15	1.20-1.50	42.00-141.00	0.05-0.10	0.0-2.9	0.5-1.0	.10	.10	4	2	134
	10-49	30-82	5-45	11-18	1.35-1.55	14.00-42.00	0.08-0.16	0.0-2.9	0.0-0.5	.32	.32			
	49-62	70-90	0-27	1-6	1.30-1.80	42.00-141.00	0.02-0.05	0.0-2.9	0.0-0.2	.10	.10			
3A:														
Craven---------	0-6	5-80	5-75	7-27	1.30-1.45	1.40-14.00	0.12-0.20	0.0-2.9	0.5-2.0	.32	.32	5	5	56
	6-31	5-40	10-65	35-60	1.30-1.45	0.42-1.40	0.12-0.15	3.0-5.9	0.0-0.5	.20	.20			
	31-45	5-75	5-65	20-60	1.30-1.45	0.42-14.00	0.12-0.15	3.0-5.9	0.0-0.2	.15	.15			
	45-62	30-90	0-45	5-35	1.35-1.60	1.40-142.00	0.03-0.14	0.0-2.9	0.0-0.2	.10	.10			
3B:														
Craven---------	0-6	5-80	5-75	7-27	1.30-1.45	1.40-14.00	0.12-0.20	0.0-2.9	0.5-2.0	.32	.32	5	5	56
	6-31	5-40	10-65	35-60	1.30-1.45	0.42-1.40	0.12-0.15	3.0-5.9	0.0-0.5	.20	.20			
	31-45	5-75	5-65	20-60	1.30-1.45	0.42-14.00	0.12-0.15	3.0-5.9	0.0-0.2	.15	.15			
	45-62	30-90	0-45	5-35	1.35-1.60	1.40-142.00	0.03-0.14	0.0-2.9	0.0-0.2	.10	.10			
3C:														
Craven---------	0-6	5-80	5-75	7-27	1.30-1.45	1.40-14.00	0.12-0.20	0.0-2.9	0.5-2.0	.32	.32	5	5	56
	6-31	5-40	10-65	35-60	1.30-1.45	0.42-1.40	0.12-0.15	3.0-5.9	0.0-0.5	.20	.20			
	31-45	5-75	5-65	20-60	1.30-1.45	0.42-14.00	0.12-0.15	3.0-5.9	0.0-0.2	.15	.15			
	45-62	30-90	0-45	5-35	1.35-1.60	1.40-142.00	0.03-0.14	0.0-2.9	0.0-0.2	.10	.10			
4A:														
Emporia--------	0-12	25-90	0-45	7-18	1.30-1.40	14.00-42.00	0.10-0.17	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	12-42	25-80	5-45	18-35	1.35-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.32	.32			
	42-62	10-80	5-45	10-50	1.45-1.60	0.10-14.00	0.08-0.18	3.0-5.9	0.0-0.2	.15	.15			
4B:														
Emporia--------	0-12	25-90	0-45	7-18	1.30-1.40	14.00-42.00	0.10-0.17	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	12-42	25-80	5-45	18-35	1.35-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.32	.32			
	42-62	10-80	5-45	10-50	1.45-1.60	0.10-14.00	0.08-0.18	3.0-5.9	0.0-0.2	.15	.15			

Table 17.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
4C:														
Emporia--------	0-12	25-90	0-45	7-18	1.30-1.40	14.00-42.00	0.10-0.17	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	12-42	25-80	5-45	18-35	1.35-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.32	.32			
	42-62	10-80	5-45	10-50	1.45-1.60	0.10-14.00	0.08-0.18	3.0-5.9	0.0-0.2	.15	.15			
5D:														
Emporia--------	0-12	25-90	0-45	7-18	1.30-1.40	14.00-42.00	0.10-0.17	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	12-42	25-80	5-45	18-35	1.35-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.32	.32			
	42-62	10-80	5-45	10-50	1.45-1.60	0.10-14.00	0.08-0.18	3.0-5.9	0.0-0.2	.15	.15			
Slagle---------	0-8	20-90	0-75	5-18	1.30-1.45	14.00-42.00	0.10-0.14	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	8-56	45-80	5-27	18-34	1.30-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.15	.15			
	56-62	25-80	5-45	18-40	1.35-1.60	0.10-9.00	0.07-0.18	0.0-5.9	0.0-0.2	.15	.15			
Rumford--------	0-14	50-90	1-25	2-15	1.25-1.45	42.00-141.00	0.06-0.10	0.0-2.9	0.5-1.0	.10	.10	5	2	134
	14-38	45-85	3-20	8-20	1.25-1.45	14.00-42.00	0.10-0.15	0.0-2.9	0.0-0.5	.24	.24			
	38-55	45-90	1-25	4-20	1.25-1.50	14.00-100.00	0.08-0.15	0.0-2.9	0.0-0.2	.10	.10			
	55-99	45-99	0-25	2-18	1.25-1.50	14.00-141.00	0.04-0.10	0.0-2.9	0.0-0.2	.10	.10			
5E:														
Emporia--------	0-12	25-90	0-45	7-18	1.30-1.40	14.00-42.00	0.10-0.17	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	12-42	25-80	5-45	18-35	1.35-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.32	.32			
	42-62	10-80	5-45	10-50	1.45-1.60	0.10-14.00	0.08-0.18	3.0-5.9	0.0-0.2	.15	.15			
Slagle---------	0-8	20-90	0-75	5-18	1.30-1.45	14.00-42.00	0.10-0.14	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	8-56	45-80	5-27	18-34	1.30-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.15	.15			
	56-62	25-80	5-45	18-40	1.35-1.60	0.10-9.00	0.07-0.18	0.0-5.9	0.0-0.2	.15	.15			
Rumford--------	0-14	50-90	1-25	2-15	1.25-1.45	42.00-141.00	0.06-0.10	0.0-2.9	0.5-1.0	.10	.10	5	2	134
	14-38	55-85	3-20	8-20	1.25-1.45	14.00-42.00	0.10-0.15	0.0-2.9	0.0-0.5	.24	.24			
	38-55	45-90	1-25	4-20	1.25-1.50	14.00-100.00	0.08-0.15	0.0-2.9	0.0-0.2	.10	.10			
	55-99	45-99	0-25	2-18	1.25-1.50	14.00-141.00	0.04-0.10	0.0-2.9	0.0-0.2	.10	.10			
6A:														
Faceville------	0-9	50-88	1-35	5-20	1.40-1.65	42.00-141.00	0.06-0.09	0.0-2.9	0.5-2.0	.28	.28	5	3	86
	9-30	35-60	5-30	20-50	1.35-1.60	4.00-14.00	0.12-0.15	0.0-2.9	0.0-0.5	.10	.10			
	30-67	35-60	5-30	30-55	1.25-1.60	4.00-14.00	0.12-0.18	0.0-2.9	0.0-0.2	.24	.24			
6B:														
Faceville------	0-9	50-88	1-35	5-20	1.40-1.65	42.00-141.00	0.06-0.09	0.0-2.9	0.5-2.0	.28	.28	5	3	86
	9-30	35-60	5-30	20-50	1.35-1.60	4.00-14.00	0.12-0.15	0.0-2.9	0.0-0.5	.10	.10			
	30-67	35-60	5-30	30-55	1.25-1.60	4.00-14.00	0.12-0.18	0.0-2.9	0.0-0.2	.24	.24			
7A:														
Kinston--------	0-4	20-88	1-75	5-18	1.40-1.60	14.00-42.00	0.13-0.19	0.0-2.9	2.0-5.0	.24	.24	5	3	86
	4-47	20-80	5-45	18-35	1.30-1.50	4.00-14.00	0.14-0.18	0.0-2.9	0.0-3.0	.20	.20			
	47-62	20-99	0-45	2-35	1.30-1.50	4.00-142.00	0.05-0.18	0.0-2.9	0.0-3.0	.24	.28			

Table 17.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodibility group	Wind erodibility index
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
7A:														
Bibb-----------	0-6	20-88	1-75	2-18	1.50-1.70	4.00-14.00	0.12-0.22	0.0-2.9	1.0-3.0	.28	.28	5	3	86
	6-30	20-80	5-75	5-18	1.50-1.70	4.00-14.00	0.12-0.20	0.0-2.9	1.0-3.0	.24	.24			
	30-62	20-99	0-75	1-18	1.45-1.75	4.00-142.00	0.03-0.20	0.0-2.9	0.5-1.0	.05	.10			
8A:														
Levy-----------	0-4	2-25	25-75	20-50	0.50-1.00	0.42-1.40	0.16-0.22	6.0-8.9	5.0-10	.37	.37	5	8	0
	4-62	1-25	25-60	35-60	0.50-1.10	0.42-1.40	0.16-0.22	6.0-8.9	2.0-8.0	.15	.15			
9A:														
Mattaponi------	0-8	40-80	5-35	5-18	1.30-1.55	4.00-42.00	0.08-0.15	0.0-2.9	0.5-2.0	.28	.28	5	3	86
	8-52	20-60	5-30	35-60	1.40-1.65	1.40-4.00	0.12-0.18	3.0-5.9	0.0-0.5	.20	.20			
	52-62	15-75	5-35	30-60	1.40-1.65	1.40-14.00	0.11-0.18	3.0-5.9	0.0-0.2	.20	.20			
9B:														
Mattaponi------	0-8	40-80	5-35	5-18	1.30-1.55	4.00-42.00	0.08-0.15	0.0-2.9	0.5-2.0	.28	.28	5	3	86
	8-52	20-60	5-30	35-60	1.40-1.65	1.40-4.00	0.12-0.18	3.0-5.9	0.0-0.5	.20	.20			
	52-62	15-75	5-35	30-60	1.40-1.65	1.40-14.00	0.11-0.18	3.0-5.9	0.0-0.2	.20	.20			
9C:														
Mattaponi------	0-8	40-80	5-35	5-18	1.30-1.55	4.00-42.00	0.08-0.15	0.0-2.9	0.5-2.0	.28	.28	5	3	86
	8-52	20-60	5-30	35-60	1.40-1.65	1.40-4.00	0.12-0.18	3.0-5.9	0.0-0.5	.20	.20			
	52-62	15-75	5-35	30-60	1.40-1.65	1.40-14.00	0.11-0.18	3.0-5.9	0.0-0.2	.20	.20			
10A:														
Munden---------	0-8	65-88	1-35	3-15	1.20-1.35	14.00-42.00	0.06-0.10	0.0-2.9	0.5-1.0	.10	.10	4	2	134
	8-33	40-80	5-45	8-18	1.20-1.35	4.00-42.00	0.08-0.18	0.0-2.9	0.2-0.8	.24	.24			
	33-42	40-95	1-45	2-20	1.35-1.55	14.00-141.00	0.04-0.08	0.0-2.9	0.0-0.2	.10	.10			
	42-70	60-98	0-35	2-15	1.35-1.60	14.00-141.00	0.04-0.08	0.0-2.9	0.0-0.2	.10	.10			
10B:														
Munden---------	0-8	65-88	1-35	3-15	1.20-1.35	14.00-42.00	0.06-0.10	0.0-2.9	0.5-1.0	.10	.10	4	2	134
	8-33	40-80	5-45	8-18	1.20-1.35	4.00-42.00	0.08-0.18	0.0-2.9	0.2-0.8	.24	.24			
	33-42	40-95	1-45	2-20	1.35-1.55	14.00-141.00	0.04-0.08	0.0-2.9	0.0-0.2	.10	.10			
	42-70	60-98	0-35	2-15	1.35-1.60	14.00-141.00	0.04-0.08	0.0-2.9	0.0-0.2	.10	.10			
11A.														
Pits, gravel														
12A:														
Rappahannock---	0-12	5-25	75-95	0-10	0.10-0.60	4.00-14.00	0.22-0.26	0.0-2.9	20-65	---	---	2	8	0
	12-39	5-25	75-95	0-10	0.10-1.00	4.00-14.00	0.22-0.26	0.0-2.9	20-50	---	---			
	39-62	55-88	1-40	5-18	1.20-1.50	4.00-142.00	0.08-0.20	0.0-2.9	2.0-5.0	.17	.17			

Table 17.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
13A:														
Roanoke--------	0-5	5-80	5-75	10-27	1.20-1.50	4.00-14.00	0.14-0.20	0.0-2.9	0.5-2.0	.32	.32	5	5	56
	5-36	5-40	30-60	35-60	1.20-1.50	0.01-4.00	0.16-0.19	3.0-5.9	0.0-1.0	.20	.20			
	36-42	5-70	5-60	20-40	1.35-1.65	4.00-14.00	0.10-0.19	3.0-5.9	0.0-0.5	.15	.15			
	42-62	25-99	0-45	2-50	1.20-1.50	0.01-141.00	0.04-0.14	0.0-5.9	0.0-0.2	.24	.24			
14B:														
Rumford--------	0-14	50-90	1-25	2-15	1.25-1.45	42.00-141.00	0.06-0.10	0.0-2.9	0.5-1.0	.10	.10	5	2	134
	14-38	45-85	3-20	8-20	1.25-1.45	14.00-42.00	0.10-0.15	0.0-2.9	0.0-0.5	.24	.24			
	38-55	45-90	1-25	4-20	1.25-1.50	14.00-100.00	0.08-0.15	0.0-2.9	0.0-0.2	.10	.10			
	55-99	45-99	0-25	2-18	1.25-1.50	14.00-141.00	0.04-0.10	0.0-2.9	0.0-0.2	.10	.10			
14C:														
Rumford--------	0-14	50-90	1-25	2-15	1.25-1.45	42.00-141.00	0.06-0.10	0.0-2.9	0.5-1.0	.10	.10	5	2	134
	14-38	45-85	3-20	8-20	1.25-1.45	14.00-42.00	0.10-0.15	0.0-2.9	0.0-0.5	.24	.24			
	38-55	45-90	1-25	4-20	1.25-1.50	14.00-100.00	0.08-0.15	0.0-2.9	0.0-0.2	.10	.10			
	55-99	45-99	0-25	2-18	1.25-1.50	14.00-141.00	0.04-0.10	0.0-2.9	0.0-0.2	.10	.10			
15A:														
Slagle---------	0-8	20-90	0-75	5-18	1.30-1.45	14.00-42.00	0.10-0.14	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	8-56	45-80	5-27	18-34	1.30-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.15	.15			
	56-62	25-80	5-45	18-40	1.35-1.60	0.10-9.00	0.07-0.18	0.0-5.9	0.0-0.2	.15	.15			
15B:														
Slagle---------	0-8	20-90	0-75	5-18	1.30-1.45	14.00-42.00	0.10-0.14	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	8-56	45-80	5-27	18-34	1.30-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.15	.15			
	56-62	25-80	5-45	18-40	1.35-1.60	0.10-9.00	0.07-0.18	0.0-5.9	0.0-0.2	.15	.15			
15C:														
Slagle---------	0-8	20-90	0-75	5-18	1.30-1.45	14.00-42.00	0.10-0.14	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	8-56	45-80	5-27	18-34	1.30-1.45	4.00-14.00	0.10-0.18	0.0-2.9	0.0-0.5	.15	.15			
	56-62	25-80	5-45	18-40	1.35-1.60	0.10-9.00	0.07-0.18	0.0-5.9	0.0-0.2	.15	.15			
16A:														
State----------	0-17	20-88	1-75	5-20	1.25-1.40	4.00-42.00	0.08-0.20	0.0-2.9	0.5-2.0	.28	.28	5	3	86
	17-36	20-80	5-65	18-34	1.35-1.50	4.00-14.00	0.14-0.19	0.0-2.9	0.0-0.5	.15	.15			
	36-62	55-99	0-25	2-15	1.35-1.50	14.00-141.00	0.02-0.15	0.0-2.9	0.0-0.2	.28	.28			
16B:														
State----------	0-17	20-88	1-75	5-20	1.25-1.40	4.00-42.00	0.08-0.20	0.0-2.9	0.5-2.0	.28	.28	5	3	86
	17-36	20-80	5-65	18-34	1.35-1.50	4.00-14.00	0.14-0.19	0.0-2.9	0.0-0.5	.15	.15			
	36-62	55-99	0-25	2-15	1.35-1.50	14.00-141.00	0.02-0.15	0.0-2.9	0.0-0.2	.28	.28			
17A:														
Suffolk--------	0-8	60-88	1-30	6-18	1.35-1.45	14.00-42.00	0.10-0.16	0.0-2.9	0.5-2.0	.20	.20	5	3	86
	8-43	35-80	5-30	18-34	1.40-1.50	4.00-14.00	0.10-0.15	0.0-2.9	0.0-0.5	.15	.15			
	43-65	75-100	0-20	4-10	1.40-1.50	14.00-141.00	0.04-0.10	0.0-2.9	0.0-0.2	.28	.28			

Table 17.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	Pct	Pct	g/cc	um/sec	In/in	Pct	Pct					
17B:														
Suffolk--------	0-8	60-88	1-30	6-18	1.35-1.45	14.00-42.00	0.10-0.16	0.0-2.9	0.5-2.0	.20	.20	5	3	86
	8-43	35-80	5-30	18-34	1.40-1.50	4.00-14.00	0.10-0.15	0.0-2.9	0.0-0.5	.15	.15			
	43-65	75-100	0-20	4-10	1.40-1.5	14.00-141.00	0.04-0.10	0.0-2.9	0.0-0.2	.28	.28			
17C:														
Suffolk--------	0-8	60-88	1-30	6-18	1.35-1.45	14.00-42.00	0.10-0.16	0.0-2.9	0.5-2.0	.20	.20	5	3	86
	8-43	35-80	5-30	18-34	1.40-1.50	4.00-14.00	0.10-0.15	0.0-2.9	0.0-0.5	.15	.15			
	43-65	75-100	0-20	4-10	1.40-1.50	14.00-141.00	0.04-0.10	0.0-2.9	0.0-0.2	.28	.28			
18B:														
Tarboro--------	0-7	75-100	0-20	3-12	1.60-1.75	42.00-141.00	0.05-0.09	0.0-2.9	0.5-1.0	.10	.10	5	2	134
	7-62	75-100	0-20	2-8	1.60-1.75	141.00-141.00	0.02-0.06	0.0-2.9	0.0-0.2	.10	.10			
19A:														
Tetotum--------	0-12	20-80	5-75	5-15	1.50-1.70	14.00-42.00	0.10-0.14	0.0-2.9	0.5-2.0	.28	.28	4	3	86
	12-32	20-75	20-75	18-34	1.40-1.65	4.00-14.00	0.14-0.19	0.0-2.9	0.0-0.5	.32	.32			
	32-49	30-80	5-45	15-34	1.40-1.65	4.00-14.00	0.12-0.19	0.0-2.9	0.0-0.2	.24	.24			
	49-65	55-99	0-25	2-20	1.50-1.80	14.00-141.00	0.03-0.12	0.0-2.9	0.0-0.2	.10	.10			
19B:														
Tetotum--------	0-12	20-80	5-75	5-15	1.50-1.70	14.00-42.00	0.10-0.14	0.0-2.9	0.5-2.0	.28	.28	4	3	86
	12-32	20-75	20-75	18-34	1.40-1.65	4.00-14.00	0.14-0.19	0.0-2.9	0.0-0.5	.32	.32			
	32-49	30-80	5-45	15-34	1.40-1.65	4.00-14.00	0.12-0.19	0.0-2.9	0.0-0.2	.24	.24			
	49-65	55-99	0-25	2-20	1.50-1.80	14.00-141.00	0.03-0.12	0.0-2.9	0.0-0.2	.10	.10			
19C:														
Tetotum--------	0-12	20-80	5-75	5-15	1.50-1.70	14.00-42.00	0.10-0.14	0.0-2.9	0.5-2.0	.28	.28	4	3	86
	12-32	20-75	20-75	18-34	1.40-1.65	4.00-14.00	0.14-0.19	0.0-2.9	0.0-0.5	.32	.32			
	32-49	30-80	5-45	15-34	1.40-1.65	4.00-14.00	0.12-0.19	0.0-2.9	0.0-0.2	.24	.24			
	49-65	55-99	0-25	2-20	1.50-1.80	14.00-141.00	0.03-0.12	0.0-2.9	0.0-0.2	.10	.10			
20A:														
Tomotley-------	0-5	20-88	1-75	5-20	1.30-1.60	14.00-42.00	0.10-0.22	0.0-2.9	1.0-6.0	.24	.24	5	3	86
	5-45	20-80	5-70	18-34	1.30-1.50	4.00-14.00	0.12-0.20	0.0-2.9	0.5-1.0	.15	.15			
	45-62	25-99	0-45	2-45	1.30-1.60	1.40-141.00	0.02-0.18	0.0-2.9	0.0-0.5	.20	.24			
21A:														
Wahee----------	0-11	20-80	5-75	5-20	1.30-1.60	4.00-14.00	0.10-0.20	0.0-2.9	0.5-5.0	.24	.24	5	3	86
	11-38	5-50	10-55	35-60	1.40-1.60	0.42-1.40	0.12-0.18	3.0-5.9	0.0-0.5	.20	.20			
	38-62	15-99	0-35	2-50	1.40-1.60	0.42-141.00	0.02-0.16	0.0-5.9	0.0-0.5	.10	.10			
W.														
Water														

Table 18.—Chemical Soil Properties

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	meq/100 g	pH	mmhos/cm	
1A:						
Augusta	0-9	2.9-12	2.2-8.6	4.5-6.0	0	0
	9-60	7.0-13	5.2-10	4.5-6.0	0	0
	60-70	3.5-13	2.6-10	4.5-6.0	0	0
2A:						
Bojac	0-10	2.2-5.0	1.6-3.8	3.6-6.5	0	0
	10-49	3.9-7.4	2.9-5.6	3.6-6.5	0	0
	49-62	0.3-3.2	0.3-2.4	4.5-6.0	0	0
2B:						
Bojac	0-10	2.2-5.0	1.6-3.8	3.6-6.5	0	0
	10-49	3.9-7.4	2.9-5.6	3.6-6.5	0	0
	49-62	0.3-3.2	0.3-2.4	4.5-6.0	0	0
3A:						
Craven	0-6	2.9-11	2.2-8.4	4.5-5.5	0	0
	6-31	8.8-16	6.6-12	4.5-5.5	0	0
	31-45	8.0-16	6.2-12	4.5-5.5	0	0
	45-62	1.2-2.0	0.9-1.7	4.5-5.5	0	0
3B:						
Craven	0-6	2.9-11	2.2-8.4	4.5-5.5	0	0
	6-31	8.8-16	6.6-12	4.5-5.5	0	0
	31-45	8.0-16	6.2-12	4.5-5.5	0	0
	45-62	1.2-2.0	0.9-1.7	4.5-5.5	0	0
3C:						
Craven	0-6	2.9-11	2.2-8.4	4.5-5.5	0	0
	6-31	8.8-16	6.6-12	4.5-5.5	0	0
	31-45	8.0-16	6.2-12	4.5-5.5	0	0
	45-62	1.2-2.0	0.9-1.7	4.5-5.5	0	0
4A:						
Emporia	0-12	2.9-9.0	2.2-6.8	4.5-6.0	0	0
	12-42	4.5-9.9	3.4-7.4	4.5-6.0	0	0
	42-62	1.2-11	0.9-8.3	4.5-6.0	0	0
4B:						
Emporia	0-12	2.9-9.0	2.2-6.8	4.5-6.0	0	0
	12-42	4.5-9.9	3.4-7.4	4.5-6.0	0	0
	42-62	1.2-11	0.9-8.3	4.5-6.0	0	0
4C:						
Emporia	0-12	2.9-9.0	2.2-6.8	4.5-6.0	0	0
	12-42	4.5-9.9	3.4-7.4	4.5-6.0	0	0
	42-62	1.2-11	0.9-8.3	4.5-6.0	0	0
5D:						
Emporia	0-12	2.9-9.0	2.2-6.8	4.5-6.0	0	0
	12-42	4.5-9.9	3.4-7.4	4.5-6.0	0	0
	42-62	1.2-11	0.9-8.3	4.5-6.0	0	0
Slagle	0-8	3.1-9.0	2.3-6.8	3.5-5.5	0	0
	8-56	3.0-9.6	2.2-7.2	3.5-5.5	0	0
	56-62	4.5-11	3.4-8.3	3.5-5.5	0	0

Table 18.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	meq/100 g	pH	mmhos/cm	
5D:						
Rumford--------------	0-14	1.6-6.0	1.2-4.5	3.5-5.5	0	0
	14-38	2.0-6.1	1.5-4.6	3.5-6.0	0	0
	38-55	1.5-6.1	1.1-4.6	3.5-6.0	0	0
	55-99	0.5-5.6	0.4-4.2	3.5-6.5	0	0
5E:						
Emporia--------------	0-12	2.9-9.0	2.2-6.8	4.5-6.0	0	0
	12-42	4.5-9.9	3.4-7.4	4.5-6.0	0	0
	42-62	1.2-11	0.9-8.3	4.5-6.0	0	0
Slagle---------------	0-8	3.1-9.0	2.3-6.8	3.5-5.5	0	0
	8-56	3.0-9.6	2.2-7.2	3.5-5.5	0	0
	56-62	4.5-11	3.4-8.3	3.5-5.5	0	0
Rumford--------------	0-14	1.6-6.0	1.2-4.5	3.5-5.5	0	0
	14-38	2.0-6.1	1.5-4.6	3.5-6.0	0	0
	38-55	1.5-6.1	1.1-4.6	3.5-6.0	0	0
	55-99	0.5-5.6	0.4-4.2	3.5-6.5	0	0
6A:						
Faceville------------	0-9	1.6-6.5	1.2-4.9	4.5-5.5	0	0
	9-30	2.0-6.1	1.5-4.6	4.5-5.5	0	0
	30-67	3.5-6.6	2.6-5.0	4.5-5.5	0	0
6B:						
Faceville------------	0-9	1.6-6.5	1.2-4.9	4.5-5.5	0	0
	9-30	2.0-6.1	1.5-4.6	4.5-5.5	0	0
	30-67	3.5-6.6	2.6-5.0	4.5-5.5	0	0
7A:						
Kinston--------------	0-4	5.8-16	4.3-12	4.5-5.5	0	0
	4-47	4.5-16	3.4-12	4.5-5.5	0	0
	47-62	2.0-16	1.7-12	4.5-5.5	0	0
Bibb-----------------	0-6	2.8-11	2.1-8.4	3.5-5.5	0	0
	6-30	2.8-11	2.1-8.4	3.5-5.5	0	0
	30-62	1.0-6.8	0.6-5.1	3.5-5.5	0	0
8A:						
Levy-----------------	0-4	18-40	14-30	3.5-5.5	0.0-2.0	10-20
	4-62	17-39	13-29	3.5-5.5	0.0-2.0	10-20
9A:						
Mattaponi------------	0-8	2.4-9.0	1.8-6.8	4.5-5.5	0	0
	8-52	8.8-16	6.6-12	4.5-5.5	0	0
	52-62	8.1-16	6.1-12	4.5-5.5	0	0
9B:						
Mattaponi------------	0-8	2.4-9.0	1.8-6.8	4.5-5.5	0	0
	8-52	8.8-16	6.6-12	4.5-5.5	0	0
	52-62	8.1-16	6.1-12	4.5-5.5	0	0
9C:						
Mattaponi------------	0-8	2.4-9.0	1.8-6.8	4.5-5.5	0	0
	8-52	8.8-16	6.6-12	4.5-5.5	0	0
	52-62	8.1-16	6.1-12	4.5-5.5	0	0

Table 18.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	meq/100 g	pH	mmhos/cm	
10A:						
Munden---------------	0-8	2.2-7.5	1.6-5.6	4.5-6.0	0	0
	8-33	3.9-8.6	2.9-6.4	4.5-6.0	0	0
	33-42	0.7-6.4	0.5-4.8	4.5-6.0	0	0
	42-70	0.7-6.7	0.5-5.1	4.5-6.0	0	0
10B:						
Munden---------------	0-8	2.2-7.5	1.6-5.6	4.5-6.0	0	0
	8-33	3.9-8.6	2.9-6.4	4.5-6.0	0	0
	33-42	0.7-6.4	0.5-4.8	4.5-6.0	0	0
	42-70	0.7-6.7	0.5-5.1	4.5-6.0	0	0
11A.						
Pits, gravel						
12A:						
Rappahannock---------	0-12	45-146	34-110	5.1-8.4	2.0-16.0	0
	12-39	45-113	34-84	5.1-8.4	2.0-16.0	0
	39-62	6.2-27	4.7-20	5.1-8.4	2.0-16.0	0
13A:						
Roanoke--------------	0-5	3.6-11	2.7-8.4	3.5-5.5	0	0
	5-36	8.8-17	6.6-13	3.5-5.5	0	0
	36-42	5.0-11	3.8-8.3	3.5-5.5	0	0
	42-62	0.5-13	0.4-9.7	3.5-5.5	0	0
14B:						
Rumford--------------	0-14	1.6-6.0	1.2-4.5	3.5-5.5	0	0
	14-38	2.0-6.1	1.5-4.6	3.5-6.0	0	0
	38-55	1.5-6.1	1.1-4.6	3.5-6.0	0	0
	55-99	0.5-5.6	0.4-4.2	3.5-6.5	0	0
14C:						
Rumford--------------	0-14	1.6-6.0	1.2-4.5	3.5-5.5	0	0
	14-38	2.0-6.1	1.5-4.6	3.5-6.0	0	0
	38-55	1.5-6.1	1.1-4.6	3.5-6.0	0	0
	55-99	0.5-5.6	0.4-4.2	3.5-6.5	0	0
15A:						
Slagle---------------	0-8	3.1-9.0	2.3-6.8	3.5-5.5	0	0
	8-56	3.0-9.6	2.2-7.2	3.5-5.5	0	0
	56-62	4.5-11	3.4-8.3	3.5-5.5	0	0
15B:						
Slagle---------------	0-8	3.1-9.0	2.3-6.8	3.5-5.5	0	0
	8-56	3.0-9.6	2.2-7.2	3.5-5.5	0	0
	56-62	4.5-11	3.4-8.3	3.5-5.5	0	0
15C:						
Slagle---------------	0-8	3.1-9.0	2.3-6.8	3.5-5.5	0	0
	8-56	3.0-9.6	2.2-7.2	3.5-5.5	0	0
	56-62	4.5-11	3.4-8.3	3.5-5.5	0	0
16A:						
State----------------	0-17	2.9-12	2.2-8.6	3.5-5.5	0	0
	17-36	6.3-13	4.7-9.8	3.5-5.5	0	0
	36-62	0.7-6.4	0.5-4.8	3.5-6.5	0	0

Table 18.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	meq/100 g	pH	mmhos/cm	
16B:						
State	0-17	2.9-12	2.2-8.6	3.5-5.5	0	0
	17-36	6.3-13	4.7-9.8	3.5-5.5	0	0
	36-62	0.7-6.4	0.5-4.8	3.5-6.5	0	0
17A:						
Suffolk	0-8	2.6-9.0	2.0-6.8	3.6-6.0	0	0
	8-43	2.5-9.4	1.9-7.0	3.6-6.0	0	0
	43-65	1.0-3.6	0.8-2.7	3.6-6.0	0	0
17B:						
Suffolk	0-8	2.6-9.0	2.0-6.8	3.6-6.0	0	0
	8-43	2.5-9.4	1.9-7.0	3.6-6.0	0	0
	43-65	1.0-3.6	0.8-2.7	3.6-6.0	0	0
17C:						
Suffolk	0-8	2.6-9.0	2.0-6.8	3.6-6.0	0	0
	8-43	2.5-9.4	1.9-7.0	3.6-6.0	0	0
	43-65	1.0-3.6	0.8-2.7	3.6-6.0	0	0
18B:						
Tarboro	0-7	2.2-6.5	1.6-4.8	5.1-6.5	0	0
	7-62	0.7-3.9	0.5-2.9	5.1-6.5	0	0
19A:						
Tetotum	0-12	2.4-8.2	1.8-6.2	3.5-5.5	0	0
	12-32	4.5-9.6	3.4-7.2	3.5-5.5	0	0
	32-49	3.8-9.0	2.8-6.7	3.5-5.5	0	0
	49-65	0.5-5.5	0.4-4.1	3.5-5.5	0	0
19B:						
Tetotum	0-12	2.4-8.2	1.8-6.2	3.5-5.5	0	0
	12-32	4.5-9.6	3.4-7.2	3.5-5.5	0	0
	32-49	3.8-9.0	2.8-6.7	3.5-5.5	0	0
	49-65	0.5-5.5	0.4-4.1	3.5-5.5	0	0
19C:						
Tetotum	0-12	2.4-8.2	1.8-6.2	3.5-5.5	0	0
	12-32	4.5-9.6	3.4-7.2	3.5-5.5	0	0
	32-49	3.8-9.0	2.8-6.7	3.5-5.5	0	0
	49-65	0.5-5.5	0.4-4.1	3.5-5.5	0	0
20A:						
Tomotley	0-5	4.0-20	3.0-15	3.5-5.5	0	0
	5-45	7.4-14	5.6-11	3.5-5.5	0	0
	45-62	1.0-17	0.5-13	3.5-6.0	0	0
21A:						
Wahee	0-11	2.9-18	2.2-14	4.5-6.0	0	0
	11-38	12-22	9.2-17	3.5-5.5	0	0
	38-62	1.2-20	0.7-17	3.5-5.5	0	0
W.						
Water						

Table 19.—Water Features

(Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
1A:										
Augusta	C	Very high	Jan-May	1.0-2.0	>6.0	---	---	None	Brief	Rare
			June-Nov	---	---	---	---	None	Brief	Rare
			December	1.0-2.0	>6.0	---	---	None	Brief	Rare
2A:										
Bojac	B	Very low	Jan-April	4.0-6.6	>6.0	---	---	None	Brief	Rare
			May-Oct	---	---	---	---	None	Brief	Rare
			Nov-Dec	4.0-6.6	>6.0	---	---	None	Brief	Rare
2B:										
Bojac	B	Very low	Jan-April	4.0-6.6	>6.0	---	---	None	Brief	Rare
			May-Oct	---	---	---	---	None	Brief	Rare
			Nov-Dec	4.0-6.6	>6.0	---	---	None	Brief	Rare
3A:										
Craven	C	Low	Jan-April	2.0-3.0	>6.0	---	---	None	---	None
			May-Nov	---	---	---	---	None	---	None
			December	2.0-3.0	>6.0	---	---	None	---	None
3B:										
Craven	C	Low	Jan-April	2.0-3.0	>6.0	---	---	None	---	None
			May-Nov	---	---	---	---	None	---	None
			December	2.0-3.0	>6.0	---	---	None	---	None
3C:										
Craven	C	Medium	Jan-April	2.0-3.0	>6.0	---	---	None	---	None
			May-Nov	---	---	---	---	None	---	None
			December	2.0-3.0	>6.0	---	---	None	---	None
4A:										
Emporia	C	Low	Jan-April	3.0-4.5	4.5-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	3.0-4.5	4.5-6.6	---	---	None	---	None
4B:										
Emporia	C	Low	Jan-April	3.0-4.5	4.5-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	3.0-4.5	4.5-6.6	---	---	None	---	None

Table 19.—Water Features—Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
4C:										
Emporia	C	Medium	Jan-April	3.0-4.5	4.5-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	3.0-4.5	4.5-6.6	---	---	None	---	None
5D:										
Emporia	C	Medium	Jan-April	3.0-4.5	4.5-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	3.0-4.5	4.5-6.6	---	---	None	---	None
Slagle	C	Medium	Jan-April	1.5-3.0	3.0-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	1.5-3.0	3.0-6.6	---	---	None	---	None
Rumford	B	Low	Jan-Dec	---	---	---	---	None	---	None
5E:										
Emporia	C	High	Jan-April	3.0-4.5	4.5-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	3.0-4.5	4.5-6.6	---	---	None	---	None
Slagle	C	High	Jan-April	1.5-3.0	3.0-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	1.5-3.0	3.0-6.6	---	---	None	---	None
Rumford	B	Medium	Jan-Dec	---	---	---	---	None	---	None
6A:										
Faceville	B	Low	Jan-Dec	---	---	---	---	None	---	None
6B:										
Faceville	B	Low	Jan-Dec	---	---	---	---	None	---	None
7A:										
Kinston	B/D	Very high	Jan-June	0.0-1.0	>6.0	---	---	None	Long	Occasional
			July-Oct	---	---	---	---	None	---	None
			Nov-Dec	0.0-1.0	>6.0	---	---	None	Long	Occasional
Bibb	D	Very high	Jan-May	0.5-1.0	>6.0	---	---	None	Long	Occasional
			June-Nov	---	---	---	---	None	---	None
			December	0.5-1.0	>6.0	---	---	None	Long	Occasional
8A:										
Levy	D	Negligible	Jan-Dec	0.0	>6.0	1.0-2.0	Long	Frequent	Very long	Very frequent

Table 19.—Water Features—Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
9A:										
Mattaponi-------------	C	Low	Jan-March	3.0-4.5	4.5-6.6	---	---	None	---	None
			April-Nov	---	---	---	---	None	---	None
			December	3.0-4.5	4.5-6.6	---	---	None	---	None
9B:										
Mattaponi-------------	C	Low	Jan-March	3.0-4.5	4.5-6.6	---	---	None	---	None
			April-Nov	---	---	---	---	None	---	None
			December	3.0-4.5	4.5-6.6	---	---	None	---	None
9C:										
Mattaponi-------------	C	Medium	Jan-March	3.0-4.5	4.5-6.6	---	---	None	---	None
			April-Nov	---	---	---	---	None	---	None
			December	3.0-4.5	4.5-6.6	---	---	None	---	None
10A:										
Munden----------------	B	Very low	Jan-April	1.5-2.5	>6.0	---	---	None	---	None
			May-Nov	---	---	---	---	None	---	None
			December	1.5-2.5	>6.0	---	---	None	---	None
10B:										
Munden----------------	B	Very low	Jan-April	1.5-2.5	>6.0	---	---	None	---	None
			May-Nov	---	---	---	---	None	---	None
			December	1.5-2.5	>6.0	---	---	None	---	None
11A.										
Pits, gravel										
12A:										
Rappahannock----------	D	Negligible	Jan-Dec	0.0	>6.0	0.0-2.0	Very brief	Frequent	Very brief	Very frequent
13A:										
Roanoke---------------	D	Very high	Jan-May	0.0-1.0	>6.0	---	---	None	Brief	Rare
			June-Oct	---	---	---	---	None	Brief	Rare
			Nov-Dec	0.0-1.0	>6.0	---	---	None	Brief	Rare
14B:										
Rumford---------------	B	Very low	Jan-Dec	---	---	---	---	None	---	None
14C:										
Rumford---------------	B	Low	Jan-Dec	---	---	---	---	None	---	None
15A:										
Slagle----------------	C	Low	Jan-April	1.5-3.0	3.0-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	1.5-3.0	3.0-6.6	---	---	None	---	None

Table 19.—Water Features—Continued

Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
15B:										
Slagle-----------------	C	Low	Jan-April	1.5-3.0	3.0-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	1.5-3.0	3.0-6.6	---	---	None	---	None
15C:										
Slagle-----------------	C	Medium	Jan-April	1.5-3.0	3.0-6.6	---	---	None	---	None
			May-Oct	---	---	---	---	None	---	None
			Nov-Dec	1.5-3.0	3.0-6.6	---	---	None	---	None
16A:										
State------------------	B	Low	Jan-June	4.0-6.6	>6.0	---	---	None	---	None
			July-Nov	---	---	---	---	None	---	None
			December	4.0-6.6	>6.0	---	---	None	---	None
16B:										
State------------------	B	Low	Jan-June	4.0-6.6	>6.0	---	---	None	---	None
			July-Nov	---	---	---	---	None	---	None
			December	4.0-6.6	>6.0	---	---	None	---	None
17A:										
Suffolk----------------	B	Low	Jan-Dec	---	---	---	---	None	---	None
17B:										
Suffolk----------------	B	Low	Jan-Dec	---	---	---	---	None	---	None
17C:										
Suffolk----------------	B	Medium	Jan-Dec	---	---	---	---	None	---	None
18B:										
Tarboro----------------	A	Very low	Jan-Dec	---	---	---	---	None	Brief	Rare
19A:										
Tetotum----------------	C	Low	Jan-April	1.5-2.5	>6.0	---	---	None	Brief	Rare
			May-Nov	---	---	---	---	None	Brief	Rare
			December	1.5-2.5	>6.0	---	---	None	Brief	Rare
19B:										
Tetotum----------------	C	Low	Jan-April	1.5-2.5	>6.0	---	---	None	Brief	Rare
			May-Nov	---	---	---	---	None	Brief	Rare
			December	1.5-2.5	>6.0	---	---	None	Brief	Rare
19C:										
Tetotum----------------	C	Medium	Jan-April	1.5-2.5	>6.0	---	---	None	---	None
			May-Nov	---	---	---	---	None	---	None
			December	1.5-2.5	>6.0	---	---	None	---	None

Table 19.—Water Features—Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
20A:										
Tomotley----------------	B/D	Very high	Jan-April	0.0-1.0	>6.0	---	---	None	Brief	Rare
			May-Oct	---	---	---	---	None	Brief	Rare
			Nov-Dec	0.0-1.0	>6.0	---	---	None	Brief	Rare
21A:										
Wahee-------------------	D	Very high	Jan-March	0.5-1.5	>6.0	---	---	None	Brief	Rare
			April-Nov	---	---	---	---	None	Brief	Rare
			December	0.5-1.5	>6.0	---	---	None	Brief	Rare
W.										
Water										

Table 20.—Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
1A:			
Augusta	None	High	Moderate
2A:			
Bojac	None	Low	High
2B:			
Bojac	None	Low	High
3A:			
Craven	None	High	High
3B:			
Craven	None	High	High
3C:			
Craven	None	High	High
4A:			
Emporia	None	Moderate	High
4B:			
Emporia	None	Moderate	High
4C:			
Emporia	None	Moderate	High
5D:			
Emporia	None	Moderate	High
Slagle	None	Moderate	High
Rumford	None	Low	High
5E:			
Emporia	None	Moderate	High
Slagle	None	Moderate	High
Rumford	None	Low	High
6A:			
Faceville	None	Low	Moderate
6B:			
Faceville	None	Low	Moderate
7A:			
Kinston	None	High	High
Bibb	None	High	Moderate
8A:			
Levy	None	High	High
9A:			
Mattaponi	None	High	High

Table 20.—Soil Features—Continued

Map symbol and soil name	Potential for frost action	Risk of corrosion	
		Uncoated steel	Concrete
9B:			
Mattaponi	None	High	High
9C:			
Mattaponi	None	High	High
10A:			
Munden	None	Low	High
10B:			
Munden	None	Low	High
11A.			
Pits, gravel			
12A:			
Rappahannock	None	High	High
13A:			
Roanoke	None	High	High
14B:			
Rumford	None	Low	High
14C:			
Rumford	None	Low	High
15A:			
Slagle	None	Moderate	High
15B:			
Slagle	None	Moderate	High
15C:			
Slagle	None	Moderate	High
16A:			
State	None	Moderate	High
16B:			
State	None	Moderate	High
17A:			
Suffolk	None	Moderate	High
17B:			
Suffolk	None	Moderate	High
17C:			
Suffolk	None	Moderate	High
18B:			
Tarboro	None	Low	Moderate
19A:			
Tetotum	None	High	High
19B:			
Tetotum	None	High	High

Table 20.—Soil Features—Continued

Map symbol and soil name	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
19C:			
Tetotum	None	High	High
20A:			
Tomotley	None	High	High
21A:			
Wahee	None	High	High
W.			
Water			

Table 21.—Classification of the Soils

Soil name	Family or higher taxonomic class
Augusta	Fine-loamy, mixed, semiactive, thermic Aeric Endoaquults
Bibb	Coarse-loamy, siliceous, active, acid, thermic Typic Fluvaquents
Bojac	Coarse-loamy, mixed, semiactive, thermic Typic Hapludults
Craven	Fine, mixed, subactive, thermic Aquic Hapludults
Emporia	Fine-loamy, siliceous, subactive, thermic Typic Hapludults
Faceville	Fine, kaolinitic, thermic Typic Kandiudults
Kinston	Fine-loamy, siliceous, semiactive, acid, thermic Fluvaquentic Endoaquepts
Levy	Fine, mixed, superactive, acid, thermic Typic Hydraquents
Mattaponi	Fine, mixed, subactive, thermic Oxyaquic Hapludults
Munden	Coarse-loamy, mixed, semiactive, thermic Aquic Hapludults
Rappahannock	Loamy, mixed, euic, thermic Terric Sulfisaprists
Roanoke	Fine, mixed, semiactive, thermic Typic Endoaquults
Rumford	Coarse-loamy, siliceous, subactive, thermic Typic Hapludults
Slagle	Fine-loamy, siliceous, subactive, thermic Aquic Hapludults
State	Fine-loamy, mixed, semiactive, thermic Typic Hapludults
Suffolk	Fine-loamy, siliceous, semiactive, thermic Typic Hapludults
Tarboro	Mixed, thermic Typic Udipsamments
Tetotum	Fine-loamy, mixed, semiactive, thermic Aquic Hapludults
Tomotley	Fine-loamy, mixed, semiactive, thermic Typic Endoaquults
Wahee	Fine, mixed, semiactive, thermic Aeric Endoaquults

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King and Queen County, Virginia

2030 Comprehensive Plan

Appendix L:
Capital Improvement Plan

Registrar Office Building Repairs

Proposed Capital Improvement Plan

$20,000 – Cost for Registrar Building Repairs

$20,000 / 6945 = $2.88 (*Note- 6945 = 2010 Census Population)

$2.88 = Per Capita Cost

$2.88 x 2.41 = **$6.94** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Archives Building Repairs

Proposed Capital Improvement Plan

$15,000 – Cost for Registrar Building Repairs

$15,000 / 6945 = $2.16 (*Note- 6945 = 2010 Census Population)

$2.16 = Per Capita Cost

$2.16 x 2.41 = **$5.21** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Land Acquisition

Proposed Capital Improvement Plan

$30,000 – Cost for land acquisition for CH parking expansion & Sheriff's Impound lot

$30,000 / 6945 = $4.32 (*Note- 6945 = 2010 Census Population)

$4.32 = Per Capita Cost

$4.32 x 2.41 = **$10.41** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Sheriff's Office Impound Lot

Proposed Capital Improvement Plan

$10,000 – Cost for Impound Lot

$10,000 / 6945 = $1.44 (*Note- 6945 = 2010 Census Population)

$1.44 = Per Capita Cost

$1.44 x 2.41 = **$3.47** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Existing Courthouse Parking Lot - Repairs

Proposed Capital Improvement Plan

$200,000 – Cost to replace existing CH parking lot (Asphalt, including parking lot expansion & walkways)

$200,000 / 6945 = $28.80 (*Note- 6945 = 2010 Census Population)

$28.80 = Per Capita Cost

$28.80 x 2.41 = **$69.41** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Courthouse Garage for Ambulance/EMS

Proposed Capital Improvement Plan

$30,000 – Cost for CH Garage for Ambulance for EMS

$30,000 / 6945 = $4.32 (*Note- 6945 = 2010 Census Population)

$4.32 = Per Capita Cost

$4.32 x 2.41 = **$10.41** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Courthouse Security System

Proposed Capital Improvement Plan

$25,000 – Cost for security system (cameras & door buzzers) at the Courthouse

$25,000 / 6945 = $3.60 (*Note- 6945 = 2010 Census Population)

$3.60 = Per Capita Cost

$3.60 x 2.41 = **$8.68** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Courthouse Admin Building Drainage Repairs

Proposed Capital Improvement Plan

$40,000 – Cost for Admin Building Drainage/Storm Drain Repairs

$40,000 / 6945 = $5.76 (*Note- 6945 = 2010 Census Population)

$5.76 = Per Capita Cost

$5.76 x 2.41 = **$13.88** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

White House Renovations for EMS

Proposed Capital Improvement Plan

$45,000 – Cost for Registrar Building Repairs

$45,000 / 6945 = $6.48 (*Note- 6945 = 2010 Census Population)

$6.48 = Per Capita Cost

$6.48 x 2.41 = **$15.62** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Fire & Rescue Vehicles

Current Capital Improvement Plan

$1,350,000 – Cost for 4 Fire Engines & 3 Ambulances

$1,350,000 / 6945 = $194.38 (*Note – 6945 = 2010 Census Population)

$194.38 = Per Capita Cost

$194.38 x 2.41 = **$468.46** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Proposed Capital Improvement Plan

$2,100,000 – Cost for 4 Fire Engines ($375,000 each) & 3 Ambulances ($200,000 each)

$2,100,000 / 6945 = $302.38 (*Note – 6945 = 2010 Census Population)

$302.38 = Per Capita Cost

$302.38 x 2.41 = **$728.74** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Fire & Rescue Construction/Renovations

Current Capital Improvement Plan

$1,350,000 – Cost for 4 Fire Stations & 2 Rescue Squads

$1,350,000 / 6945 = $194.38 (*Note – 6,945 = 2010 Census Population)

$194.38 = Per Capita Cost

$194.38 x 2.41 = **$468.46** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Proposed Capital Improvement Plan

$3,600,000 – Cost for 4 Fire Stations & 2 Rescue Squads ($600,000 each)

$3,600,000 / 6945 = $518.36 (*Note – 6,945 = 2010 Census Population)

$518.36 = Per Capita Cost

$518.36 x 2.41 = **$1,249.25** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Fire & Rescue Training Facility

Proposed Capital Improvement Plan

$1,400,000 – Fire/EMS Training Facility, Burn Building & Classrooms with props

$1,400,000 / 6945 = $201.58 (*Note – 6,945 = 2010 Census Population)

$201.58 = Per Capita Cost

$201.58 x 2.41 = **$485.81** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Schools

Current Capital Improvement Plan

$14,300,000 – Cost for new King & Queen Elementary School

$14,300,000 / 6945 = $2,059.04 (*Note – 6,945 = 2010 Census Population)

$2,059.04 = Per Capita Cost

$2,059.04 x 2.41 = **$4,962.29** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Proposed Capital Improvement Plan

$14,300,000 – Cost for new King & Queen Elementary School

$14,300,000 / 6945 = $2,059.04 (*Note – 6,945 = 2010 Census Population)

$2,059.04 = Per Capita Cost

$2,059.04 x 2.41 = **$4,962.29** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

(*Note – 50,000 sq. ft. building accommodating 300 students at $200 per sq. ft. = $10,000,000, Site work & Design Elements $4,300,000. Figures were gathered from Mosley Architects per Dr. Layman)

Lawson Marriott Elementary School A/C Units

Proposed Capital Improvement Plan

$33,000 – Cost for 12 new A/C units

$33,000 / 6945 = $4.75 (*Note – 6,945 = 2010 Census Population)

$4.75 = Per Capita Cost

$4.75 x 2.41 = **$11.45** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Central High School A/C Units

Proposed Capital Improvement Plan

$33,000 – Cost for 12 new A/C units

$33,000 / 6945 = $4.75 (*Note – 6,945 = 2010 Census Population)

$4.75 = Per Capita Cost

$4.75 x 2.41 = **$11.45** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Lawson, KQ Elementary & Central High School New Roof

Proposed Capital Improvement Plan

$200,000 – Cost for new roof

$200,000 / 6945 = $28.80 (*Note – 6,945 = 2010 Census Population)

$28.80 = Per Capita Cost

$28.80 x 2.41 = **$69.41** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Emergency Services

Current Capital Improvement Plan

$150,000 – Cost to Replace Dispatch Center Call Processing Equipment

$150,000 / 6945 = $21.60 (*Note – 6,945 = 2010 Census Population)

$21.60 = Per Capita Cost

$21.60 x 2.41 = **$52.06** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Proposed Capital Improvement Plan

$175,000 – Cost for Primary County Shelter & King & Queen Central High School (Includes – Emergency Power & Equipment)

$175,000 / 6945 = $25.20 (*Note – 6,945 = 2010 Census Population)

$25.20 = Per Capita Cost

$25.20 x 2.41 = **$60.73** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Emergency Services Radio System

Proposed Capital Improvement Plan

$3,500,000 – Cost for Trunk Radio System with the addition of 2 Channels

$3,500,000 / 6945 = $503.96 (*Note – 6,945 = 2010 Census Population)

$503.96 = Per Capita Cost

$503.96 x 2.41 = **$1,214.54** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

County Park Development

Current Capital Improvement Plan

$150,000 – Cost of site/design work & construction of Mattaponi Public River Access Park

$150,000 / 6945 = $21.60 (*Note – 6,945 = 2010 Census Population)

$21.60 = Per Capita Cost

$21.60 x 2.41 = **$52.06** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Proposed Capital Improvement Plan

$150,000 – Cost of site/design work & construction of Mattaponi Public River Access Park

$150,000 / 6945 = $21.60 (*Note – 6,945 = 2010 Census Population)

$21.60 = Per Capita Cost

$21.60 x 2.41 = **$52.06** (*Note – 2.41 person per household according to the 2010 census figures - 6945 population divided by 2,882 occupied housing units = 2.41 person per household)

Current Capital Improvement Plan Totals/Adopted Current Cash Proffer Amount

$52.06 + $468.46 + $468.46 + $4,962.29 + $41.64 + $52.06 + $52.06 + $27.76 = **$6,124.79**

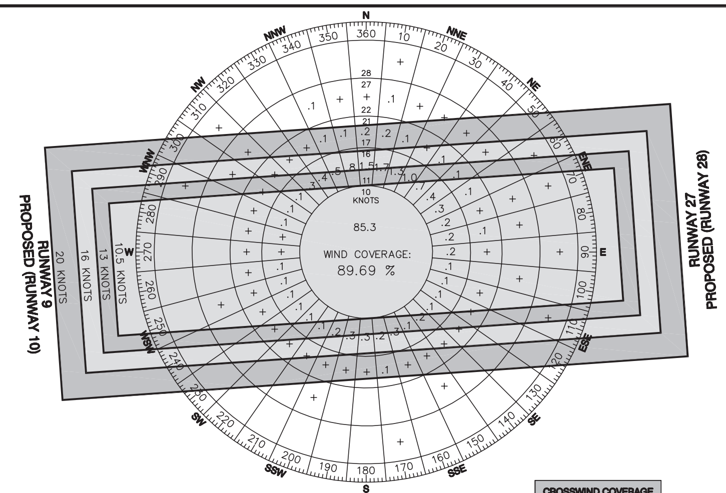
Proposed Capital Improvement Plan Totals / Proposed Cash Proffer Amount

$6.94 + $5.21 + $10.41 + $3.47 + $69.41 + $10.41 + $8.68 + $13.88 + $15.62 + $728.74 + $1,249.25 + $485.81 + $4,962.29 + $11.45 + $11.45 + $69.41 + $60.73 + $1,214.54 + $52.06 = **$8,989.76**

King and Queen County, Virginia

2030 Comprehensive Plan

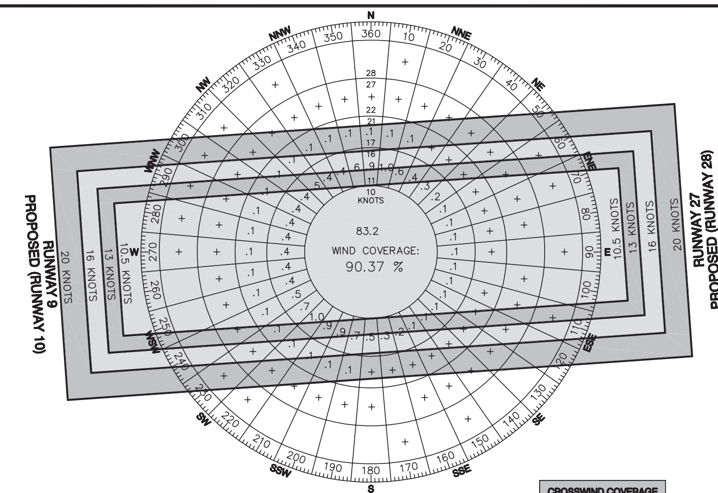
Appendix M:
Airport Master Plan



CROSSWIND COVERAGE	
KNOTS	RW 9–27
10.5	89.69%
13	94.08%
16	98.51%
20	99.51%

IFR WIND ROSE

WIND DATA PERIOD: 1995–2004
SOURCE: National Climatic Data Center
STATION: Richmond, Virginia



CROSSWIND COVERAGE	
KNOTS	RW 9–27
10.5	90.37%
13	94.83%
16	98.83%
20	99.76%

ALL WEATHER WIND ROSE

WIND DATA PERIOD: 1995–2004
SOURCE: National Climatic Data Center
STATION: Richmond, Virginia

Magnetic Declination 10.58° W
NOAA Geomagnetic
Field Synthesis Program (Version 4.0)
September 30, 2004

SEE "TERMINAL AREA PLAN DRAWING" SHEET 3 OF 5

RUNWAY PROTECTION ZONE (RPZ)

	RUNWAY	INNER WIDTH (W_1)	LENGTH (L)	OUTER WIDTH (W_2)	RPZ DIMENSION AREA (ACRES)
EXISTING	9	500'	1000'	700'	13.770
EXISTING	27	500'	1000'	700'	13.770
ULTIMATE	9	1000'	1700'	1510'	48.978
ULTIMATE	27	500'	1000'	700'	13.770

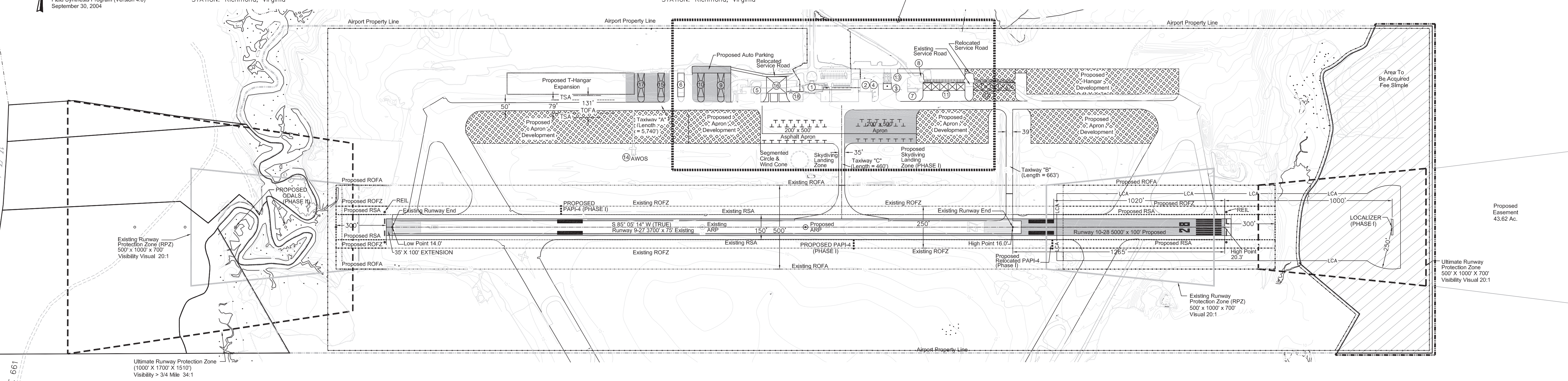
RPZ NOMENCLATURE (W_1 X L X W_2)

DEVELOPMENT STAGES

PHASE I (2006–2011)	0–5 YEARS	
PHASE II (2012–2016)	6–10 YEARS	
PHASE III (2017–2026)	11–20 YEARS	
ULTIMATE (ULT.)	20+YEARS	

LEGEND

	EXISTING	PROPOSED
AIRPORT REFERENCE POINT (ARP)		
AIRPORT PROPERTY LINE		
LAND ACQUISITION		
RUNWAY PROTECTION ZONE		
APPROACH SURFACES		
RUNWAY SAFETY AREA (RSA)		
TAXIWAY SAFETY AREA (TSA)		
RUNWAY OBJECT FREE AREA (ROFA)		
TAXIWAY OBJECT FREE AREA (TOFA)		
RUNWAY OBSTACLE FREE ZONE (ROFZ)		
BUILDINGS		
FENCE		
TREE LINE		
WATER/DITCHLINES		
PAPI		
ROTATING BEACON		
REIL		
THRESHOLD LIGHTS		
MONUMENTS (NAME)		
DRAINAGE IMPROVEMENTS		
LOCALIZER CRITICAL AREA (LCA)		LCA
CONTROLLING OBSTRUCTION (MSL ELEV.)	CO (81)	CO (81)



RUNWAY DATA

NO.	ITEM	RUNWAY 9–27 (PROPOSED 10–28) EXISTING	PROPOSED
1	APPROACH VISIBILITY MINIMUMS	RWY 9 – VISUAL RWY 27 – VISUAL	RWY 10 – 3/4 MILE RWY 28 – VISUAL
	FAR PART 77 APPROACH SURFACES (INNER WIDTH X LENGTH X OUTER WIDTH)	500' X 5000' X 1500' 20:1 RUNWAY 9 500' X 5000' X 1500' 20:1 RUNWAY 27	1000' X 10,000' X 4000' 34:1 RUNWAY 10 500' X 5000' X 1500' 20:1 RUNWAY 28
2	FAR PART 77 APPROACH SLOPE	RWY 9–20:1 RWY 27–20:1	RWY 10–34:1 RWY 28–20:1
3	RUNWAY DIMENSIONS	3,700' X 75'	5,000' X 100'[3]
4	PAVEMENT TYPE	ASPHALT	ASPHALT
5	PAVEMENT STRENGTH/GEAR CONFIGURATION	30,000 LBS. SW[1]	30,000 LBS. SW[1]
6	RUNWAY LIGHTING	MIRL	MIRL
7	RUNWAY MARKING	NON–PRECISION INSTRUMENT	NON–PRECISION INSTRUMENT
8	EFFECTIVE GRADIENT (%)	0.05%	0.12%
9	MAX. GRADE WITHIN RUNWAY LENGTH	NOT SURVEYED	NOT SURVEYED
10	LINE OF SIGHT REQUIREMENTS	FULL RUNWAY LENGTH	FULL RUNWAY LENGTH
11	ALL WEATHER PERCENT WIND COVERAGE, (13 KNOTS)	94.21%	94.21%
12/13	ELECTRONIC & VISUAL APPROACH AIDS		RUNWAY 10: PAPI (4L), ODALS, LOCALIZER RUNWAY 28: PAPI (4L)
14	RUNWAY AIRPORT REFERENCE CODE (ARC)	B–II	B–II
15	RUNWAY CRITICAL AIRCRAFT	BEECH KING AIR 200	CESSNA CITATION BRAVO
16	LENGTH OF HAUL FOR CRITICAL AIRCRAFT OVER 60.000 LBS.	N/A	N/A
17	RUNWAY SAFETY AREA DIMENSIONS	4,300' X 150'	5,600' X 150'
18	OBJECT FREE AREA DIMENSIONS	4,300' X 500'	5,600' X 500'
19	OBSTACLE FREE ZONE	NO OFZ OBJECT PENETRATIONS	NO OFZ OBJECT PENETRATIONS
20	SURVEY END COORDINATES[2]	RWY 9 LAT. 37° 31' 15.22" LONG. 76° 46' 16.10" RWY 27 LAT. 37° 31' 17.69" LONG. 76° 45' 30.26"	RWY 10 LAT. 37° 31' 15.20" LONG. 76° 46' 16.54" RWY 28 LAT. 37° 31' 18.53" LONG. 76° 45' 14.61"
21	RUNWAY ELEVATIONS	RWY 9 / RWY 27	RWY 10 / RWY 28
	RUNWAY END	14.0' / 16.0'	14.0' / 20.3'
	DISPLACED THRESHOLD	N/A / N/A	N/A / N/A
	TOUCHDOWN ZONE(TDZE)	15.0' / 16.0'	15.0' / 17.0'
	HIGH & LOW POINTS	14.0'–16.0' / 14.0'–16.0'	14.0'–20.3' / 14.0'–20.3'

[1] SW = SINGLE WHEEL

[2] DATA FROM JUNE 2000 SURVEY BY SHORE ENGINEERING.

[3] BASED ON THE CURRENT AND FUTURE ARC, THE FAA WILL NOT FUND THE ADDITIONAL RUNWAY WIDENING TO 100'.

AIRPORT FACILITIES INDEX

NO.	FACILITY	DEVELOPMENT STAGE	TOP ELEVATION (FEET) AGL	MSL
1	TERMINAL BUILDING	EXISTING	–	32
2	CORPORATE HANGAR	EXISTING	14.59	32
3	REFUELING PAD	EXISTING	–	41
4	ELECTRICAL VAULT	EXISTING	–	20
5	T–HANGAR	EXISTING	–	26
6	T–HANGAR	EXISTING	–	25
7	SKYDIVERS BUILDING	EXISTING	–	28
8	STORAGE BUILDING	EXISTING	–	N/A
9	T–HANGAR	PHASE I	–	25
10	T–HANGAR	PHASE I	–	25
11	CONVENTIONAL HANGAR	PHASE II	–	41
12	CONVENTIONAL HANGAR	ULTIMATE	–	41
13	FUEL FARM	EXISTING	–	20
14	AWOS III–PT	EXISTING	–	–
15	T–HANGAR EXPANSION	ULTIMATE	–	–
16	MAINTENANCE HANGAR	PHASE II	–	35
17	T–HANGAR EXPANSION	ULTIMATE	–	25
18	BEACON	EXISTING	–	–

AIRPORT DATA

	ITEM	EXISTING	ULTIMATE
1	AIRPORT ELEVATION (MSL)	16'	20'
2	AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD 83)	LAT. N 37° 31' 16.46" LONG. W 76° 45' 53.19"	LAT. 37° 31' 16.87" LONG. 76° 45' 45.57"
3	MEAN MAXIMUM DAILY TEMPERATURE HOTTEST MONTH (JULY)	86.9° F	86.9° F
4	ALL WEATHER PERCENT WIND COVERAGE, (13 KNOTS)	94.83%	94.83%
5	AIRPORT MAGNETIC VARIATION	10.58° W (9/30/04)	10.58° W (9/30/04)
6	AIRPORT REFERENCE CODE (ARC)	B–II	B–II
7	NPIAS SERVICE LEVEL	GENERAL AVIATION –GA	GENERAL AVIATION –GA
8	VATSP SERVICE LEVEL	GENERAL AVIATION REGIONAL – GR	GENERAL AVIATION REGIONAL – GR
9	TAXIWAY LIGHTING	NONE	MITL
10	TAXIWAY MARKING	NONE	CENTERLINE
11	AIRPORT AND TERMINAL NAVAIDS	AWOS	AWOS, PAPI, LOC ODALS, REIL

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED. DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS AND EXTERIOR FINISHES OF STRUCTURES. FAA'S CONCERNS ARE OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS AND ADVERSE EFFECT OF CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENTS, WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY OR UTILITY OF THE AIRPORT.

1"=300'   300 0 300 600
scale   feet

MODIFICATIONS TO FAA DESIGN STANDARDS

NO.	MODIFICATION	WAIVER	DATE

APPROVAL BLOCK

Middle Peninsula Regional Airport Authority — Date: 6-2-06

Federal Aviation Administration
Approved Subject to Comments and Conditions Noted in Letter from Manager Washington Airports District Office Dated 6/13/06 — Date: 6/13/06

Virginia Department of Aviation — Date: June 9 2006

DATE	DESCRIPTION REVISIONS	REV. NO.

AIRPORT LAYOUT PLAN DRAWING

Airport Layout Plan Update

Middle Peninsula Regional Airport - West Point, Virginia

TALBERT & BRIGHT
ENGINEERING & PLANNING CONSULTANTS
10105 KRAUSE ROAD, SUITE 100
CHESTERFIELD, VIRGINIA 23832
PHONE: 804-768-6878 FAX: 804-768-6871

FINAL

Date	MARCH 2006
Scale	1"=300'
Drawn	REK
Checked	JAW
Project No.	4206–9902
Sheet No.	2
Of	7

King and Queen County, Virginia

2030 Comprehensive Plan

Appendix N:
Biosolids FAQ

July 2015

Biosolids
Frequently Asked Questions

What are biosolids?
Biosolids is a term that refers to solid, semisolid, or liquid materials removed from municipal sewage and treated to be suitable for recycling as fertilizer. As fertilizer, biosolids are used to improve and maintain productive soils and stimulate plant growth. The use of biosolids is subject to the Virginia Department of Environmental Quality regulatory requirements that exist to help keep rivers, lakes, streams, bays and ground water clean; protect plants; and prevent the transmission of diseases.

What is the difference between biosolids and sewage sludge?
When wastewater arrives at a treatment facility, the solids are separated out and become sewage sludge. Sewage sludge may be sent to a landfill, incinerated or receive additional treatment to become biosolids. This additional treatment must occur for sewage sludge to be called biosolids.

Where do biosolids come from?
Biosolids are created through the treatment of sewage sludge in a municipal wastewater treatment facility. Wastewater treatment facilities receive sewage – the solids and liquids from toilets and drains. If the sewage comes from an industrial location, it must meet certain standards before being sent down the drain. This is called pre-treatment, where specialized processes are used to remove or reduce certain pollutants. In recent years, these processes have dramatically reduced the amount of heavy metals in sewage.

Once the sewage reaches the municipal treatment facility, it goes through physical, chemical and biological processes to treat the liquids known as wastewater and remove the solids known as sewage sludge. The sewage sludge is broken down and sanitized to control disease-causing organisms and reduce odor. Once the sewage sludge is treated, it is called biosolids. When applied according to DEQ regulations, biosolids are suitable for applying to land as fertilizer to improve and maintain productive soils and stimulate plant growth.

Many processes and techniques exist to treat sewage and they vary by treatment facility. Contact your local wastewater treatment facility for details on treating sewage sludge and generating biosolids in your area.

How are biosolids used?
When processed and applied according to DEQ and federal regulations, biosolids are suitable for applying to land as fertilizer to improve and maintain productive soils and stimulate plant growth. Biosolids may also be used to establish vegetation and reduce soil erosion on land which has been mined, and improve drought resistance because the additional organic matter increases the soil's ability to absorb and hold moisture. Sewage sludge may be sent as waste to landfills or incinerators.

Are there different types of biosolids?
Biosolids that are used as fertilizer are divided into two categories: Class A and Class B. Class A biosolids have received a level of treatment that virtually eliminates disease-causing organisms or pathogens. If the levels of heavy metals are low enough and the treatment includes methods to reduce the possibility that animals will be attracted to the material, Class A biosolids

629 E. Main St., Richmond, VA 23218
804-698-4000 or toll-free in Virginia 800-592-5482
www.deq.virginia.gov

may be distributed as Exceptional Quality biosolids. Because of the extra treatment, no special distance setbacks from wells or streams are required by the regulations to provide environmental and health protection from pathogens. Exceptional Quality material may be bagged and is often sold alongside commercial fertilizers. Producers of Exceptional Quality biosolids are required to obtain permits from DEQ and register with the Virginia Department of Agriculture and Consumer Services before selling the material.

Class B biosolids have less restrictive standards for content of metals and disease-causing organisms, and thus require more restrictive permit limitations so that specific land application practices are observed and environmental and health impacts are avoided. Class B biosolids standards are considered to protect human health and the environment as well as Class A biosolids standards when coupled with specific application restrictions, such as distance between land with biosolids and any wells and streams, access restrictions for people and livestock, and certain crop exclusions.

How much biosolids is applied to land in Virginia?

From 2008 – 2013, an average of 220,000 dry tons of biosolids were applied annually to approximately 65,000 acres of permitted land application sites in Virginia. There are 7.89 million acres of cropland, pastureland, and woodland on Virginia farms, and biosolids was used on less than 1 percent of this area. In comparison, commercial fertilizer was used on more than 1.9 million acres and animal manure on more than 363,000 acres (2012 U.S. Department of Agriculture Census).

Who determines how and where biosolids are applied?

Wastewater treatment facilities that produce biosolids, and any persons contracting with the facility to apply biosolids on land, must obtain a permit from DEQ before application. DEQ's permit regulations require that only biosolids that meet specific requirements are applied, and only on approved lands with ongoing testing, notification and monitoring.

To determine whether biosolids can be applied to a particular site, an evaluation of the site is first performed by the land applier. The evaluation examines water supplies, soil characteristics, slopes, vegetation, crop needs and the distance to streams, lakes, rivers and groundwater. When DEQ receives a permit application with this initial information, DEQ staff reviews the proposed biosolids sources and proposed land application sites to confirm if they are suitable. DEQ notifies the local government and residents adjacent to the land application sites. For the initial permit in a locality, DEQ also holds a public meeting to discuss the proposed permit. After the public meeting, the staff will assemble a permit with consideration of comments from the public, local government and other state agencies. Once the draft permit is complete, a notice will appear in the local paper. During the following 30 days, the public is encouraged to provide comment on the proposed permit. Members of the public may also request that DEQ host a public hearing. At the end of 30 days, DEQ will consider all comments received and either approve or deny the permit. Before applying biosolids to newly permitted lands, the permit holder must first notify the local government and then wait 100 days.

DEQ has biosolids specialists at its seven offices throughout the state who are dedicated to overseeing the proper management of biosolids. To read more about the regulations for applying biosolids on land, please visit http://www.deq.virginia.gov/Programs/Water/LandApplicationBeneficialReuse/Permits,Fees,Regulations.aspx

How do we know what's in biosolids?

DEQ regulations require sampling on a prescribed schedule to ensure that the regulated parameters are measured and treatment levels are achieved. The nutrient content of the material is measured so that the appropriate rate for the crop to be grown can be determined. The frequency of testing depends upon the amount of biosolids a particular generator produces; more production requires more frequent sampling. At a minimum, the following parameters are analyzed:

Nutrients	Metals	Other
• Total kjeldahl nitrogen • Ammonia nitrogen • Nitrates • Total phosphorus • Total potassium	• Arsenic • Cadmium • Copper • Lead • Mercury • Molybdenum • Nickel • Selenium • Zinc	• Percent solids • Volatile solids • pH • CaCO3 (for lime stabilized biosolids) • Alkalinity as CaCO3 • Additional parameters may be analyzed for screening purposes when approving a new source. For example, analysis for PCBs (poly-chlorinated biphenyls) is required before a new biosolids source will be approved.

The U.S. Environmental Protection Agency has conducted surveys of sewage sludge throughout the United States to evaluate whether there are other constituents found in biosolids that would warrant further testing requirements before land application. Additional research is being conducted to determine not only the amount present, but also whether these amounts pose significant concerns. DEQ monitors the ongoing work of EPA in this respect, and if necessary, will respond to these findings with additions to the list of regulated parameters.

Who can apply biosolids to land?

Anyone who wants to apply biosolids to land must comply with all federal and state regulations. In most cases, a permit is required. Contact the local DEQ office to find out if your land qualifies (see the "Where can I find out more about biosolids in my area?" section).

How much biosolids can be spread as fertilizer and when?

The amount of biosolids that can be applied and when they can be applied is different for each site. Virginia DEQ permits for land application require that a site-specific nutrient management plan be developed to establish the amounts and timing.

The goal of these management plans is to maximize the ability of the plant to use the nutrients in the biosolids so that losses to the environment are minimized. The application rate will be based on the crop type, the varying nutrient content of biosolids and the nutrient content of the soil. In general terms, this will typically equate to approximately one tractor-trailer load of biosolids for every one to two acres of land. Biosolids are applied when a growing crop can best utilize the nutrients, or at some time slightly before that crop is planted. The rates at which biosolids break down and the nutrient become available to the crop are also taken into account in the timing. If biosolids are applied in the fall of the year for a spring crop, a cover crop must be planted to retain the nutrients over the winter months.

A certified land applier knocks off biosolids from the tailgate of truck while a local DEQ biosolids specialist inspects the application of biosolids from the Hampton Roads Sanitation District in Chesapeake City, VA. The DEQ's biosolids specialists work throughout Virginia to ensure proper application of biosolids for the protection of human health and the environment. (DEQ Photo)

What type of crops can be fertilized with biosolids?

In Virginia, biosolids are most often applied to hay, pasture, forests and crops grown for grain such as corn and wheat. In order to prevent bacterial contamination of food crops like vegetables, there are restrictions on when these types of crops can be grown in a field that has received biosolids. In addition, livestock is not allowed to graze pastures where biosolids have been applied for at least 30 days.

Can biosolids be spread near my home?

Buffers, or areas where biosolids cannot be applied, are required between homes and the land applied with biosolids. The buffer can be decreased if the homeowner requests the reduction and signs a waiver. This distance may vary depending upon the location of the resident's well, and in some cases, whether there are occupants in the home with compromised immune systems. There are also mandatory buffers from property lines, roadways, wells, water bodies, streams, and environmentally sensitive areas such as rock outcrops and sinkholes. The buffer distance may vary depending upon whether or not the biosolids are incorporated (worked under the soil), the season of the year and slope conditions. Waivers are permitted only for dwellings and property lines; environmental restrictions such as wells or areas next to streams cannot be waived by the property owner.

How do the biosolids rules protect human health and the environment?

Environmental regulations are designed to reduce concerns about the effects that many activities may have on people's health and the environment. The current biosolids rules address the potential concerns of impacts on surface water and ground water, harmful effects on plants and transmission of disease. These rules include: (1) proper pollutant source control and disposal of household and business hazardous wastes, (2) assessment of biosolids quality, (3) determining appropriate soil, landscape, and crop conditions, (4) monitoring and oversight of transport, storage, application and land use before, during and after application, and (5) limiting access, harvest or grazing until appropriate time periods have elapsed.

These regulations are based on the best information currently available. However, some questions about biosolids do remain, including the presence of pharmaceuticals, personal care products such as antibacterial soaps, and other possible contaminants. As new research emerges on these and other topics, additional protective measures may be added to the regulations.

What has changed about biosolids regulations in Virginia?

Beginning January 1, 2008, the Virginia Department of Environmental Quality assumed regulatory oversight of all land application of biosolids in the state. From 1994 to 2007, the Virginia Department of Health regulated all biosolids applied to land by private contractors. The 2007 General Assembly voted to consolidate the regulatory programs so that all persons applying biosolids to land would be subject to uniform requirements. DEQ was chosen to oversee this because of its existing compliance and enforcement structure. The VDH continues to consult with DEQ and advise the public on health issues related to biosolids applications.

The 2007 General Assembly also added requirements on biosolids to protect human health and the environment. Among these changes, DEQ requires nutrient management plans for all land receiving biosolids, conducts unannounced inspections of the land application sites, ensures certification of persons applying biosolids to land, and requires payment of a $7.50 fee per dry ton of biosolids land applied. The fee is paid to DEQ by the producer of the biosolids. The fee helps fund the biosolids regulatory functions of DEQ and the Department of Conservation and Recreation, as well as local government monitoring programs.

Who checks to see if the biosolids regulations are followed?

DEQ employs biosolids specialists at its seven regional offices located throughout Virginia who are responsible for monitoring and enforcing biosolids regulations. The specialists evaluate sites before, during and after application of biosolids. There is a particular emphasis on being present as many times as possible when biosolids spreading is actually occurring. These field experts are equipped with specialized tools to determine compliance with location of application. An inspection report is prepared for each visit to a land application site. The inspection report documents numerous aspects of the activity and conditions observed. The biosolids specialists are also available to answer questions from the public.

What is a local monitor?

Localities are empowered by state law with the ability to employ an individual that monitors the use of biosolids to ensure state and federal requirements are met, just like a Virginia Department of Environmental Quality biosolids specialist. DEQ encourages local governments to exercise this ability to supplement oversight and provide a familiar, local presence where these activities occur. The local monitor can also require that any activity that is in violation of the regulations be stopped. DEQ can reimburse the locality for costs incurred in implementing a local monitoring program, provided the local monitor has met training requirements and prescribed procedures are followed.

Where can I find out more about biosolids in my area?

To find out more about biosolids in your area, contact a Virginia Department of Environmental Quality biosolids specialist from the nearest regional office.

Blue Ridge Regional Office
(434) 582-5120
7705 Timberlake Road
Lynchburg, VA 24502

Piedmont Regional Office
(804) 527-5020
4949-A Cox Road
Glen Allen, VA 23060

Tidewater Regional Office
(757) 518-2000
5636 Southern Blvd.
Virginia Beach, VA 23462

Northern Virginia Regional Office (703) 583-3800
13901 Crown Court
Woodbridge, VA 22193

Southwest Regional Office
(276) 676-4800
P.O. Box 1688
355-A Deadmore Street
Abingdon, VA 24210

Valley Regional Office
(540) 574-7800
P.O. Box 3000
4411 Early Road
Harrisonburg, VA 22801