SECTION 905(b)
WRDA '86 Analysis

LOWER RAPPAHANNOCK RIVER BASIN RECONNAISSANCE STUDY

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Section 905(b) (WRDA) 1986 Analysis
LOWER RAPPAHANNOCK RIVER BASIN
RECONNAISSANCE STUDY

STUDY AUTHORITY

The study was authorized by resolution dated 5 June 1997 of the Senate Committee on Environment and Public Works, which reads as follows:

> "Resolved by the Committee on Environment and Public Works of the United States Senate, that the Secretary of the Army is requested to review the report of the Chief of Engineers on the Rappahannock River, Virginia, published as House Document 119, Eightieth Congress, First Session and other pertinent reports that have this year been submitted by the local government entities and by the State of Virginia, and that encompass the Rappahannock River, Virginia and vicinity, with a view to conducting a study of water resources improvements in the interest of environmental restoration, and other allied purposes, with specific attention toward evaluating the feasibility of environmental restoration of Embrey Dam to restore the Rappahannock River to a more natural state while continuing to recognize and preserve the adjacent water related facilities and needs, including historic canals, wetlands, and ponds, historic locks, ponds, and other sites, downstream parks, and flood control provisions along the river."

STUDY PURPOSE

The purpose of the reconnaissance study is to determine if the water resource problems warrant Federal participation in feasibility studies, to define the Federal interest, to complete a 905(b) Analysis (refers to Section 905(b) of the WRDA of 1986 and is also known as a Reconnaissance Report), to prepare a Project Management Plan (PMP), to assess the level of interest and support from non-Federal entities, and to negotiate and execute a Feasibility Cost Sharing Agreement (FCSA). This determines whether or not planning to develop a project should proceed to the more detailed feasibility stage. The reconnaissance phase is Federally funded and the target for completion is 6-12 months from obligation of reconnaissance funds to a signed FCSA.

LOCATION OF PROJECT/CONGRESSIONAL DISTRICT

The study area encompasses the twelve- county (Gloucester, Essex, King and Queen, King William, Middlesex, and Mathews counties comprise the Middle Peninsula Planning District Commission; Lancaster, Northumberland, Richmond, and Westmoreland counties comprise the Northern Neck Planning District Commission; and Caroline, and King George counties are included in the RADCO Planning District Commission) as depicted on Plate 1. The twelve-county area is distributed into portions of the lower Rappahannock, lower Potomac, Mattaponi, Pamunkey, York, and/or Great

Wicomico-Piankatank basins as shown on Plate 2. The study area is located in Congressman Herbert H. Bateman's 1st Congressional District of Virginia.

PRIOR STUDIES, REPORTS AND EXISTING WATER PROJECTS

The River and Harbor Act of 3 March 1905 authorized a navigation project for the Rappahannock River. The project calls for a channel 12 ft. deep and 200 feet wide from the mouth for 77 miles, thence narrowing to 100 feet wide for 30 miles to Fredericksburg. The last condition survey was conducted September 1982 and concluded that maintenance of the 12-foot deep channel is not justified and a 6-foot deep channel would be maintained until traffic indicates a need for a change. The project has not received maintenance dredging since 1970. There are 29 additional shallow-draft navigation channels in the study area. Table 1 details these navigation channels. In addition, House Document No. 119, 80th Congress (1st Session) presented recommendations regarding a comprehensive examination of the Rappahannock River and its tributaries.

There are no Federal flood control (beach restoration or environmental restoration) projects in the study area. There is a Section 510 (WRDA 1996) oyster restoration project in place in the Lower Rappahannock River in the vicinity of Carters Creek, west of the Route 3 Bridge connecting Middlesex and Lancaster Counties. The project was constructed for the Commonwealth of Virginia by the Norfolk District COE in the summer of 2000. There is also a Corps of Engineers feasibility study being conducted that examines environmental restoration opportunities for the Upper Rappahannock River (Embrey dam and upstream).

PLAN FORMULATION

EXISTING CONDITIONS

Introduction

The Rappahannock River basin (upper and lower reaches) includes the land and water drainage area that flows to the Rappahannock River. The area of the basin is approximately 2,715 square miles, and includes all or part of the counties of Albemarle, Caroline, Essex, Fauquier, Greene, King George, Lancaster, Madison, Middlesex, Northumberland, Orange, Rappahannock, Richmond, Spotsylvania, Stafford, and Westmoreland. The City of Fredericksburg and a number of towns also share the basin.

The waterway begins as streams flowing from the eastern slopes of the Blue Ridge Mountains. The southern streams form the Rapidan River, while the Rappahannock River forms in the northern localities of the basin. The Rapidan meets the Rappahannock just west of Fredericksburg, where Culpeper, Stafford, and Spotsylvania counties share borders. The river at Fredericksburg travels through the fall line geologic formation, characterized by rocks and rapids. East of Fredericksburg, the Rappahannock enters the coastal province of the state, where the waters receive tidal influences from the Chesapeake Bay. The river continues to widen and becomes increasingly brackish as it flows east toward Stingray Point and Windmill Point where it meets the Bay.

Table 1. FEDERAL NAVIGATION CHANNELS LOCATED IN THE STUDY AREA

Locality	Project Name	Authorized Project Dimensions			Status	Date of Last Maintenance Dredging
		Length (ft)	Width (ft)	Depth (ft)		
Gloucester County	Aberdeen Creek	5,175	80	6	A/N	1974
Essex County	Hoskins Creek	5,800	80 - 100	10	A/M	1996
	Rappahannock River	564,960	100 - 200	12	A/N	1970
King and Queen County	Mattaponi River	147,840	150	9	A/N	1941
King William County	Mattaponi River	147,840	150	9	A/N	1941
	Pamunkey River	248,688	100	7	A/N	1936
Middlesex County	Broad Creek	4,100	100	7	A/M	1994
	Jackson Creek	2,640	60 - 80	8	A/N	1970
	Locklies Creek	3,300	100	4	A/N	1924
	Mill Creek	1,700	100	11	A/N	1937
	Parrotts Creek	4,800	60	6	A/N	1956
	Rappahannock River	564,960	100 - 200	12	A/N	1970
	Urbanna Creek	4,700	150	10	A/N	1956
	Whitings Creek	3,100	70	4	A/M	2000
Mathews County	Davis Creek	4,845	80	10	A/N	1971
	Horn Harbor	7,920	100	7	A/M	1997
	Milford Haven	5,280	200	10	A/N	1936
	Queens Creek	4,295	60	6	A/M	1996
	Winter Harbor	8,265	100	12	A/M	1980
Lancaster County	Carters Creek	2,100	200	15	A/N	1908
	Dymers Creek	4,600	200	15	A/N	1911
	Greenvale Creek	3,350	50 - 60	6	A/M	1995
	Mulberry Creek	900	100	6	A/N	1928
	Rappahannock River	564,960	100 -200	12	A/N	1970
Northumberland County	Cranes Creek	1,500	80	6	A/M	1996
	Jarvis Creek	2,200	80	8	I	N/A
	Little Wicomico River	4,800	150	8	A/M	1995
Richmond County	Rappahannock River	564,960	100 - 200	12	A/N	1970
	Totuskey Creek	31,680	100 - 150	10	A/N	1969
Westmoreland County	Bonum Creek	3,795	60	6	A/M	1993
	Bransom Cove (Lower Machodoc River)	1,750	60	7	A/M	N/A
	Lower Machodoc River	1,350	150	9	A/M	N/A
	Monroe Bay and Creek	950	100	8	A/M	1989
	Nomini Bay and Creek	6,600	150	9	A/M	N/A
	Rappahannock River	564,960	100 - 200	12	A/N	1970
Caroline County	Rappahannock River	564,960	100-200	12	A/N	1970
King George County	Rappahannock River	564,960	100 - 200	12	A/N	1970

Key:

A	Active	M	Maintained
D	Deauthorized	N	Not Maintained
I	Inactive	N/A	Not Applicable

Physical Setting and Resources

Physiography. The lower Rappahannock Valley is within the Coastal Plain Province. Major physiographic units within the study area include coastal plain uplands, low marine terraces, and fluvial river terraces. Coastal marine uplands range in elevation between 90 and 170 feet above sea level. The soils are predominately well drained. Low marine terraces vary in elevation from 10 to 50 feet above sea level and are generally level. This land feature parallels the Rappahannock River. Fluvial marine terraces range in elevation from sea level to 10 feet above sea level and are located along the Rappahannock River and its major tributaries. These terraces flank the Rappahannock River and are part of what is known as the Essex Escarpment. Historically on the ocean floor, these lowlands follow the 50-foot contour line and are separated from adjacent uplands by what is known as the Essex Scarp. In some locations, the Essex Scarp borders the river forming high bluffs and steep cliffs. Much of the remaining land above the Essex Escarpment in the study area is Coastal Plain uplands.

Geology. In geologic terms, the Chesapeake Bay system is very young. During the latter part of the Pleistocene epoch, which began 1 million years ago, the area encompassing the Chesapeake Bay was alternately exposed and submerged as massive glaciers advanced and retreated up and down North America. This movement caused sea levels to rise and fall in response to glacial expansion and contraction. The region still experiences small-scale changes in sea level, which have been easily observed over the past century.

The most recent retreat of the glaciers, which began approximately 10,000 years ago, marked the end of the Pleistocene epoch and resulted in the birth of the Chesapeake Bay. The melting glacial ice caused an increase in sea level that submerged the coastal regions, including the ancient Susquehanna River Valley along with many of the river's tributaries. The resulting complex of drowned streambeds now forms the Chesapeake Bay and its tidal tributaries.

Soils. Soils in Middlesex County along the southern bank of the Rappahannock are mapped generally as the Suffok-Eunola-Remlik association. This soil grouping includes deep, well drained and moderately well drained, nearly level to very steep soils that have a dominantly loamy subsoil. These soils are found at elevations mostly 20-50 feet above sea level. Soils in Lancaster County along the northern shoreline of the Rappahannock River are mapped generally as the Woodstown-Dragston association in the area around the Corrotoman and as Sassafras, thick surface phases-Woodstown association from Carter Creek eastward to Mosquito Point. Both of these associations are characterized as nearly level soils of variable texture and drainage found in broad, flat areas along coastal bays.

Climate. The climate of the lower Rappahannock River Valley is considered temperate, humid subtropical. This climate is produced by latitude, topography, prevailing westerly winds, and the influence of the Atlantic Ocean. Soil Survey reports indicate average winter temperatures of 41 degrees Fahrenheit and average summer

temperature of 76 degrees. Average annual precipitation is approximately 42 inches, with half falling in the period of April through September. Prevailing winds are from the southwest, with the highest average speed, 12 miles an hour, in the spring.

Tides. The astronomical tides affecting the tidal portion of the study area are semi-diurnal, which means a tidal cycle consisting of two high tides and two low tides each lunar day, where consecutive high tides are of similar height and consecutive low tides are of similar height. A representative tidal station is at Millenbeck, VA, on the Corrotoman River near its confluence with the Rappahannock, at Latitude 37 degrees 40 minutes N, 76 degrees 29 minutes W. Based on the Hampton Roads, VA, reference site, the mean tidal range at Millenbeck, VA, is 1.30 feet, with a spring range of 1.60 feet. The mean tide level is 0.70 feet MLLW.

Surface Water. Surface water resources within the study area include tidal and tributary portions of the Rappahannock River. The major tributaries include Cat Point Creek and the Corrotoman River. With the exception of small farm related ponds, there are no major surface water impoundments. The drainage area for this study is approximately 1100 square miles as compared with the drainage area for the entire Rappahannock River of approximately 2715 square miles. The following table contains United States Geological Survey (USGS) surface-water discharge stations located within the study area.

Groundwater. Available groundwater level records for 18 wells within the study area are contained in USGS report VA-99-2 Water Resources Data Virginia Water Year 1999. The number of monitoring well listed in each county are as follows: Essex 0, Gloucester 6, King and Queen 4, King William 2, Lancaster 2, Mathews 1, Middlesex 0, Northumberland 0, Richmond 0, and Westmoreland 3.

The following except from the 1999 USGS Water Resources Data publication describes the general trends of the confined-coastal aquifer that is a prominent feature in the subject study area.

Table 2. SURFACE WATER STATIONS

01668500 Cat Point Creek near Montross, VA - Richmond County - Rappahannock River Basin
01669000 Pascataway Creek near Tappahannock, VA - Essex County - Rappahannock River Basin
01669520 Dragon Swamp at Mascot, VA - King and Queen County - Piankatank River Basin
01673638 Cohoke Mill Creek near Lester Manor, VA - King William County - York River Basin
01674500 Mattaponi River near Beulahville, VA - King William County - York River Basin

Crest-Stage Partial-Record Station

01661800 Bush Mill Stream near Heathsville, VA - Northumberland County - Great Wicomico River Basin
01668300 Farmers Hall Creek near Champlain, VA - Essex County - Rappahannock River Basin
01669980 My Ladys Swamp near Saluda, VA - Middlesex County - Piankatank River Basin

Special Study and Miscellaneous Sites

01660860 Bridges Creek at Mouth near Oak Grove, VA - Westmoreland County - Potomac River Basin
0166087770 Dancing Marsh near Oak Grove, VA - Westmoreland County - Potomac River Basin
01661800 Bush Mill Stream near Heathsville, VA - Northumberland County - Great Wicomico River Basin
01668300 Farmers Hall Creek near Champlain, VA - Essex County - Rappahannock River Basin
01669520 My Ladys Swamp near Saluda, VA - Middlesex County - Piankatank River Basin

Discontinued surface-water discharge or stage-only stations

01668800 Hoskins Creek near Tappahannock, Va- Essex County - Rappahannock River Basin

Source: Water Resources Data, Virginia, Water Year 1999, published by U.S. Geological Survey

"The confined sand aquifers of the Coastal Plain of Virginia are separated by layers of silt and clay. The deep confined aquifers of the Coastal Plain supply water to industrial, municipal, agricultural, and domestic users throughout eastern Virginia and adjoining states. Water levels in most of the confined aquifers of the Coastal Plain of Virginia have declined throughout much of their period of record because of unrestricted flows and groundwater withdrawals by large-capacity pumps. Historic records from wells and from reports of the U.S. Geological Survey indicate that water levels in most of the aquifers of the Coastal Plain of Virginia were much higher during the early years of the 20th century than they are now. In fact, before groundwater withdrawals began, many wells open to the confined aquifers of the Coastal Plain flowed at land surface. Since then, however, water levels have dropped below land surface. Cones of depression around the major pumping centers have coalesced throughout much of Virginia and changes in pumping at any one location can have far-reaching affects. Water levels in observation wells open to the deep confined aquifers of the Coastal Plain change in response to changing pumpage in and near large-capacity wells and well fields. The amplitude of the water-level response in an observation well is proportional to the proximity of the well to the change in pumpage and proportional to the hydraulic properties of the porous media between the observation well and the change in pumpage. Two index wells, 55516 in Isle of Wight County and 56H27 in James City County, show changes in water levels typical for the deep confined aquifers of the Coastal Plain of Virginia. Long-term records such as these can provide detailed information about the history of water use in Virginia and the impact of groundwater withdrawals on water levels."

In addition to groundwater level data, groundwater quality records are available for wells in King and Queen, Lancaster, and Middlesex Counties.

Water Quality. Water quality in the Rappahannock River Basin is generally considered good. At the fall line, near Fredericksburg, water quality normally meets Federal and state criteria for phosphorus. Nitrogen levels are reportedly higher than those of other Chesapeake Bay tributaries. Within the tidal portion of the river, levels of nitrogen and phosphorus exhibit distinctive seasonal variation, an effect typical of rivers with dominant nonpoint sources of pollution (i.e., agriculture). According to the Rappahannock River Tributary Strategy, only 6 percent of controllable nitrogen and 20 percent of controllable phosphorus in the river originate from point sources.

Chlorophyll levels are increasing in the middle portion of the river, and state dissolved oxygen level violations are more frequent in the Rappahannock than in any other Virginia river. A portion of the river from Leedstown to the mouth is considered nutrient enriched. There are times when the water quality throughout the river may be too poor to support the growth of Submerged Aquatic Vegetation (SAV), although dissolved oxygen conditions have improved near the mouth. Low dissolved oxygen

levels in deeper waters near the mouth of the river have created a hypoxic environment for benthic organisms and a marginal environment for fish. Such events occur during the summer months when water stratification and eutrophic conditions are most pronounced.

Water quality in the Rappahannock River has been extensively monitored through the Chesapeake Bay Monitoring Program. Since the early 1980's, measurements of dissolved oxygen, salinity, pH, temperature, nutrients, and suspended solids have been taken. In 1994, the Virginia Department of Environmental Quality (VDEQ) expanded the monitoring program to include several nutrient forms not previously measured, such as particulate inorganic phosphorus, biogenic silica, and particulate carbon. Permanent enhancement of the program includes light attenuation measurements, field filtration of water samples, and lower detection limits on some analysis. As part of the Rappahannock River Tributary Strategy, the goal of which is a 40 percent nutrient reduction as part of a program for the overall improvement of water quality, an enhanced monitoring program will provide information on additional forms of nutrients (VDEQ, 1999).

According to data supplied by the Rappahannock River Basin Commission Atlas and GIS database and VDEQ, Piedmont Regional Office, there are no major wastewater treatment plant point dischargers located in the Lower Rappahannock. All of the permitted dischargers are considered minor contributors of less than one million gallons per day. Table 3 lists these permitted dischargers.

Many areas of the Rappahannock have been condemned by the Virginia Department of Health for the direct harvesting of shellfish. Condemnation is based upon levels of bacterial contamination. According to the Department of Conservation and Recreation, approximately 6,500 acres of shellfish growing areas east of Tappahannock do not meet state bacteriological standards (DCR, no date).

Water quality is very important to the economic and environmental health of the Lower Rappahannock basin. Nonpoint sources of pollutants affecting the surface waters include runoff from animal waste and feeding facilities, septic systems, and agricultural activity, including application of fertilizers and pesticides. Point source pollution may come from water and wastewater treatment plants, industrial dischargers, and marinas.

Nutrient enrichment adversely affects water quality in the basin. It is an overabundance of nitrogen and phosphorus compounds. Nutrients enter waterways from both point (wastewater discharges) and nonpoint sources (agricultural runoff, atmospheric sources, etc.).

Table 3. VIRGINIA POLLUTION DISCHARGE SYSTEM

National Pollution Discharge System (NPDS) - Virginia

Permit No.	Facility Name	County	Major /Minor	Municipal /Industrial
VA0071471	Tappahannock Town	Essex	Minor	Municipal
VA0029351	The Tides Inn	Lancaster	Minor	Municipal
VA0029343	Tides Golf Lodge	Lancaster	Minor	Industrial
VA0060569	Windmill Point Marine Resort	Lancaster	Minor	Municipal
VA0024066	Christchurch School	Middlesex	Minor	Municipal
VA0087629	Dozier Marine Center	Middlesex	Minor	Municipal
VA0058327	Jackson Creek Condominiums WTP	Middlesex	Minor	Industrial
VA0073318	Middle Peninsula Regional Security Ctr.	Middlesex	Minor	Municipal
VA0063029	Mizpah Nursing Home WWTP	Middlesex	Minor	Municipal
VA0087611	Norview Marina	Middlesex	Minor	Municipal
VA0087360	Stringray Harbor Marina	Middlesex	Minor	Municipal
VA0026263	Urbanna Wastewater Treatment Plant	Middlesex	Minor	Municipal
VA0026891	Warsaw Aerated Lagoons	Richmond	Minor	Municipal
VA0083127	Wood Preservers, Inc.	Richmond	Minor	Industrial
VA0087807	Stringray Harbor, LLC	Lancaster	Minor	Industrial

Virginia General Permits

Permit No	Facility Name	County
VAG524001.	B. G. Smith & Sons, Inc	Richmond
VAG524008	Doggett Seafood, LLC	Lancaster
VAG524010	W. F. Morgan & Sons, Inc.	Lancaster
VAG524013	Cap'n Tom's Seafood	Lancaster
VAG524017	Callis Seafood, Inc.	Lancaster
VAG524019	Stingray Point Oyster Co. Inc.	Lancaster
VAG524023	J. Henry Talbott Seafood	Lancaster
VAG524028	Waterview Packing Co., Inc.	Middlesex
VAG524030	RCV Seafood Corporation	Lancaster
VAG524035	W. Ellery Kellum, Inc.	Lancaster
VAG524038	Irvington Packing Co., Inc.	Lancaster
VAG524043	J. W. Ferguson Seafood Co.	Middlesex
VAG524044	E. J. Conrad & Sons Seafood, Inc.	Lancaster
VAG524045	W. R. Pittman & Sons, Inc.	Lancaster
VAG524049	Abbott Brother, Inc. #1	Lancaster
VAG524050	Abbott Brother, Inc. #2	Lancaster
VAG524051	Shores & Shores, Inc.	Middlesex
VAG524052	Simonson Seafood, Inc.	Richmond
VAG524058	Shores & Ruark Seafood, Inc.	Middlesex
VAG524064	Parks Seafood, Inc.	Lancaster

Source: Virginia DEQ

General permits and permits-by-rule. All dischargers of wastewater into the state's waters must obtain a permit under Virginia Pollution Discharge Elimination System (VPDES). There are 33 VPDES permitees in the Lower Rappahannock River basin. Information about these permitees is displayed in the above table. The majority of the permitees are wastewater and water treatment facilities.

VDEQ issues permits and conducts extensive monitoring to ensure that air, water, and waste discharges comply with state and Federal standards. VDEQ also oversees monitoring by permit holders and conducts inspections of permitted sites to ensure that sources such as water discharges, air emissions, and waste management facilities meet permit requirements.

The descriptions of air, water, and waste permits provide information on who must apply for a specific type of permit, the legal authority for the permit, permit terms and fees, typical permit requirements, and an outline of the permit application process.

The most dramatic results in streamlining permit processes have come, and will continue to come, from the increased use of general permits and permits-by-rule. VDEQ is able to significantly reduce the time, expense, and complexity related to the preparation and review of a permit for facilities with substantially similar industrial, remedial, or sanitary processes, as well as devote more time and resources to permits for facilities with more complex permit requirements. Permit requirements for general permits and permits-by-rule are enforced in the same manner in which individual permit requirements are enforced.

With general permits, VDEQ develops requirements for category-specific permits with the Environmental Protection Agency (EPA) and adopts the permits through the regulatory process; individual facilities within the Commonwealth are then able to apply for and be covered by the "umbrella" of the general permit. For both VDEQ and permit applicants, the benefits are significant: general permits can be issued in a matter of days, not months, saving all participants time and money; and individual facilities save the expense of developing and presenting costly data because this information is covered on their behalf in the general permit. General permits are in place for:

- Underground storage tank corrective action plans.
- Non-metallic mineral mining operations.
- Confined animal feeding operations.
- Stormwater discharges, including construction operations, large industrial operations, small industrial operations, transportation-related facilities, landfill discharges, and recycling operations.
- Sanitary sewage discharges of less than 1,000 gallons per day.

With certain permits-by-rule, an applicant is deemed to have a permit upon filing specified information with VDEQ. With other permits-by-rule, the applicant is deemed to have a permit when VDEQ acknowledges receipt of the required information. For more information, check the appropriate regulation. Generally, these permits are used for categories of facilities that have very simple permit requirements and pose minimal threat to the environment. The information submitted is certified by a professional engineer as being accurate and in compliance with regulatory requirements. Currently, VDEQ uses permits-by-rule for:

- Yard waste composting facilities.
- Energy recovery or incineration facilities for solid waste.
- Waste transfer stations.
- Materials recovery facilities for solid waste.

VDEQ believes that the future of increased permit efficiency lies in the expansion of the use of general permits and permits-by-rule wherever possible. Data continue to demonstrate that this innovative approach to permits not only cuts average times for permit issuance dramatically; it also reveals that such streamlined permitting will continue to free experienced VDEQ staff to better serve applicants with complex permit needs. VDEQ is pursuing development of general permits or permits-by-rule in these areas:

- Car washes.
- Seafood processors.
- Aquaculture operations.
- Ready-mix concrete plants.
- Vegetative waste decomposition facilities.
- Cooling tower discharges to storm sewers.

Hazardous, Toxic, and Radioactive Waste (HTRW). The Commonwealth of Virginia currently has 993 permits for active and inactive landfills on record. A total of 26 landfills have been identified in the twelve- county subject area. These sites are listed on the attached sheet. Three of these landfills are currently active. Saint Laurent Paper Products Corp operates an industrial landfill in King William County. Browning Ferris Industries (BFI) operates King & Queen County Landfill. Waste management operates the Middle Peninsula Landfill and Recycling Center in Gloucester County. Middle Peninsula and King & Queen are Subtitle D landfills utilizing liners, leachate collection systems, groundwater monitoring and standard daily cover on all wastes. Saint Laurent

Paper utilizes their landfill for byproducts of the paper making process and does not accept waste from outside sources.

All three landfills are permitted and monitored by the Virginia Department of Environmental Quality (VDEQ), and are subject to Virginia Code Section 10.1-1408.1.

VDEQ Leaking UST / AST Cases -- The Virginia Department of Environmental VDEQ tracks and monitors all reported petroleum storage tank releases and assigns to each a pollution complaint (pc) number. The scope of these petroleum releases ranges from 275-gallon home heating oil tanks to 12,000-gallon retail gasoline storage tanks. The VDEQ has on record 98 active pollution complaint numbers for the twelve- county subject areas. A listing of these cases are attached. To put this number into perspective, there are 2,679 active cases statewide. These 98 cases are in varying stages of initial abatement, site characterization monitoring or corrective action.

National Priority List -- The National Priority List was developed as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund. This is a list of sites where there is broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. There are thirty NPL sites in the commonwealth of Virginia. One NPL site exists in the twelve- county subject area, and is described below.

> The Arrowhead Associates/Scovill Corp. site is located on 30 acres in a rural area in Westmoreland County, Virginia. The Scovill Corp. electroplated cosmetic cases from 1966 to 1972, when Arrowhead, Inc. of Delaware acquired the business and its assets. Arrowhead continued the electroplating operations until 1979. From 1979 to 1981, Arrowhead also filled the cases with cosmetics. From 1981 to the present, A.R. Winarick has assembled and filled cases with cosmetics, and beginning in the early 1980s to the present, Mattatuck Manufacturing has also fabricated automobile wire harnesses at the site. Plating wastes were treated in a surface impoundment system and discharged to Scates Branch under a permit issued through the National Pollutant Discharge Elimination System. After the plating operations ended in 1979, process equipment and materials were abandoned at the site. An estimated 1,100 people obtain drinking water from shallow private wells within 3 miles of the site. A coastal wetland is about one mile from the site, and local surface water is used for recreational activities. High levels of volatile organic compounds (VOCs) in the groundwater at the site pose a significant threat. The contamination plume extends off site and into Scates Branch and the South Fork Scates Branch where groundwater discharges to the stream. Surface soil sampling did not indicate a widespread presence of contamination; VOCs, metals, and cyanide were found in a few locations. In subsurface soil, high levels of VOCs were found in two former drum storage areas and in one of the former pond areas. High levels of heavy metals were detected in the area on the former disposal ponds.

There is currently operating a soil vapor extraction system to address the VOCs. Phase 2 of this system was approved by the EPA in April 2000, and involves the installation of a permeable reactive barrier wall to address the groundwater plume.

Land Use and Development. Rural land use dominates the counties in the study area with nine incorporated towns (West Point, Tappahannock, Warsaw, Urbanna, Montross, Colonial Beach, Kilmarnock, Irvington, and White Stone) being the centers of most commercial and residential development. Forestland dominates the study area with agricultural land the next most prevalent type. Typically, about two-thirds of a county's acreage is covered with forests, the majority of which are privately owned. Most of this privately owned acreage is not industry-owned, although in King and Queen County about 25 percent of the county's total land area is owned by commercial timber companies. Agricultural land makes up between approximately 11 and 35 percent of each county's acreage. The largest category of developed acreage is residential land, which can be found in the small towns and communities of the study area and along the more traveled roads of the region. Commercial development can be found in the area's towns like Tappahannock and Urbanna and along the major highways such as U.S. Route 17. Although industrial land use makes up a very small part of the overall land use, there are significant industrial areas in King William and Essex Counties. Future land use is expected to remain roughly similar to the current uses with some increase in residential and commercial development. In many of the counties a conservation category is planned for land that has environmental features that make it undesirable for development but valuable from a natural resource perspective.

Living Resources

Submerged Aquatic Vegetation (SAV). According to the most recent final report by the Virginia Institute of Marine Science (VIMS) on the 1997 distribution of SAV in the Chesapeake Bay (Orth et al., 1998), only a few small beds exist in the vicinity of this part of the river. Species composition of one of the beds is reported from a VIMS field survey as widgeon grass (Ruppia maritima) (Orth et al., 1998). Additionally, several smaller, less dense beds are located at the mouth of Carter Creek, approximately a mile away from the Drumming Ground site. Species composition is reported as widgeon grass (R. maritima) and horned pondweed (Zannichellia palustris) from a field survey of a small bed at the mouth of Carter Creek. No beds were mapped on the south shore of the Rappahannock River during the 1997 survey (Orth et al., 1998). Preliminary 1999 data from VIMS indicates the presence of a sparse, almost contiguous SAV bed surrounding Corrotoman Point (VIMS, 1999). However, since 1991, total distribution has decreased dramatically, from a high of 413.47 hectares in 1993 to a low of 14.70 hectares in 1997. In fact, the 1997 reported abundance for the lower Rappahannock River is only 1.5 percent of the Tier I goal of 999.92 hectares (VIMS, 1998). More information on the demise of SAV's is contained in the "Problems and Opportunities" section of this report.

Wetlands. Wetlands located in the middle and downstream portion of the study area are dominated by those vegetative species more adapted to higher salinities. Vegetative communities are primarily composed of saltmarsh cordgrass (Spartina

alterniflora) and brackish water mixed communities. Interspersed throughout these marshes are tidal guts, creeks, ponds, and potholes. Table 4 summarizes some of the major marshes of the lower Rappahannock River (Fish and Wildlife Service, 1995).

Several locations in the study area are best described as bottomland hardwood wetlands. These wetlands are sustained by fluvial flooding which maintains these wetlands by providing sediment and nutrients and exporting organic and inorganic material. Major components of this habitat type in the study area include Horse Head Point, Marsh Point, and the bottomland hardwoods at Green Bay, all of which are found in Essex County. Smaller tracts are found in the upper reaches of the lower Rappahannock and its tributaries (U.S. Fish and Wildlife Service, 1995).

Table 4. MAJOR TIDAL MARSHES IN THE LOWER RAPPAHANNOCK RIVER DOWNSTREAM TO BELLE ISLE (PRIEST 1990; MOORE 1981; DOUMLELE 1979; HARRIS 1979; MERCER 1978)

Wetland	Marsh Acreage	Dominant Vegetation
Belle Isle/Lancaster Cr.	1,190	Saltmarsh cordgrass (Spartina alterniflora) Black needlerush (Juncus romerianus) Big cordgrass (Spartina cynosuroides) Saltbush (Iva frutescens)
Richardson Cr.	350	Big cordgrass Saltmeadow hay (Spartina patens)
Little Carter Cr.	1,220	Big cordgrass, saltmarsh cordgrass, saltmeadow hay
Cat Point Cr.	930	Big cordgrass Arrow arum (Peltandra virginica) Pickerelweed (Pontedaria cordata) Beggar ticks (Bidens spp.)
Mount Landing Cr.	800	Big cordgrass, arrow arum, pickerelweed cattail (Typha spp.)
Sluice Cr./Broad Cr.	550	Big cordgrass
Mulberry Island	490	Big cordgrass
Beverly Marsh/Occupacia Cr.	1,975	Big cordgrass, cattail, arrow arum, pickerelweed
Otterburn Marsh	320	Cattail, arrowarum, wild rice (Zizania aquatica)
Drakes Marsh	430	Rice cutgrass (Leersia oryzoides), wild rice, pickerelweed, arrow arum
White Marsh	120	Wild rice, smartweed (Polygonum spp.), jewelweed (Impatiens capensis)
Corbins Neck/Birchwood Run Marshes	180	Smartweed, beggar ticks, wild rice

Fisheries. The Rappahannock River area has historically provided significant water-related economic activity associated with commercial seafood harvesting, boat repair, marinas, charter sport fishing, and recreational boating. The importance of navigation is indicated by the substantial commercial seafood activity in the Rappahannock River, Chesapeake Bay, and adjacent waters. The tidal wetlands along the coastline produce an abundance of commercially important shellfish, including crabs, clams, and oysters. Shellfish and finfish landings in the lower Rappahannock River for the last 10 years of record are shown in Table 5. Landings have fluctuated over the past 10 years due primarily to a variability in the populations of the various finfish and shellfish species. Gloucester, Northumberland, and Mathews Counties are the major landing points, representing approximately 76 percent of landings and 72 percent of the value for the 12-county area in 1999.

Oysters are components of the benthic community. Although free-swimming as larvae, once they settle on an appropriate substrate, a process known as setting, they are henceforth sessile creatures. Areas of the Rappahannock River were evaluated in terms of suitability for harvesting commercial benthos, primarily oysters and soft clams clams (Mya arenaria), by Haven et al., of VIMS, in 1981. The disease MSX has been a major deterrent for attempting to use seed oysters. In addition, Haven et al., report that oysters setting in areas where MSX is active often mature with very low mortality. Therefore, the area is recommended for use as a "grow out" area for spat developing on planted shell, spat transplanted from areas where MSX is active, and hatchery-reared MSX-resistant spat. Dermo may be present, as salinities average over 15 ppt in the fall, but annual mortalities may be expected to be less than 10 percent except in years with higher than average salinities, high temperatures, presence of infected oysters, and thickly planted oysters (Haven et al., 1981).

According to the Virginia Department of Game and Inland Fisheries (VDGIF) online database, Fish and Wildlife Information Service, six species of anadromous fish may occur in the lower Rappahannock. These include Atlantic sturgeon (Acipenser oxyrhynchus), a Virginia species of special concern, alewife (Alosa pseudoharengus), blueback herring (A. aestivalis), American shad (A. sapidissima), sea lamprey (Petromyzon marinus), and striped bass (Morone saxatilis). Of these six, only striped bass has been confirmed in the study area, although considering habitat and distribution, the other species are likely in the area (VDGIF, 2000). Other fish include Atlantic croaker (Micropogonias undulatus), gizzard shad (Dorosoma cepedianum), spot (Leiostomus xanthurus), and weakfish (Cynoscion regalis).

Table 5. COMMERCIAL LANDINGS (Finfish and Shellfish) 1990-1999

Year	Landed pounds	Value($)
1990	3,220,761	717,342
1991	3,418,276	723,797
1992	1,863,673	1,013,992
1993	1,545,992	908,028
1994	912,125	563,185
1995	2,155,353	765,273
1996	2,193,524	850,507
1997	2,568,339	1,040,905
1998	2,087,062	976,769
1999	2,554,090	1,091,180

Source: Virginia Marine Resources Commission

VIMS identified over 100 species of finfish and shellfish in the Rappahannock River from 1967-1992 (Seaver 1993).

The river is populated by a large assemblage of resident fish species including white perch (Morone americana), yellow perch (Perca flavescens), largemouth bass (Micropterus salmoides), white crappie (Pomoxis annularis), black crappie (Pomoxis nigromaculatus), bluegill (Lepomis macrochirus), and channel catfish (Ictalurus punctatus). The blue catfish (Ictalurus furcatus) is a non-native, resident species in the river that was introduced by VDGIF.

The Rappahannock River also provides very important nursery habitat to several coastal, migratory species of fish. The major species include weakfish (Cynoscion regalis), Atlantic croaker (Micropogonias undulatus), spot (Leiostomus xanthurus), Atlantic menhaden (Clupea harnghus), bluefish (Pomatomus saltatrix), and summer flounder (Paralichthys dentatus).

Primary nursery and spawning areas in the Rappahannock River for anadromous Alosa species, such as river herring and shad, have been identified from river mile 35 (RM35) to approximately RM95. Critical spawning and nursery area in the river for striped bass is found from approximately RM37 to RM67 (Seaver 1993). Spawning habitat for herring and shad includes tributaries in the same river section. The lower portion of the river is important oyster habitat, as well as important nursery habitat for coastal, migratory finfish.

Terrestrial Organisms. A diverse assemblage of mammals utilize the study area. Wetland habitats support an abundance of furbearers, including muskrat (Ondatra

zibethica), raccoon (Procyon lotor), beaver (Castor canadensis), and mink (Mustela vison). Larger mammals more closely associated with uplands include white-tailed deer (Odocoileus virginianus), gray squirrel (Sciurus carolinensis carolinensis), red fox (Vulpes vulpes fulva), and opossum (Didelphis marsupialis) (USFWS, 1994). Other mammals that may occur in the study area include a variety of bats, mice, rats, squirrels, shrews, muskrat, voles, bobcat, chipmunk, woodchuck, and weasel. The river otter (Lontra canadensis lataxina), a species of special concern in Virginia, may also potentially occur within the study area (VDGIF, 2000).

An abundant variety of reptiles and amphibians are reported to occur within the study area. Approximately 60 species of frogs, toads, treefrogs, salamanders, skinks, snakes and turtles that may be found within 2 miles of the centerline of the Rappahannock River near the confluence of the Corrotoman with the Rappahannock.

Endangered Species. At least six Federally listed threatened or endangered species may be found within the project study area seasonally or year-round.

Table 6. FEDERALLY LISTED ENDANGERED OR THREATENED SPECIES IN THE LOWER RAPPAHANNOCK

Common Name	Scientific Name	Federal Status
Bald Eagle	Haliaeetus leucocephalus	Threatened
Peregrine Falcon	Falco peregrinus	Endangered
Shortnose Sturgeon	Acipenser brevirostrum	Endangered
Small Whorled Pogonia	Isotria medeoloides	Endangered
Sensitive Joint Vetch	Aeschynomene virginica	Threatened
Swamp Pink	Helonias bullata	Threatened

Of these species, the bald eagle, sensitive joint vetch, and the small whorled pogonia are by far the most common threatened or endangered species in the Lower Rappahannock study area. The bald eagle, a Federally endangered species, nests along the high banks of the Rappahannock River. It is estimated that one-third of all of Virginia's nesting pairs live in a section of the river just below the fall line east of Fredericksburg. FWIS, VDGIF's database, lists the bald eagle as potentially occurring within the study area.

Eagles are mostly fish eaters, but will prey upon mammals and birds when necessary. They will eat carrion, especially fish, although diet varies depending on the geographic area and season (VDGIF, 2000). Bald eagles nest throughout the Rappahannock River Valley and large summer and winter concentrations are located in the Horse Head Point area in Essex, King George, and Westmoreland Counties, and at Fones Cliff in Richmond and Westmoreland Counties. The remaining endangered

species are much less common in the study area and may occur there only infrequently if at all (USFWS, 1995).

State Species -- The peregrine falcon (Falco peregrinus) is documented as a state-listed endangered species occurring within the study area (VDGIF, 2000). This species was removed the Federal list of endangered species in August 1999.

Table 7. COMMONWEALTH OF VIRGINIA LISTED THREATENED OR ENDANGERED SPECIES IN LOWER RAPPAHANNOCK

Common Name	Scientific Name	State Status
Bald Eagle	Haliaeetus leucocephalus	Endangered
Bachman's Sparrow	Aimophila aestivalis	Threatened
Small Whorled Pogonia	Isotria medeoloides	Endangered
Swamp Pink	Helonias bullata	Endangered

The river otter (Lontra canadensis canadensis) and Atlantic sturgeon (Acipenser oxyrhynchus) are also state species of special concern that may potentially occur in the study area (VDGIF, 2000).

Birds. Avian species documented for the vicinity of the study area include the great Egret (Ardea alba egretta) and least tern (Sterna albifrons), both of which are species of concern in Virginia. Twenty avian species of special concern may occur in the study area according to VDGIF, including brown creeper (Certhia americana), dickcissel (Spiza americana), purple finch (Carpodacus purpureus), nothern harrier (Circus cyaneus), little blue heron (Egretta caerulea caerulea), tricolored heron (Egretta tricolor), glossy ibis (Plegadis falcinellus), golden-crowned kinglet (Regulus strapa), common moorhen (Gallinula chloropus cachinnans), yellow-crowned night-heron (Nyctanassa violacea violacea), red-breasted nuthatch (Sitta canadensis), barn owl (Tyto alba pratincola), brown pelican (Pelecanus occidentalis carolinensis), saltmarsh sharp-tailed sparrow (Ammodramus caudacutus diversus), Caspian tern (Sterna caspia), Forster's tern (Sterna forsteri), sandwich tern (Sterna antillarum), hermit thrush (Catharus guttatus), sedge wren (Cistothorus platensis), and winter wren (Troglodytes troglodytes).
Socio-Economic Resources

Population. The study area's population was estimated to be 129,000 as of 1999 (Weldon Cooper Center for Public Service), which is a 28.7 percent increase since 1980. This growth rate is identical to that of the State of Virginia. Within the study area, the largest county, by far, is Gloucester County with an estimated 1999 population of 34,500. All the other counties have less than half as many people. The smallest is King and Queen County with 6,500 residents. Gloucester County also had the largest growth rate of all the counties in the study area with an average annual rate from 1980-1999 of 2.9 percent, and Essex County had the smallest growth rate with 0.3 percent.

Projections of the region's population show 163,914 residents by 2020 (Virginia Employment Commission), reflecting an average annual growth rate of 1.1 percent. This is slightly above the 0.9 percent projected for the state. Over half the population growth is expected to take place in Gloucester County, reflecting its proximity to the high growth Counties of York and James City on the Lower Peninsula. The balance of the growth is projected to be scattered throughout the remainder of the study area.

Education. As is typical in the more rural counties of the state, education levels tend to be below the state average. Only Gloucester County had a proportion of residents with a high school diploma equal to the percentage for the state as a whole (U.S. Census, 1990). All the counties had smaller percentages of residents with advanced degrees than the state.

Employment. Total employment by place of work grew significantly more for the middle peninsula than for the northern neck between 1980 and 1999. The northern neck counties had an average annual growth rate of 0.9 percent while the middle peninsula rate was 2.5 percent. Virginia's rate for the same time period was 1.9 percent. The counties with the highest growth were Middlesex, King William, and Gloucester. Essex and Westmoreland Counties had the smallest growth rates. The largest sectors of employment are private services, retail trade, and government, which provide over half the region's jobs.

Income**.** Income levels in the study area as measured by per capita income are below the state average for all the counties (Bureau of Economic Analysis, 1998). The highest incomes can be found in Lancaster and Mathews Counties ($27,133 and $25,207 respectively), while the lowest are found in Richmond County ($16,258) and Westmoreland County ($20,313). Although the Virginia average of $28,063 is somewhat higher than the figures for the study area, much of this higher average is due to the large, relatively wealthy population of Northern Virginia.

Cultural Resources

Both the Middle Peninsula and the Northern Neck counties are rich in historical and archaeological resources. Prior to European settlement, this region was inhabited by members of the Algonquian Indian tribes, who lived in villages spread thinly over the area. European settlement of the region began in the first half of the 17th century, particularly along the rivers and their tributaries. Numerous sites, both prehistoric and historic, remain from the earlier inhabitants of the region. These sites are scattered throughout the region, and it is likely there are many other sites that have not been discovered. While areas along rivers and streams (including eroding shorelines) are prime areas for prehistoric sites, many other areas in the region would also be considered medium to high probability areas based on topography and little extensive land disturbance. Historical era sites consist of both structures that are still standing and archaeological sites that contain artifacts and features dating from the early 17th century to the 20th century. These sites can be found where the early settlements, plantations, farms, and shipping ports existed as well as where events such as the Civil War took place.

EXPECTED FUTURE CONDITIONS

The most likely future without project condition is the land use and related conditions likely to occur under existing improvements, laws, and policies and provides the basis for the evaluation of potential measure for addressing the problems, needs, and opportunities discussed in the previous section of this report. The complexity of water resources problems and needs identified combined with the lack of larger scale local resources indicates that many of the issues and concerns will go unresolved. There is a major initiative of the U.S. Fish and Wildlife Service (USFWS) to acquire up to 20,000 acres along a portion of the lower Rappahannock river shoreline for the "Rappahannock River Valley National Wildlife Refuge" for the purposes of: 1) protecting and restoring wetlands; 2) maintaining and enhancing waterfowl populations; 3) protecting important wintering and nesting habitat for the endangered bald eagle and other endangered and threatened species; 4) providing and maintaining grassland and forested habitat for neotropical birds; 5) protecting fish and shellfish resources; and 6) maintaining biodiversity. Once acquired, the areas will become part of the National Wildlife Refuge System. In consonance with this initiative, the feasibility study will examine complimentary restoration initiatives that will be coordinated with the USFWS and other interested organizations such as the Chesapeake Bay Foundation, the Nature Conservancy, and Ducks Unlimited.

IDENTIFIED PROBLEMS AND OPPORTUNITIES

A stakeholder meeting was held on 19 July 2000 in order to ascertain the issues, concerns, problems, and needs of the study area. The meeting was hosted by the Tidewater Resource Conservation and Development Council (RC&D), associated with the U.S. Department of Agriculture. The mission of the RC&D is to capitalize on abilities, resources, and opportunities to create an economically diverse, culturally responsive and ecologically sound region. It was clear from the discussions of the stakeholders that the study purpose should be a comprehensive regional basin analysis to include ecosystem restoration, groundwater and surface water, public access, navigation, landfills, pollution and storm water management, shoreline stabilization, and flood damage prevention. Further details of the meeting are discussed in subsequent portions of this report.

The aforementioned study authority was previously used to evaluate the potential for Federal interest in environmental restoration opportunities that include returning the upper Rappahannock River basin to anadromous fish and restoring riparian and wetland habitat in the Rappahannock River basin above and in the vicinity of Embrey Dam and the City of Fredericksburg while recognizing and preserving adjacent water related facilities and needs, including historical canals, wetlands and ponds, historical locks, other sites, downstream parks, and flood control provisions along the river.

Ecosystem Restoration

Riparian/Forest Buffers. Acting as a "sponge," forests capture rainfall, reduce runoff, maintain stream flow, filter nutrients and sediments, and stabilize the soils. For example, a riparian forest buffer may remove 30 to 98 percent of the nitrogen and phosphorous from the groundwater before it reaches a stream, depending on the depth of the groundwater from the surface.

Healthy forests provide food, shelter, nesting sites, and safe migration paths for the Chesapeake's wildlife. In fact, riparian forests are essential to the life stages of over one-half of the native wildlife species in the Bay watershed. Riparian forest buffers also shade stream and rivers providing cooler temperatures, which are important for spawning fish.

Forests keep air clean by absorbing or trapping nitrogen, particulates, and other pollutants that are released in the atmosphere by cars, industry, farming and construction. In the northeastern United States, the forests remove 70 to 80 percent of the airborne nitrogen.

One of the most important factors in maintaining stream and river health is conserving and restoring riparian forest buffers. A riparian forest buffer is a forested area bordering a body of water that serves as a buffer between adjacent land uses and the sensitive stream environment. In the 1600's when settlers first arrived on the shores of the Chesapeake Bay, the watershed was about 95 percent forested. Today, about 60 percent of the Bay's watershed is forested and this number is decreasing as growth and development increase.

Many streambanks have been subjected to clear-cutting and are impacted by agricultural and industrial run-off. Poor drainage systems from communities and individual residences have seriously eroded the integrity of stream, river, and Chesapeake Bay waters.

The result of the loss of riparian buffers has been an increase in sedimentation affecting water quality, SAV, drinking water and fish. Increased water temperatures caused by removing trees that shade the water have decreased proper habitat for fish. Removal of the natural filter system that decreases pollutants from run-off includes fertilizers, pesticides, heavy metals, and other harmful substances.

In 1994, the Chesapeake Executive Council called the establishment of a "Riparian Forest Buffer Panel" to recommend actions for the stewardship of riparian forest buffers. Two years later, the Executive Council adopted the recommendations of the panel and set several goals, including the restoration of 2,010 miles of riparian forest buffer by the year 2010. Before this goal was established, Federal landholding agencies in the Bay watershed had already signed a 1994 agreement in which they committed to support the development of a riparian forest buffer policy. In 1998, these agencies signed a supplemental agreement committing among other things, to: (1) adopt riparian area conservation policies for Federal lands by January 2005, and (2) restore 200 miles of riparian forest buffers on Federal lands by 1 January 2010. The Chesapeake Bay Agreement 2000's goal, is to ensure that measures are in place by 2003 to meet the riparian forest buffer restoration goal of 2,010 miles by 2010.

Fish Migration Barriers. Many streams and rivers in the Chesapeake Bay watershed are blocked by dams, culverts, and other structures. Over 2,500 blockages in the watershed prevent anadromous and other migratory fish from reaching historic

spawning grounds. Anadromous fish, such as shad and herring, are fish that live in salt water during their adult life and migrate into freshwater to spawn.

In the early 1900's, the annual catches of shad in Virginia were around 8 million pounds. Less than 500 pounds per year have been reported in recent years (VDGIF, 1992). Over-fishing, pollution, and the loss of historic spawning grounds have all contributed to the decline of anadromous fish stocks. This decline has led to a moratorium on shad fishing within the Chesapeake Bay and its tributaries.

In addition to their economic worth as a commercial fishery, these migratory species once played a significant ecological role in the coastal tributary ecosystem. Many shad and river herring die shortly after spawning and the decomposing carcasses may have once represented an important source of nutrients to tidal freshwaters and enhanced the productivity of these streams and rivers (VDGIF, 1992). Also, because shad and river herring remain in freshwater through the autumn of their first year before returning as adults to the ocean, they provided abundant forage for larger predatory species (VDGIF**,** 1992).

In the Rappahannock River, historical spawning grounds for shad have been reported to extend to Remington (Beverly's Ford), about 188 miles upstream of the river mouth (Mudre, 1985). In 1883 herring were reported to have been caught in large quantities as far upstream as Fauquier Springs, 15 miles above Remington, and 202 miles above the river mouth (Mudre, 1985).

A report prepared for VDGIF by McIninch and Garman (1999) identified more than 300 potential impediments to fish migration in the Rappahannock River Basin. Of those, approximately 50 are located below the fall line at Fredericksburg (Embrey Dam) and were identified as primary impediments or barriers.

Fish passage development within the Chesapeake Bay tributaries has been a major priority since the late 1980's. In 1980, Virginia and Maryland legislatures established the Chesapeake Bay Commission. The commission through interstate planning and programs drafted the Chesapeake Bay Agreement, which in December 1987 was signed by representatives from Virginia, Maryland, Pennsylvania, the District of Columbia, and the United States (EPA Administrator). The agreement established goals and priorities for restoring Chesapeake Bay resources through restoration and protection of the living resources, their habitats, and ecological relationships.

In December 1993, the Chesapeake Executive Council formalized the short- and long-term goals for fish passage development with Directive 93-4. The directive instructs the Chesapeake Bay Program partners to open 582.05 and 1,356.75 miles of spawning habitat for shad and herring (<u>Alosa spp.</u>*)* by 1998 and 2003, respectively (Fish Passage Workgroup of the Chesapeake Bay Program, 1997). The Chesapeake Executive Council is made up of the governors of Maryland, Pennsylvania, and Virginia; the mayor of Washington, D.C.; the EPA Administrator; and the chair of the Chesapeake Bay

Commission. The Chesapeake Bay Program is a regional partnership leading and directing restoration of the Chesapeake Bay since 1983.

Table 8 compares the commercial landings of the target anadromous species within the lower Rappahannock River for the years 1973 and 1999 as reported by the Virginia Marine Resources Commission (VMRC)**.** Barriers to fish migration have not been solely responsible for the significant decline in the fishery resources over this period. As pointed out earlier, over-fishing, pollution, and the loss of historic spawning grounds have all contributed to the significant decline.

Table 8. COMMERCIAL LANDINGS OF ANADROMOUS FISH IN THE LOWER RAPPAHANNOCK RIVER (1973 and 1999)

Anadromous species		Commercial landings (lb.)	
Common name	Scientific name	1973	1999
Alewife	Alosa pseudoharengus	1,313,577	0
Blueback Herring	Alosa aestivalis	2,632 (1)	221
Hickory Shad	Alosa mediocris	25,527	81
American Shad	Alosa sapidissima	67,384	0
Striped Bass	Morone saxatilis	333,880	34,774

Source: Virginia Marine Resources Commission
(1) 1990 Commercial landings.

The expected future condition is the continual decline of the anadromous fish stock in the Rappahannock River and tributaries. Fish barriers will remain in place and continue to block the migration of anadromous fish upstream to historical spawning grounds.

Submerged Aquatic Vegetation. SAV communities are those in which the plant life present requires complete submersion all or most of the time. In areas where the vegetation is not completely submersed at all times, only the tops of plants are exposed at periods of low tides, or when weather conditions cause the temporary removal of water from the water body in which they occur. Seagrasses form highly productive communities in estuarine systems and serve as valuable habitats for various commercial and noncommercial animal species. SAV also serve to slow water currents, promote sedimentation, and reduce shoreline and near-shoreline erosion.

The predominant form of SAV in the more saline portions of tidal tributaries of the bay is eel grass (Zostera marina), which grows in dense patches on the benthos in the depth zone where light penetration is good (the phototrophic zone). SAV requires light for photosynthesis, and its growth, survival, and depth penetration is directly related to light availability.

Impacts from agriculture and development have degraded water quality in the watersheds and have probably contributed, at least in part, to the demise of SAV in the waters of the lower Rappahannock River and adjoining watersheds. Deteriorating water quality often results in the decline of SAV acreage. Suspended sediments block sunlight that the plants need to survive.

The lower Rappahannock River appears to be fairly dynamic in terms of SAV coverage, showing increases and decreases of SAV in the past. Since 1991, total distribution has decreased dramatically, from a high of 329 acres in 1993 to a low of 37 acres in 1997. In fact, the 1997 reported abundance for the lower Rappahannock River is only 1.5 percent of the Tier I goal of 2470 acres (VIMS, 1998). Table 9 details the abundance of SAV for recent reporting periods.

Table 9. SUBMERGED AQUATIC VEGETATION ABUNDANCE IN THE LOWER RAPPAHANNOCK RIVER

Year	Acres
1971	1,692
1981	0
1989	860
1993	329
1997	37

Source: Virginia Institute of Marine Science

Dragon Run. The following text is taken from a pamphlet from the Friends of Dragon Run.

"Dragon Run stretches for 35 miles from near Tappahannock to the Piankatank River just south of the Rappahannock River mouth on Chesapeake Bay. Dragon Run splits Virginia's Middle Peninsula. The Dragon wilderness is a unique ecosystem, which has been ranked, second in ecological significance among 232 areas investigated in a Smithsonian Institution study, which covered 12,600 square miles of Chesapeake Bay region. The unique character of the Dragon wilderness and its natural beauty exist primarily because it is remote. Except for the several highway bridges, which cross its 35 mile run to the Piankatank, most points are only reached by way of nearly a mile trek over rugged back country. The flora and fauna of the Dragon are diverse and numerous. The swamp is primarily composed of hardwoods, however, it is the majestic bald cypress trees, with trunks 8 to 9 feet in diameter that are most inspiring.

"Due to record development of the Middle Peninsula, wild areas are quickly disappearing and there is a need to protect, restore, and preserve these areas. The Friends of Dragon Run seek to promote preservation and protection of the watershed primarily through the example it gives the community in managing the 203 acre tract of Dragon swampland it purchased with assistance of the Chesapeake Bay Foundation and the Virginia Outdoors Foundation."

The Dragon Run is one of the few waterways left in the eastern United States that has not been seriously altered by human activities. A management plan has been developed through the work of a citizen advisory board, the Dragon Run Steering Committee, and volunteer water quality monitors. There is a need to preserve this area and to implement recommendations of the "Dragon Run Management Plan."

Wetlands Restoration. Wetlands provide many benefits, including food and habitat for fish and wildlife; flood protection; shoreline erosion control; natural products for human use; water quality improvement; and opportunities for recreation, education, and research**.**

USFWS estimates that Virginia lost 57,000 acres, or 14 percent of its 800,000 acres, of nontidal vegetated wetlands between 1956 and 1977. Agricultural drainage, mostly in the Coastal Plain (much lower Rappahannock River Basin), was the largest contributor to the conversion of nontidal wetlands over this period.

Historical annual losses for Virginia in the past have averaged about 3,000 acres per year. Inland forested wetlands have suffered the greatest losses of about 9 percent in the last 21 years, while inland vegetated wetlands of the Coastal Plain have experienced losses of about 14 percent in the same time period. Historically, wetland destruction on the Coastal Plain has accounted for 80 percent of the state's inland vegetated wetland losses.

The wetland status of the Chesapeake Bay watershed has been summarized by Tiner (1994). Virginia had the greatest palustrine vegetated wetland losses of any state in this study, losing approximately 23,000 acres: about 4,000 acres of emergent marsh, over 8,000 acres of scrub-shrub wetlands, and nearly 11,000 acres of forested wetlands during the study period. One of the major areas for wetland loss is identified as the Upper Coastal Plain of Virginia that incorporates the Lower Rappahannock River Valley ecosystem (USFWS, 1995).

In the rural areas in these watersheds, many wetlands were drained, and/or filled, and cleared for crop production, while in the urban areas, they have been cleared for housing, industrial facilities, other buildings, and sanitary landfills.

Beneficial Use of Dredged Material. Dredging to provide navigation access is a continual need within the Rappahannock River Basin. Sediments derived from upstream sources and the constant movement of bottom sediments within the river causes shoaling of river and creek navigation channels. Historically, dredged material has been placed in

wetlands, in overboard placement sites, and in upland areas. Many of these sites are no longer available or environmentally acceptable as dredged material placement areas. Without suitable placement areas for dredged material, navigation channels will shoal and will no longer provide access for commercial and recreational boat traffic.

In order to address the growing need to accommodate increasing volumes of dredged material, there is a need to examine productive and innovative uses for dredged material derived from navigation channels and waterways in the Rappahannock River and its tributaries.

Common Reed Infestation. Phragmites australis (common reed) is a large, coarse perennial grass commonly found in brackish and freshwater wetlands. Phragmites seeds profusely and spreads vegetatively by a vigorous system of rhizomes and stolons. Once established, the plant forms dense stands that may invade adjacent areas, thereby crowding out more desirable wetland species. Phragmites reduces natural plant diversity and it is not considered an important wildlife cover or food plant.

Reaching heights of 12 feet, Phragmites is one of the tallest plants in tidal wetlands. It can form dense stands mainly in the upper portions of marshes. But, by laying down runners and trapping sediments and debris in its stems, it can actually build up the soils around it and move into tidal zones.

A citizens group called the "Rappahannock Phragmites Action Committee" is attempting to map Phragmites distribution in the Rappahannock and use that information to determine if and where the plant is spreading. The group indicates that the plant has invaded marshes above Port Royal, 45 miles upstream. Mr. Doug Forsell, with the U.S. Fish and Wildlife Service, has documented the spread of Phragmites across Virginia and Maryland marshes. He traces Phragmites appearance along the Rappahannock to the dredging of Hoskins Creek in Tappahannock years ago. His map notations made during years of aerial waterfowl census work suggest the plant moved to new areas up and down the river from there (Richmond Times Dispatch, August 6, 2000).

Without any specific plan to control Phragmites, it will eventually take over much of the high marsh areas within the Rappahannock. In Maryland, where the plant has had a longer time to spread, it is estimated that of 177,000 acres of marshes, 8,500 are occupied by Phragmites (Richmond Times Dispatch, August 6, 2000).

Oyster Restoration. Years of habitat destruction, harvesting, pollution, and disease-induced mortalities have severely impacted oyster populations throughout the Chesapeake Bay and its tributaries, including the Rappahannock River. Oysters are pivotal organisms in the ecology of Chesapeake Bay both for the habitat they create and for their water filtering capacity. As such, oysters are important to both the economic and ecological health of the Chesapeake Bay. Not only have oysters historically been an important commercial resource, but also they play an important role in the bay's natural ability to cleanse itself, or its "resilience." Oysters feed by filtering organic matter out of the water. Although estimates vary, it has been reported that historic oyster populations

could filter the volume of the bay every four days. Currently, the oyster population takes over a year to filter the same volume. It is through this process that oysters help in filtering suspended particles out of the water, increasing light penetration. Clearer water enhances SAV growth as well as other important primary producers in the water column.

Decades of harvesting activity with the consequent loss of shell material have resulted in the virtual elimination of these oyster reef features, with adverse results on oyster population and water quality. The oyster resource has supported a substantial commercial fishery in the past. During the 1958-59 oyster harvest season, watermen harvested more than 4 million bushels of market-size oysters from the Bay's Virginia's waters. In the 1997-1998 harvest season, total landings were 14,295 bushels. Over the years, watermen, using rake-like tongs, depleted the reefs, leaving flat beds of oyster shells that often barely covered bay and river bottoms. Today, watermen say they cannot reach oysters in deep water with their 18-foot-long tongs. This has threatened a way of life for both oystermen and the bay itself.

The continuing decline of the bay's oyster population is a complex problem. Outbreaks of disease epidemics, commercial overharvesting, and environmental degradation have all played roles. The organisms responsible for oyster diseases were first encountered in the bay in the late 1950s; however, scientists have been unsuccessful in developing a mechanism for immunity or prevention. These organisms are the endoparasite Haplosporidium nelsoni, responsible for the disease MSX (multinucleated sphere X) and Perkinsus marinus, or Dermo. The loss of oyster populations due to these parasites has been most severe in regions with salinities over 12 parts per thousand (ppt). While MSX cannot survive in salinities below 10 ppt, Dermo is more tolerant of low salinities.

The progressive eutrophication of the bay as a result of point and nonpoint sources of pollution may have detrimentally affected the oysters' ability to fight these diseases.

Groundwater

Five specific areas of concern related to groundwater identified at the Stakeholder Meeting included septic systems, water supply, quantity and quality, and deep and shallow wells and contamination.

Groundwater is a very important resource that affects the economy and environmental quality of the study area. Groundwater is the sole source of fresh water for most uses including domestic, public supplies, agricultural irrigation, commercial, and manufacturing. Groundwater also discharges directly and indirectly to ponds, non-tidal and tidal creeks, estuaries, the Chesapeake Bay, and Atlantic Ocean and is, therefore, a major source of fresh water to these surface waters. Groundwater levels reflect the combined effects of natural seasonal changes in recharge to, and in discharge from, the aquifer system, as well as effects of groundwater pumpage from wells. Groundwater levels would remain above sea level throughout the aquifer system if it were not for the effects of pumping, which results in the decline of groundwater levels below sea level. The confined Yorktown-Eastover aquifers generally are the source of groundwater for

domestic, public-supplied, commercial, and manufacturing water use. The unconfined surficial aquifer is also the source of water for a large part of the domestic use, particularly for those residences that have old wells.

As groundwater is pumped from a well, it creates a draw down that extends radially from the pumped well and decreases with the distance from the well. This draw down can interfere with the ability of other well owners to withdraw water and result in the apparent failures of the surrounding wells. This can be a particular problem during the summer months when water levels in the aquifer decline naturally due to increased seasonal pumping demands.

Numerous management alternatives are available for protecting the quantity and quality of the groundwater. In some instances, one management practice will satisfy multiple management objectives, while in other instances, there may be conflicts between practices or conflicts with economic development or other goals. An overview of appropriate management measures is presented in the following paragraphs. These practices, which fall within the broad categories of monitoring and management, are presented as alternatives for consideration by local or state officials as they incorporate the desires and needs of the local community and the state into management plans.

A variety of management practices can be used to manage groundwater levels. These practices include the location of wells to minimize well interference, lowering of pump intakes to the top of the aquifer from which water is withdrawn in existing wells, installing submersible pumps to that depth in wells to reduce the likelihood of well failure, and reducing instantaneous pumping rate by storing water in tanks and ponds and water conservation.

Desired goals for groundwater quality will affect the management practices implemented and will vary with location because of the intended use of the groundwater. The primary means of managing groundwater is through the control of land use and the management practices associated with the land use.

Public Access

The lack of usable public access to navigable waterways was cited by several of the localities that participated in the 19 July 2000 stakeholder meeting. Local interests report that an increase in usable public access is desirable and worthy of investigation in the feasibility phase of study.

Navigation

As shown in Table 1, there are 30 existing authorized Federal navigation projects located in the 12-county study area. In addition to these Federally maintained projects, there are also a number of important waterways that are not Federally maintained. An inventory of the existing Federal navigation projects was made in order to determine their existing conditions and the need for any modifications. Several other waterways that are not currently Federally authorized navigation projects were also investigated to determine their potential for development. For these waterways, consideration was placed on those

areas of special interest to non-Federal sponsors and that have the greatest potential for further Federal involvement. The initial survey, based on meetings with local interests, field investigations, maps and aerial photographs, past reports, and general knowledge of the locality gained from this and previous studies, indicates a potential need for deepening Hoskins Creek in Essex County and Totuskey Creek in Richmond County. In addition, a number of local interests indicated a desire for the provision of long-term disposal options to ensure continued maintenance dredging.

Landfills

The Commonwealth of Virginia currently has 993 permits for active and inactive landfills on record. A total of 26 landfills have been identified in the ten county study area. Three of these landfills are currently active. Saint Laurent Paper Products Corp operates an industrial landfill in King William County. Browning Ferrous Industries (BFI) operates the King & Queen County Landfill. Waste Management operates the Middle Peninsula Landfill and Recycling Center in Gloucester County. Middle Peninsula and King & Queen are Subtitle D landfills utilizing liners, leachate collection systems, groundwater monitoring, and standard daily cover on all wastes. Saint Laurent Paper utilizes their landfill for byproducts of the paper making process and does not accept waste from outside sources. All three landfills are permitted and monitored by VDEQ and are subject to Virginia Code Section 10.1-1408.1.

Surface Water

The primary issue at the stakeholders meeting related to surface water involves environmental regulations associated with construction of small ponds and dams by private property owners for irrigation. In the past, landowners were encouraged to construct impoundments and given free technical advice and cost share to install these impoundments. Currently, mitigation requirements make these small impoundments financially prohibitive.

Pollution and Storm Water Management

The primary issues identified during the stakeholder meetings was the identification of the locations of point and, to the extent possible, non-point source pollution. A key factor in the identification is the management of storm water run-off, which, in turn, effects water quality.

Shoreline Stabilization

The most significant cause of shoreline erosion in the study area is the combined action of wind and waves on the shoreline. Shorelines are areas of unending conflict between the natural forces of wind, water, and the land. Along the Virginia coastline the most damaging storms are the “nor'easters” and occasional hurricanes, which in addition to generating intense wave action, generally produce a one to three foot storm surge.

Several public access areas were identified at the stakeholder meeting are in need of shoreline stabilization. These include Belle Island State Park, Westmoreland State Park, Gloucester Point Public Beach, Festival Beach, Powhatan Burial Ground, and George Washington Birthplace National Monument.

Flood Damage Prevention

Developed low-lying areas within the basin are susceptible to flood damages resulting from high tidal conditions and significant rainfall events associated with coastal and other severe storms. The most severe storms to which the study area is subjected are hurricanes that originate principally during the months of August, September, and October. A hurricane is characterized by an intense cyclone, low barometric pressure, winds over 74 miles per hour, heavy rainfall, and tidal surges. The most severe hurricane affecting the study area occurred in August 1933. In addition to hurricanes, there are storms called "nor'easters" that also affect the study area. Nor'easters are characterized by onshore winds, predominantly from the northeast, and occur periodically throughout the fall, winter, and spring months along the Atlantic Coast. Winds accompanying these storms are often persistent enough to raise the elevation of nearshore waters for extended periods of time. The most severe nor'easter to affect the study area occurred in March 1962.

Based on field surveys, aerial photographs, flood plain information reports, flood insurance rate maps, and discussions with local interests, the areas most susceptible to damages to property from flooding are the populated tidal areas located along the coastal areas primarily in Gloucester and Mathews Counties.

ALTERNATIVE PLANS & PRELIMINARY EVALUATION OF ALTERNATIVES

Ecosystem Restoration

Riparian/Forest Buffers. Restoration of riparian zones along selected upper basin areas will be enormously beneficial to reducing nonpoint pollution into headwaters and streams that can disrupt or reverse downstream recovery efforts within the Rappahannock River and the Chesapeake Bay. One of the largest contributors to the decline in water quality and fisheries habitat in the lower Rappahannock River system is non-point pollution. Excessive siltation, nutrient loading, herbicide/pesticide runoff from intensive land development, and poor agricultural practices are the primary culprits. Restoration of riparian buffers would serve to reduce or eliminate these effects.

The next phase of study would inventory the remaining riparian buffers and areas where buffers have historically occurred to prioritize areas for riparian buffer restoration. In cooperation with the non-Federal sponsor, specific riparian buffer restoration projects will be developed.

Fish Migration Barriers. Over 50 barriers to fish passage have been identified in the lower Rappahannock River basin. Establishing safe and effective fish passage at these barriers is of paramount importance in restoring the anadromous fishery within the Rappahannock River and, hence, the Chesapeake Bay. The feasibility study effort would closely examine existing barriers to determine the feasibility of providing fish passage at these locations. Preliminary designs for fish passage would be developed and evaluated from engineering, economic, and environmental perspectives.

Submerged Aquatic Vegetation. In cooperation with the non-Federal sponsor, projects that would contribute to the restoration of SAV will be developed. These may include actual planting of SAV's or other restorative measures that would stimulate the natural resurgence of SAV populations in the lower Rappahannock.

Dragon Run. The Dragon Run Management Plan outlines ways to improve management of the Dragon Run basin through education of landowners and visitors; cooperation with state agencies in voluntary practices and enforcement of regulations; and new local initiatives to provide quality in design and function to new development in the area.

In concert with the Management Plan, specific measures to improve and maintain the Dragon Run as an unspoiled natural and diverse ecosystem would be identified and evaluated during the next phase of study. Methods of protecting this area from development and pollution would be developed. As a supplement to the management plan, specific projects that address opportunities to protect, preserve, restore, and enhance wildlife habitat and associated species populations in the Dragon Run basin would be developed during the feasibility phase.

Wetlands. Virginia, and more specifically the Rappahannock River, has lost a substantial portion of its wetlands primarily due to filling and draining activities. Wetlands perform a variety of beneficial functions including moderation of storm flows, absorption of nutrients, retention of eroded sediment, and function as wildlife habitat.

Restoration of prior wetlands would restore the above listed beneficial uses. This would be helpful in buffering streams, rivers, and the Chesapeake Bay from continued sedimentation and nutrient pollution. This is especially important given the relatively high rate of development that is occurring in the Rappahannock River Basin.

Division of the study area into sub-basins may facilitate selection of high priority areas for restoration. Restoration should initially emphasize those sub-basins that contain relatively high proportions of degraded wetland habitat. By focusing efforts in these areas, the potential for benefits to be realized by many species is maximized.

Soil composition and structure is one of the primary features of non-tidal wetlands. In these areas, success of wetland restoration efforts depends on identification of areas that are likely to contain soils that would support growth of wetland vegetation. Degraded wetlands, especially those drained for agriculture, will typically be mapped as hydric soil units, although National Wetlands Inventory maps will not indicate the presence of wetlands. Conducting this type of analysis on a basin scale would provide an excellent basis for decision making regarding wetland restoration priorities.

During the next phase of study, wetland restoration sites throughout the basin will be identified in cooperation with the non-Federal sponsors. Field studies will be accomplished to evaluate the suitability of sites for restoration. Various sizes and configurations of constructed wetlands will be developed at various sites, as appropriate

and supported by the sponsors.

Beneficial Uses of Dredged Material. Interest in dredged material as a manageable, beneficial resource and as an alternative to conventional placement practices is increasing.

Dredged material is available from Federally authorized navigation projects in the Lower Rappahannock River basin (listed in Table 1). These projects may offer opportunities for the beneficial use of dredged material. These dredging projects would be thoroughly evaluated to closely examine the potential for the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging for construction, operation, or maintenance of these navigation projects.

The following specific beneficial use alternatives would be evaluated during the next phase of study in cooperation with the non-Federal sponsor.

Oyster Reefs. As discussed previously, much work is being done in an attempt to replenish oyster stocks in Virginia. Scientists are now proposing the rebuilding of oyster beds or reefs, providing a more suitable habitat for the establishment and settling of oyster spat. The use of dredged material to recreate oyster reefs may have some merits in this respect.

There are several methods available to attempt to restore oyster habitat using dredged material. One is to create new oyster bars in areas that are known to have viable oyster stocks (i.e., are parasite-free). The other is to create oyster bars that are intertidal rather than subtidal. Placing newly set oysters intertidally may not only serve to minimize the effects of predation and competition, but may also serve to increase the oyster's resistance to disease through exposure to air. Both methods employ dredged material to build up the bottom elevations upon which reefs can be developed. Constructing reefs higher in the water column places them off the bottom. On the bottom, much of the oyster's energy is used to filter potentially smothering dirt and silt and contaminants tend to settle on the bottom.

The Virginia Marine Resources Commission (VMRC) has endorsed a plan to construct oyster shell reefs with higher elevations in the James, Piankatank, Rappahannock, and Wicomico Rivers as well as along the Eastern Shore oceanfront using disease-free cultch material. The reefs will be monitored and will be kept clean and, hopefully, parasite and disease free.

As depicted in Table 10, the benefits of restoration and creation of oyster reefs include water quality improvement, habitat diversity for benthic organisms and nektonic fishes, and the reestablishment of a valuable commercial and natural resource.

Table 10. BENEFITS OF REEFS

RESOURCE	BENEFIT
Oysters	Restoration of historical conditions. Sanctuaries provide opportunity for older, larger, disease resistant oysters to spawn. Harvest areas provide suitable substrate for larval attachment (spatset) that have previously been suboptimal.
Finfish/ Shellfish	Increased reef dwelling organisms and spatset provide increased food source for finfish and shellfish. Species richness increases at oyster restoration sites (Harding and Mann, 1999).
Water Quality	Enhanced water quality provides improved habitat for submerged aquatic vegetation.

Island Building. Re-creation of islands, replacing those lost to erosion or sea level rise, or creating new islands may provide additional spatial heterogeneity for benthic organisms, finfish, and birds (especially colonial nesters, waterfowl, and shorebirds), some of which are endangered or threatened due to anthropogenic and natural habitat depletion.

Wetland Creation/Restoration. Dredged material has been used extensively to restore and establish wetlands. Dredged material can be used to stabilize eroding natural wetland shorelines or nourish subsiding wetlands. Dewatered dredged material can be used to construct erosion barriers and other structures. Some types of restoration are more feasible than others.

By far the most difficult aspect of the application of marsh development is the location of suitable sites. Low energy, shallow water sites are most attractive; however, cost factors become significant if long transport distances are necessary to reach low-energy sites. Temporary or low cost protective structures (i.e., geotextile containers) may be required if low energy sites cannot be located and have been used successfully at several Chesapeake Bay sites where moderate wave energy occurs.

Smooth cordgrass (Spartina alterniflora), because of its large areal extent, has been considered the major marsh species on the East Coast of the United States, but other species such as black needlerush, saltgrass, salt-meadow cordgrass, big cordgrass, saltmarsh bulrush and others also establish easily and are highly productive.

In some cases, Phragmites has spread from dredged material placement sites to adjacent wetlands choking out native plants. Removal of the Phragmites would provide higher-quality food sources and brood-rearing habitats in the fresh water marshes.

Restoration of marshes that have been degraded or altered by dredged material placement in the Rappahannock River would benefit a variety of fish and wildlife. Restoration of native plant communities on dredged material placement sites could be coordinated with nearby tidal marsh restoration efforts. Some of the placement sites may contain suitable sediments appropriate for tidal marsh restoration. Although labor and handling costs could be high, these sites potentially could provide substantial amounts of high quality sediment for marsh restoration projects.

Marshes that have been impacted by erosion could be restored/protected through beneficial use of dredged material obtained from navigation projects, or material could be used to create barriers to prevent further marsh erosion. Potential marsh protection/restoration/creation sites in the Rappahannock are primarily those areas near the mouths of the basin where wind and wave action along exposed areas has caused erosion of shoreline and wetland habitats.

New and maintenance dredging projects would be identified for candidate locations where dredged material could potentially be used for wetland creation/restoration.

Shoreline Protection. There are three basic responses to an erosion problem: no action, relocation of endangered structures, and corrective measures at the site. The latter includes devices that directly armor the shore, those that intercept and dissipate wave energy and those that prevent the failure of bluffs. Corrective measures include various structural and nonstructural alternatives for controlling shoreline erosion. Several of these measures are commonly used in the Chesapeake Bay region. These include bulkheads and seawalls, revetments, groins, breakwaters, beachfills, vegetation, etc.

In recent years, design and construction of geotextile containers (GeoTube™ and GeoContainer™) filled with dredged material has gained popularity. GeoTube and GeoContainer systems are durable fabric containers, generally tubular in shape, with the ends taking on the shape of a pillow when filled with dredged material.

Beach nourishment/shoreline protection projects often incorporate groins, breakwaters, or sill structures as effective tools for trapping littoral drifting sediments, which stabilize the shoreline. Because of their flexibility, structural integrity, and relatively large mass, dredged material filled fabric tubes are suitable for use as groins, breakwaters, or sills. They can also be used as containment dikes for reclamation of land or creation of artificial islands in the coastal environment and in estuaries (Waterways Experiment Station 1995).

Geo Tubes (or geotextile containers) are more economical than most traditional erosion protection measures. For example, in medium wave energy environments, stone

revetment or timber bulkheads (per linear foot) would cost as much as four to five times that of a GeoTube filled, in place, with dredged material.

Candidate sites would be identified during the feasibility phase and would be evaluated to determine whether the use of geotextile containers and dredged material would be feasible to provide shoreline protection. Also, as discussed previously, wetland creation/restoration is also a feasible component of shoreline protection.

Common Reed Infestation. Phragmites can be controlled and eradicated through application of herbicides and some controlled burning. The F&WS is funding the "Rappahannock Phragmites Action Committee" with $5,000 this year to buy herbicides to fight Phragmites on the Rappahannock. This effort alone is not enough to stop the spread of this invasive plant. In cooperation with the F&WS and the local sponsors, Phragmites areas in the Rappahannock will be mapped. Once mapping is completed, sites will be prioritized for eradication/restoration.

Oyster Restoration. Recent restoration efforts by the VMRC have shown much promise, but the scale of the efforts is limited by available funding and is not enough to reverse historical population decline. Current restoration techniques focus on the recreation of oyster reef structures and restoration of degraded, barren mudbottoms to a substrate more suitable for larval settlement. Construction of three-dimensional (3-D) reefs involves purchasing, hauling, and deploying shell to create mounds rising off the river bottom. Increased reef height allows for optimized spawning success as the broodstock oysters are located higher in the water column. Similarly, harvest areas are created by the placement of shell 10 inches high within historical reef footprints in proximity to the 3-D reefs. These low profile, or 2-D, harvest areas are large areas of reconditioned river bottom that provide successful settling substrate for the set derived from spawning oysters on nearby sanctuary reefs.

Under the auspices of the Virginia Oyster Heritage Program, a multi-agency effort formed by VMRC and VDEQ in August 1999, a series of strategically-located sanctuary and harvest areas are planned statewide in an effort to restore historical oyster populations. Phase one of the Virginia Oyster Heritage Program's restoration efforts involves the construction of 8 sanctuary reefs and approximately 200 acres of 2-D harvest areas.

The proposed feasibility effort would develop a comprehensive plan in cooperation with the Oyster Heritage Program, VMRC, and VDEQ to identify additional high priority sites for restoration in the Lower Rappahannock river to be compatible with the ongoing program. Specific oyster restoration projects would be designed and proposed for construction.

Groundwater

It is apparent that a number of stakeholders are interested in both the quality and quantity of reliable groundwater sources. For this reason, it is felt that groundwater investigations could be accomplished in a feasibility level investigation. Single purpose

study initiatives for groundwater or water supply are not traditionally in the Federal interest. Further investigations regarding these identified problems and needs would only be considered if addressed as part of a comprehensive basin evaluation.

Public Access

Following completion of the 19 July 2000 stakeholder meeting, contact was made with each of the 12 county managers in order to determine the interest in additional study of public access to the Rappahannock River and its tributaries. Sufficient interest was expressed in including public access in a feasibility level investigation.

Navigation

An initial inventory of the waterways shown in Table 1 was accomplished to identify specific problems, needs, and opportunities. For each waterway, detailed information was compiled including a description of the waterway and its location, dredging history, current use, adjacent facilities, last investigation, and a local contact knowledgeable with the current condition and use of the waterway. The identification of a local contact associated with each waterway proved to be a valuable resource in evaluating problems, needs, and opportunities.

Due to limitations on time and resources available for this investigation, it was not practical to conduct detailed surveys of each of the waterways. The preliminary initial survey screened all waterways to determine the potential need for any improvements and/or modifications. For the majority of the Federal projects, the inventory determined that current operations are satisfactory, and the projects are serving their intended purposes. However, two Federal projects, Totuskey Creek in Richmond County and Hoskins Creek in Essex County, displayed potential problems, needs, and opportunities that warrant investigations in greater detail than provided by the initial inventory. Site specific studies for these two waterways further defined their problems that are described in the following paragraphs.

Totuskey Creek. The existing Federal navigation project was authorized by the River and Harbor Act of 14 June 1880 and modified by the River and Harbor Acts of 30 August 1935 and 2 March 1945 to provide a channel 10 feet deep from the Rappahannock River to the Totuskey bridge, 150 feet wide at the entrance and 100 feet wide within the creek, with a turning basin 450 feet long and 275 feet wide at the Totuskey bridge and a timber dike at Booker Bar. Maintenance dredging was last performed in 1969. Local interests report that a deeper channel is desired to accommodate the needs of a shipping terminal under consideration in Essex County.

Hoskins Creek. The existing Federal navigation project was authorized by the River and Harbor Act of 26 August 1937 and modified by the River and Harbor Act of 2 March 1945 to provide a channel 10 feet deep from the Rappahannock River to the U.S. highway bridge on Route 17 at a width of 100 feet wide in the entrance channel, 80 feet within the creek and a turning basin 250 feet long and 200 feet wide at the public wharf. Maintenance dredging was last performed in 1996. Local interests report that a deeper

channel is desired to accommodate the needs of a shipping terminal under consideration in Essex County.

Landfills

It is apparent that a number of stakeholders are interested in the preservation of water quality and as such desire that feasibility level studies include landfills as an item when reviewing groundwater and surface water quality.

Surface Water

It is apparent that a number of stakeholders are interested in both the quality and quantity of surface water sources. For this reason, it is felt that surface water investigations could be accomplished in a feasibility level investigation. Single purpose study initiatives for surface water or water supply are not traditionally in the Federal interest. Further investigations regarding these identified problems and needs would only be considered if addressed as part of a comprehensive basin evaluation.

Pollution and Storm Water Management

A data query of VDEQ's permits resulted in a listing of 27 landfills with only three active sites. The active sites are as follows: the Saint Laurent Paper Products Corp. in West Point, the King and Queen Sanitary Landfill in Little Plymouth, and the Middle Peninsula Landfill and Recycling Center in Gloucester. The impact of these sties would be evaluated during the feasibility study to determine if they are contributing to groundwater deterioration.

Shoreline Stabilization

Several public access areas were identified at the stakeholder meeting are in need of shoreline stabilization. The specific needs of each are identified below.

Belle Isle State Park is located on the southeastern tip Belle Isle in Lancaster County. Known as the "watch tower," this area is undergoing severe erosion and contributing sediment and nutrient loads to the Rappahannock River. Large loblolly pines are being eroded at a rate of 2.5 feet per year from the area that has a bald eagle nest active during past breeding seasons.

Westmoreland State Park located in Westmoreland County on the Potomac River has a historical erosion rate of 3.5 feet per year. The shoreline is oriented east-west with significant fetch exposure from the northwest down the Potomac River. Steep bluffs provide sediment and nutrient loads to the river.

Gloucester Point Public Beach is located at the southern end of Gloucester County on the York River. The shoreline is approximately 950 feet long and the longitudinal axis is oriented southeast. The historical erosion rate is approximately 1 foot per year.

Festival Beach is located on the Chesapeake Bay in Mathews County at the end of Route 643 near Diggs, VA. The beach is approximately 500 feet long bounded at a spit

to the north and backed by embayed wetlands. This area has experienced a historical erosion rate of 4.6 feet per year.

Powhatan Burial Ground is located in King William County on the Pamunkey River. The shoreline area is characterized as a moderately-low shore with a marsh fringe. The predominate erosional force is from recreational boat traffic along the Pamunkey River. Severe erosion threatens both infrastructure and cultural resources.

George Washington Birthplace National Monument is located on National Park Service property in Westmoreland County on 550 acres along the Potomac River. The shoreline is oriented southeast to northwest with an average fetch of 9 nautical miles. Erosion rates of 3.5 feet per year threaten cultural resources.

Flood Damage Prevention

While no specific sites were identified by the stakeholders during the reconnaissance study, opportunities for flood damage prevention could be examined if an expressed need is identified. The opportunities for flood damage prevention will be further assessed during discussions with the potential local sponsors.

Comprehensive Regional Basin Study

Given the number and complexity of the problems, needs, and opportunities identified during the conduct of the reconnaissance study, a comprehensive regional basin study consisting of short, intermediate and longer term solutions would address the concerns expressed by the stakeholders. A Geographic Information System (GIS) based system would facilitate decision making during development of such a feasibility study. Table 12 lays out the contents of a comprehensive regional basin study as well as short and intermediate term options for addressing identified problems and needs.

FEDERAL INTEREST

The Planning Guidance notebook (ER 1105-2-100) identifies a federal interest in comprehensive watershed studies. Such a study for the Rappahannock River basin would be in the Federal interest. Areas of opportunities to be examined include ecosystem restoration, navigation, flood damage reduction, ground water, surface water, public access, landfills, pollution and storm water management, shoreline stabilization, and integrated geographic information system. Of these areas, ecosystem restoration, navigation, and flood damage prevention are high priority mission areas. Ground water is also of major importance to the stakeholders. Since ground water does not follow river basin boundaries, the scope of the comprehensive study will include counties that are located outside of the river basin area as well as the counties within the basin. With the exception of ground water, areas of opportunities for counties or portions of counties located outside of the river basin area will be examined on an individual basis.

PRELIMINARY FINANCIAL ANALYSIS

The reconnaissance study included a facilitated meeting with basin stakeholders on 19 July 2000 as well as follow-up meetings with various stakeholder groups to

determine the problems and needs of the basin. Input from all stakeholder coordination has been incorporated into this report. An executive overview of the reconnaissance study process was provided to the stakeholders and as well as to a joint meeting of the Northern Neck and Middle Peninsula executive directors on 8 September 2000. County administrators and executive directors of the planning district commissions participated in the work session. They were favorably impressed with the concept of a comprehensive basin study and requested that the project delivery team schedule individual briefings for them as soon as can be scheduled. Several letters of interest from the counties stating their desire to proceed into the feasibility phase have been received and are attached. It is expected that the District will finalize negotiations leading to receipt of letters of intent by Jan 01. Also, on 31 October 2000, the Secretary of Natural Resources for the Commonwealth of Virginia will be briefed by the District team with a view of receiving a letter of interest by Nov 2000. Findings and conclusions of the Section 905(b) analysis and opportunities for local sponsorship will be discussed during the briefing. Following local sponsor review of the Section 905(b) analysis, letters of intent will be received and the PMP will be finalized. The fiscal planning calendars for the Commonwealth and her counties run from January through June 2001 with their fiscal year starting 1 July 2001. It is noted that sponsorship of the feasibility study is currently an un-funded initiative for each county and the Commonwealth of Virginia.

SUMMARY OF FEASIBILITY STUDY ASSUMPTIONS

Assumptions Pertaining to a Comprehensive Basin Management Feasibility Study

1. The document will address all water resources problems and opportunities for all geographic areas of the 12-counties as well as those portions of Caroline County and King George county that drain into the Rappahannock River.

2. The document will address the project as a management tool for local decision makers that could also identify under the authorities (CAP, Design/Construct, SFO) for construction.

3. The schedule assumes that local sponsors will sign an FCSA no earlier than July 2001, corresponding to the start of their fiscal new year.

4. Due to comprehensive nature of the study, additional recon/feasibility studies may be appropriate and recommended in the future to fully address all potential projects that may be identified during the feasibility study.

5. The potential for up to 13 local cost sharing sponsors (including the Commonwealth of Virginia, PDC 17 and PDC 18) will require special coordination and negotiation strategies.

6. Standard criteria for traditional civil works projects will be fully employed in accordance with Planning Guidance, dated 22 April 2000 (ER1105-2-100,

Exhibit G-1).

FEASIBILITY PHASE MILESTONES

Table 11 lists the preliminary milestones for the feasibility phase.

Table 11. FEASIBILITY PHASE MILESTONES

Milestone	Description of Milestone	Date
P5	Execute Feasibility Cost Sharing Agreement	Jul 01
	Initiation of Feasibility Study	Aug 01
P6	Initial Feasibility Coordination Meeting	Oct 01
	Division Receives Formulation Package	Apr 03
P7	Formulation Meeting	May 03
P8	Division Receives Draft Feasibility Report/EIS, Feasibility Review Conference (FRC)	Nov 03
P9	Division & HQ Receive Final Feasibility Report/EIS	May 04
P10	Completion of Feasibility Report/Division Engineer's Public Notice	Jul 04

FEASIBILITY PHASE COST ESTIMATE

Feasibility phase cost estimate will be included in the Project Management Plan once local sponsor review of the Section 905(b) Analysis Report is completed and letters of intent have been received.

RECOMMENDATIONS

Based on the information and existing data collected, input received from the stakeholders, and the professional experience and judgment of the project team and technical reviewers, it is recommended, pending completion of non-federal sponsorship coordination, that a comprehensive watershed management study be undertaken for the counties located within the Lower Rappahannock River Basin; to include the 12-county area for groundwater specifically. All other needs and opportunities might be addressed on a "one each basis" with each individual county and will be coordinated with the Baltimore District as appropriate based on potential project sites (i.e., for areas that directly drain into the Lower Potomac River basin). Table 12 lays out the basis for a Federal interest in short, intermediate and longer term plans.

Table 12. Federal Interests in Solutions to Identified Problems and Opportunities (1)

Authorities & Programs Available	Short-Term Opportunities for Individual Counties (1 Year or Less)	Intermediate-Term Opportunities for Individual Counties (>1<3 Years)	Comprehensive Opportunities (3-6 Years)
General Investigations/Congressional			
Congressionally Authorized Comprehensive Basin Management Study (House Document 119, 80th Congress, 1st Session)			Ecosystem Restoration Groundwater Surface Water Navigation Public Access Landfills Pollution & Storm Water Management Shoreline Stabilization Flood Damage Prevention Integrated Geographic Information Syste
Section 217 (WRDA 1996, as amended) and other related long-term disposal authorities		Addition of Disposal Capacity at existing DMDA's	
Continuing Authorities			
Section 22 (Water Resources Development Act of 1974, as amended)	Public Access Studies (Lancaster, Mathews) (Richmond, Westmoreland, Middlesex) Public Education/Awareness Campaigns (Early Detection/Warning) (Native American Tribes) (Working Watermen) Water Quality Studies Identification of Water Hazards (Mosquito Point, Christ Church) Consumptive Use Studies Conduct a GIS Needs Assessment and Develop a Phased Implementation Plan to Address Watershed Issues	Solid Waste/Landfill Initiatives Delineation of Ground Water (Both Planning District Commissions) Implement an Integrated GIS in Accordance with the Phased Implementation Plan and Update as Required	
Section 14 (Flood Control Act of 1946, as amended)		Protection of Threatened Public Facilities/ Archaeological and/or Burial Sites	
Section 107 (River and Harbor Act of 1960, as amended)	Hoskins Creek, Essex County (Maintenance Dredging) Totuskey Creek, Richmond County (Maintenance Dredging)	Hoskins Creek, Essex County (New Work Deepening) Totuskey Creek, Richmond County (New Work Deepening)	
Section 204 (Water Resources Development Act of 1992)		Ecosystem Restoration in Combination With Maintenance/New Work Dredging of Federal Navigation Channels	
Section 206 (Water Resources Development Act of 1996)		Aquatic Ecosystem Restoration	
Section 1135 (Water Resources Development Act of 1986, as amended)		Modification of Corps Structures to Improve the Environment (Phragmites Eradication Sites)	
Design & Construct			
Section 505 Public Law 104-303		Conservation of Fish & Wildlife (Fish & Wildlife Habitat Sites)	
Section 510 Public Law 104-303		Environmental Infrastructure and Resource Protection (State Park Shorelines) (Oyster Reefs)	
Support for Others		Erosion Control Along Federally Owned Shorelines	

(1) Where applicable, from planning through construction

POTENTIAL ISSUES EFFECTING INITIATION OF FEASIBILILTY PHASE

The major issue effecting initiation of feasibility phase investigations is the identification of the level of interest and support of a non-Federal sponsor(s). The technical review process has followed this issue beginning with the discussions that occurred at the 19 July 2000 stakeholder meeting. The plan to address this issue, as documented in the District's ongoing technical review process, is to present the alternative approaches to the potential local sponsors for their decision making bodies to consider. Letters of intent resulting from this process will be provided based on discussions included in the District's certification of independent technical review.

VIEWS OF OTHER RESOURCE AGENCIES

Briefings for the Secretary of Natural Resources of the Commonwealth of Virginia, the administrators and board of supervisors of each of the 12 counties, and the executive staff of the 2 planning district commissions are planned for September and October 2000. The views of other resource agencies will be known at that time.

PROJECT AREA MAPS

Plates 1 and 2 display the study area by county and by river basin, respectively.

ALLAN B. CARROLL
Colonel, Corps of Engineers
District Engineer

Attachments:

- Plate 1 – Study Area Vicinity Map
- Plate 2 – Basins in the Vicinity of the Lower Rappahannock River
- Statement of Technical Review
- Certification of Independent Technical Review for Lower Rappahannock River Basin Section 905(b) Analysis Report
- Letters of Interest (9)

STUDY AREA VICINITY MAP

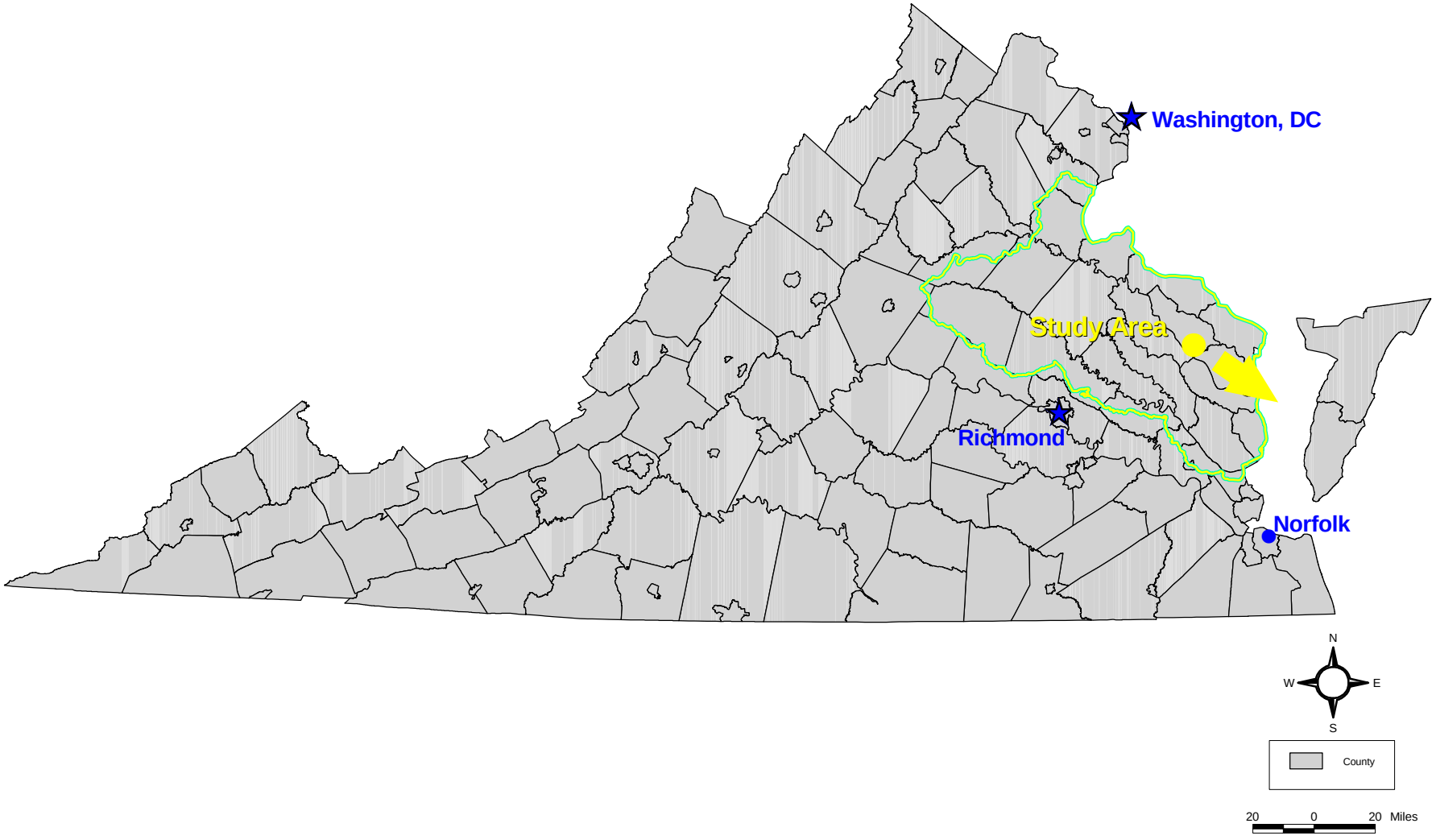


Plate 1

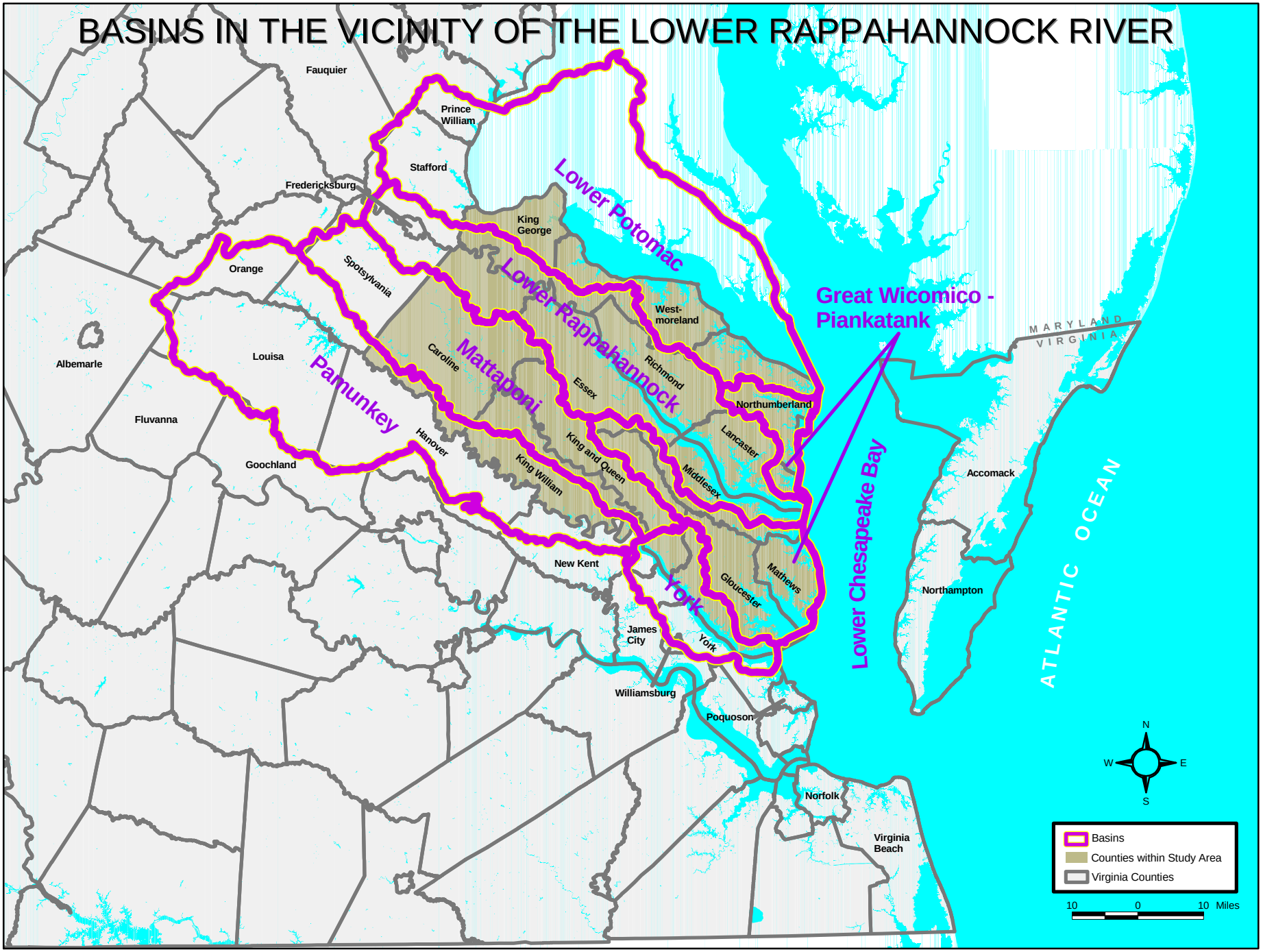

BASINS IN THE VICINITY OF THE LOWER RAPPAHANNOCK RIVER
Fauquier
Prince William
Stafford
Fredericksburg
King George
Lower Potomac
Orange
Spotsylvania
Lower Rappahannock
Great Wicomico - Piankatank
West-moreland
MARYLAND
VIRGINIA
Albemarle
Louisa
Caroline
Mattaponi
Pamunkey
Richmond
Essex
Northumberland
Fluvanna
Hanover
Lancaster
King and Queen
Goochland
King William
Middlesex
Accomack
Lower Chesapeake Bay
ATLANTIC OCEAN
New Kent
York
Gloucester
Mathews
Northampton
James City
York
Williamsburg
Poquoson
Norfolk
Virginia Beach
N
W
E
S
Basins
Counties within Study Area
Virginia Counties
10
0
10 Miles

Plate 2

STATEMENT OF TECHNICAL REVIEW

The Norfolk District has completed the General Investigation Reconnaissance Study of the Lower Rappahannock River Basin. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project, as defined in the Quality Control Plan. During the independent technical review, compliance with established policy, principles, and procedures, utilizing justified and valid assumptions was verified. This included review of assumptions, methods, procedures, material used in analysis, alternatives evaluated, the appropriateness of data used and level of data obtained, and reasonableness of the results, including whether the product meets the customers' needs consistent with law and existing Corps policy. An independent district team accomplished independent technical review.

Ronald V — 9/25/00
Ron Vann
Technical Review Team Leader

Doug Martin — 9/21/00
Doug Martin
Project Manager

9/22/00
Jeff Irving
Technical Reviewer

Mark T. Mansfield — 9/21/00
Mark Mansfield
Technical Team Leader

Tom Yancey — 9/22/00
Tom Yancey
Senior QC Reviewer

Helen Neluska for — 9/25/00
Craig Seltzer
Technical Team Member

Michele Cleland — Sep 25, 2000
Michele Cleland
Technical Reviewer

Helene Haluska — Sept. 25, 2000
Helene Haluska
Technical Team Member

Larry E Holland — 26 SEP 2000
Larry Holland
Technical Reviewer

Mark Hudgins — Sept 26, 2000
Mark Hudgins
Technical Team Member

Gary Szymanski for GZ — Sept 25, 2000
Gary Szymanski
Technical Reviewer

Gordon Chancey — Sept 25, 2000
Gordon Chancey
Technical Team Member

Eugene R Batty — 26 Sept '00
Gene Batty
Technical Reviewer

Richard Klein — 25 Sep 2000
Richard Klein
Technical Team Member

Allan Ellinwood — 25 Sept. 00
Allan Ellinwood
Technical Reviewer

Michael Hall — 25 September 2000

Mike Hall
Technical Team Member

M. D. Gutterman — 26 Sept 2000

Marc Gutterman
Technical Reviewer

R. Reali — Sept 25, 2000

Rob Reali
Technical Team Member

Robert T. Turner — Sept 26 2000

Robert Turner
Technical Reviewer

David Parson — Sept 26, 2000

David Parson
Technical Team Member

CERTIFICATION OF INDEPENDENT TECHNICAL REVIEW
FOR
LOWER RAPPAHANNOCK RIVER BASIN
SECTION 905(b) ANALYSIS REPORT

Significant concerns and the explanation of the resolution are as follows:

Major Technical Concern: The study area at the start of the reconnaissance study was identified as the 10-county area comprising the Northern Neck and Middle Peninsula Planning District Commissions (Essex, Gloucester, King and Queen, King William, Lancaster, Mathews, Middlesex, Northumberland, Richmond, and Westmoreland). These counties lie within the Rappahannock, Potomac, York, and Small Coastal River Basins. For this reason, there is concern as to whether a comprehensive basin (watershed) study can and should include portions of other river basins. In addition, two other counties, Caroline and King George, also drain into the Lower Rappahannock River Basin. Consideration should also be given to these two counties and their impact to the river basin watershed. During a 19 July 2000 public stakeholders meeting, the participants emphasized groundwater as a major priority to be examined in a comprehensive watershed study. Since groundwater does not follow watershed boundaries, concern was expressed as to how groundwater would affect the determination of the study boundaries. During an 8 Sept 2000 joint executive meeting of the Northern Neck and Middle Peninsula Planning District Commissions, the county administrators of the 10-county region reaffirmed their desires that a comprehensive watershed study be accomplished for the entire 10-county geographical area.

Possible Impact: Definition of the study area will impact the name of the reconnaissance and feasibility studies, scope and cost of the feasibility study, and the list of potential non-federal sponsors.

Resolution: Documentation relative to this issue was forwarded to NAD for review. Phone conversations between NAD and Norfolk District have also been conducted. NAD will support an expanded study area outside of the Lower Rappahannock River Basin that will include a potential 12-county area (10-county area listed above plus King George and Caroline). Further discussions with the project delivery team and the technical reviewers have refined the study area to include a comprehensive watershed study consisting of ecosystem restoration, public access, navigation, landfills, surface water, pollution and storm water management, shoreline stabilization, and flood damage reduction for the counties located within the Lower Rappahannock River Basin. It will also include the entire 12-county area for groundwater only. All other needs and opportunities will be addressed on a "one each" basis with individual counties. For example, the need for a small navigation project in the portion of the 12-county area draining into the Potomac River Basin would be recommended to be accomplished under Section 107 of the Continuing Authorities Program and referred to the Baltimore District.

Major Technical Concern: During a 19 July 2000 public stakeholders meeting, the participants expressed their concern that the name of the study, Lower Rappahannock River Basin Reconnaissance Study, did not accurately describe the study area. At that time, the study area was defined as a 10-county area represented by the Northern Neck and Middle Peninsula Planning District Commissions. The participants requested that the name of the study be changed to Northern Neck / Middle Peninsula Reconnaissance Study.

Possible Impact: The name of the study should accurately reflect the study area. For budgeting and project management purposes, higher headquarters is tracking this project as Lower Rappahannock River Basin Reconnaissance Study. Confusion could result if the reconnaissance is known by two different names. Based on the above discussion and resolution addressing the study area, two additional counties have been added to the study area that are not located within the Northern Neck and Middle Peninsula Planning Districts. "Northern Neck / Middle Peninsula" does not accurately describe the study area.

Resolution: The name of this reconnaissance study will remain "Lower Rappahannock River Basin Reconnaissance Study". This title accurately describes the study area and will provide consistency for budgeting and project management tracking purposes. This position will be coordinated with the local sponsors.

Major Technical Concern: This reconnaissance study had a late start (July 2000). Norfolk District made a commitment to NAD to forward the Section 905(b) Report by the end of FY 2000. Due to the large study area and the potential for 13 non-Federal sponsors (12 counties and the Commonwealth of Virginia), there has not been enough time to coordinate with each non-Federal sponsor with respect to sponsorship and obtaining letters of commitment. In that connection, a meeting is scheduled between the Secretary of Natural Resources for the Commonwealth of Virginia and the Norfolk District on 31 Oct 2000 to discuss sponsorship for the feasibility study. Coordination meetings with the other 12 potential non-Federal sponsors are scheduled during the months of Oct, Nov, and Dec 2000. Letters of intent will not be available when the Section 905(b) report is forwarded to NAD and headquarters.

Possible Impact: The absence of letters of intent may delay the approval of the Section 905(b) Analysis Report, completion of the reconnaissance phase, and the start of the feasibility phase.

Resolution: To support the Norfolk District's commitment to forward the Section 905(b) Report by the end of FY 2000, letters of intent will be forwarded at a later date once coordination with the local sponsors has been completed. Several letters of interest to continue working with the Corps with the goal of proceeding to the feasibility phase have been received from the counties and are included as an attachment to the Section 905(b) Analysis.

Major Technical Concern: ER 1105-100 dated 22 April 2000 requires that a feasibility study cost estimate be included in the Section 905(b) Report. Due to a late start of the reconnaissance study (see discussion above), the scope of work and the corresponding cost estimate for the feasibility phase has not been developed.

Possible Impact: A reliable feasibility study cost estimate is unknown at this time.

Resolution: Once coordination with the non-Federal sponsors is complete, the project management plan (PMP) will be finalized to include the feasibility study cost estimate based on a specific scope of work as desired by the sponsors.

Major Technical Concern: The 12-county study area includes part of the Potomac River Basin. Concern has been expressed about performing a comprehensive watershed study with a portion of the study area being within the jurisdiction of the Baltimore District.

Possible Impact: The comprehensive watershed study could be incomplete without adequate coordination with the Baltimore District. As a courtesy, Baltimore District should be consulted early on if it is determined that a comprehensive feasibility study is supported.

Resolution: Projects within the Potomac River Basin will be "one each" and referred to the Baltimore District as they are identified during coordination with the sponsors.

Major Technical Concern: Numerous potential non-Federal sponsors were identified at the start of the reconnaissance study. Concern was expressed if the Northern Neck and Middle Peninsula Planning District Commissions and the Tidewater Resource, Conservation, and Development Council could qualify as non-Federal sponsors.

Possible Impact: The roles and limitations of each organization should be clearly identified as early as possible in the reconnaissance phase process so that proper customer relations are established and maintained.

Resolution: This issue was referred to the Norfolk District Office of Counsel. They advised the project team that planning district commissions could serve as agents for the counties as non-Federal sponsors, if requested. In this case, the counties providing funds for the feasibility study would still be required to sign the Feasibility Cost-Sharing Agreement (FCSA). On the other hand, Office of Counsel advised that the Tidewater Resource, Conservation, and Development Council would not qualify as a non-Federal sponsor. The Commonwealth of Virginia would also qualify as a non-Federal sponsor.

As noted above, all concerns resulting from independent technical review of the project have been considered. The Section 905(b) Analysis Report has been fully reviewed.

25 Sep 00

James N. Thomasson
Chief, Programs and Project Management Division

9/25/00

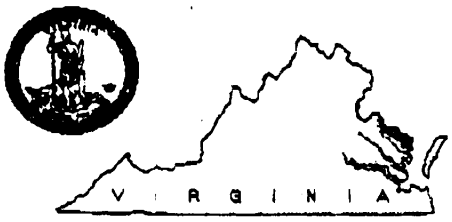
William A. Sorrentino Jr.
Chief, Technical Services Division

CERTIFICATION OF LEGAL REVIEW

The reconnaissance report for the Lower Rappahannock River Basin has been fully reviewed by the Office of Counsel, Norfolk District and is approved as legally sufficient.

9-25-00

District Counsel



NORTHERN NECK PLANNING DISTRICT COMMISSION
P. O Box 1600, Warsaw, Virginia 22572
Telephone: 804/333-1900 Fax: 804/333-5274

September 26, 2000

Mr. Doug Martin, Project Manager
U. S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, Virginia 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a Comprehensive Feasibility Study. I further understand that you will make a recommendation to higher headquarters to proceed into the feasibility phase. I look forward to receiving your report and reviewing the findings.

Please accept this letter as an expression of the NNPDC's interest in continuing to work with you and your team with the goal to proceed into the feasibility phase. I also look forward to meeting with you to discuss the Section 905(b) Analysis Report with the intent for you to make a presentation to our Commission in the near future.

If you have any questions or comments, please let me know. Thank you for your consideration.

Sincerely,

Jerry W. Davis, AICP
Executive Director

Middle Peninsula Planning District Commission

Saluda Professional Center, Bowden Street, P. O. Box 286, Saluda, VA 23149-0286
Toll-Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-Mail: mppdc@inna.net Web Page: http://www.mppdc.com

September 26, 2000

Mr. Doug Martin
Project Manager
Norfolk District, U.S. Army Corps of Engineers
803 Front Street
Norfolk, VA 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to higher headquarters to proceed into the feasibility phase. I look forward to receiving your report and reviewing the findings.

Please accept this letter as an expression of our interest in continuing to work with you and your team with the goal to proceed into the feasibility phase. I also look forward in meeting with you to discuss the Section 905(b) Report with the intent for you to make a presentation to the Board of Commissioners of the Middle Peninsula Planning District Commission in the near future.

Sincerely,

Dan

Dan Kavanagh
Executive Director

DK:rl

Richmond County Board of Supervisors

101 Court Circle P. O. Box 1000 Warsaw, Virginia 22572 (804) 333-3415 FAX (804) 333-3408 www.co.richmond.va.us

September 27, 2000

Doug Martin
Project Manager
Norfolk District, US Army Corps of Engineers
803 Front Street
Norfolk, VA 23510-1096

Dear Mr. Marin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to higher headquarters to proceed into the feasibility place. I look forward to receiving your report and reviewing the findings. Please accept this letter as an expression of our interest in continuing to work with you and your team with the goal to proceed into the feasibility phase I also look forward in meeting with you to discuss the Section 905(b) Report with the intent for you to make a presentation to our Board of Supervisors in the near future.

Sincerely,

William E. Duncanson

William E. Duncanson
County Administrator

R. Gary Allen
County Administrator

Linda E. Lumpkin
Assistant County Administrator

205 Cross Street
Post Office Box 1079
Tappahannock, Virginia 22560
(804) 443-4331
Fax (804) 443-4157
www.essex-virginia.org

Established 1692

Essex County
Virginia

September 27, 2000

Doug Martin
Project manager
Norfolk District, US Army Corps of Engineers
803 Front Street
Norfolk, Virginia 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to higher headquarters to proceed into the feasibility phase. I look forward to receiving your report and reviewing the findings. Please accept this letter as an expression of our interest in continuing to work with you and your team with the goal to proceed into the feasibility phase. I also look forward to meeting with you to discuss the Section 905(b) Report with the intent for you to make a presentation to our Board of Supervisors in the near future.

Sincerely,

R. Gary Allen
County Administrator

County of Gloucester

COUNTY ADMINISTRATOR
6467 Main Street
P.O. Box 329
Gloucester, Virginia
23061-0329

(804) 693-4042
FAX (804) 693-6004
E-Mail: wwhitley@co.gloucester.va.us

September 26, 2000

Mr. Doug Martin
Project Manager
Norfolk District
US Army Corps of Engineers
803 Front Street
Norfolk, VA 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to higher headquarters to proceed into the feasibility phase. I look forward to receiving your report and reviewing the findings. Please accept this letter as an expression of our interest in continuing to work with you and your team with the goal to proceed into the feasibility phase. I also look forward to meeting with you to discuss the Section 905(b) Report with the intent for you to make a presentation to our Board of Supervisors in the near future.

Sincerely,

William H. Whitley
County Administrator

WHW:djb

WESTMORELAND COUNTY, VIRGINIA
Board of Supervisors
MONTROSS, VIRGINIA 22520-1000

NORM RISAVI
County Administrator
P. O. BOX 1000
MONTROSS, VIRGINIA 22520-1000
PHONE: 804/493-0130
FAX: 804/493-0134

September 22, 2000

Doug Martin
Project Manager
Norfolk District, US Army Corps of Engineers
803 Front Street
Norfolk, Virginia 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to higher headquarters to proceed into the feasibility phase. I look forward to receiving your report and reviewing the findings. Please accept this letter as an expression of our interest in continuing to work with you and your team with the goal to proceed into the feasibility phase. I also look forward in meeting with you to discuss the Section 905(b) Report with the intent for you to make a presentation to our Board of Supervisors in the near future.

Sincerely,

Norm Rivasi
County Administrator

COUNTY OF LANCASTER

FOUNDED 1651 IN VIRGINIA
LANCASTER COURTHOUSE
8311 MARY BALL ROAD
LANCASTER, VIRGINIA 22503

William H. Pennell, Jr.
County Administrator

804-462-5129
804-462-0031 (FAX)
www.lancova.com

BOARD OF SUPERVISORS
F. W. Jenkins, Jr., 1st District
Donald O. Conaway, 2nd District
Patrick G. Frere, 3rd District
Cundiff H. Simmons, 4th District
B. Wally Beauchamp, 5th District

September 22, 2000

Mr. Doug Martin
Project Manager, Norfolk District
U. S. Army Corps of Engineers
803 Front Street
Norfolk, VA 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study. The Norfolk District of the U. S. Army Corps of Engineers has determined that there is a federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to its headquarters to proceed into the feasibility phase. I anticipate receiving your report, reviewing its findings and sharing the information with the members of the Lancaster County Board of Supervisors.

Please accept this letter as an expression of interest in continuing to work with you and your team with a goal of proceeding into the feasibility phase. Please understand that the Lancaster County Board of Supervisors has appropriated no fund to support this effort at this stage.

I look forward to meeting with you to discuss the Section 905(b) Report with the intent to make a presentation to the Board of Supervisors in the near future.

Sincerely,

William H. Pennell, Jr.
County Administrator

Cc: Board of Supervisors
Jack D. Larson, Planning Director

King William County
Founded 1702 in Virginia

FRANK A. PLEVA
County Administrator

TERRI E. HALE
Assistant County Administrator

September 26, 2000

Doug Martin, Project Manager
U. S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, Virginia 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to higher headquarters to proceed into the feasibility phase. I look forward to receiving your report and reviewing the findings. Please accept this letter as an expression of our interest in continuing to work with you and your team with the goal to proceed into the feasibility phase. I also look forward to meeting with you to discuss the Section 905(b) Report with the intent for you to make a presentation to our Board of Supervisors in the near future.

Sincerely,

Terri E. Hale, for

Frank A. Pleva
County Administrator

180 Horse Landing Road • Post Office Box 215 • King William, Virginia 23086
804-769-4927 • 804-843-3422 • 804-994-2937 • fax: 804-769-4964
www.co.king-william.va.us

Charles M. Culley, Jr.
County Administrator

Marcia Jones
Assistant Administrator

County of Middlesex
OFFICE OF THE COUNTY ADMINISTRATOR

September 22, 2000

Mr. Doug Martin
Project Manager
Norfolk District
US Army Corps of Engineers
802 Front Street
Norfolk, VA 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to higher headquarters to proceed into the feasibility phase. I look forward to receiving your report and reviewing the findings.

Please accept this letter as an expression of our interest in continuing to work with you and your team with the goal to proceed into the feasibility phase. I also look forward to meeting with you to discuss the Section 905(b) Report with the intent for you to make a presentation to our Board of Supervisors in the near future.

Sincerely,

Charles M. Culley, Jr.
County Administrator

P.O. Box 428, Saluda, Virginia 23149-0428 • Phone: (804) 758-4330 Fax: (804) 758-0061 • www.co.middlesex.va.us

COUNTY ADMINISTRATOR

Kenneth D. Eades
Heathsville, VA 22473
804-580-7666 (Voice)
804-580-7053 (Fax)
keades@co.northumberland.va.us

Northumberland County, Virginia

Board of Supervisors

P.O. Box 129 • 72 Monument Place
Heathsville, Virginia 22473

September 21, 2000

Doug Martin
Project Manager
Norfolk District, US Army Corps of Engineers
803 Front Street
Norfolk, VA 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905 (b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to higher headquarters to proceed into the feasibility phase.

I look forward to receiving your report and reviewing the findings.

Please accept this letter as an expression of our interest in continuing to work with you and your team with the goal to proceed into the feasibility phase. I also look forward to meeting with you to discuss the Section 905 (b) Report with the intent for you to make a presentation to our Board of Supervisors in the near future.

Sincerely,

Kenneth D. Eades
County Administrator

KDE/jm

King and Queen County

KING AND QUEEN C.H., VIRGINIA 23085

COUNTY ADMINISTRATOR

September 21, 2000

Mr. Doug Martin
Project Manager
Norfolk District, U.S. Army Corps of Engineers
803 Front Street
Norfolk, Virginia 23510-1096

Dear Mr. Martin:

I enjoyed speaking with you today regarding the Lower Rappahannock River Basin Reconnaissance Study. As you may recall from the stakeholders' meeting there were two Board of Supervisors' Members present from King and Queen County. I believe that their presence at the stakeholders' meeting serves as an appropriate gauge for the County's interest in this project.

Per our discussion, it is my understanding that your project team is in the process of completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Study and that the Norfolk District of the U.S. Army Corps of Engineers has determined that there is Federal interest in conducting a comprehensive watershed feasibility study and will, therefore, recommend to your superiors that the project proceed to the feasibility phase. With this letter I am confirming the County's interest in continuing to work with the Corps of Engineers on this project and to see the project through to the feasibility phase.

I look forward to receiving your report and reviewing the findings. In addition, I also look forward to meeting with you to discuss the 905(b) report and further discussing this issue with the Board of Supervisors.

Sincerely,

Christopher J. Layton
County Administrator

County of Mathews
Office of the County Administrator
. Box 839
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Stephen K. Whiteway
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Doug Martin, Project Manager
Norfolk District, US Army Corps of Engineers
803 Front Street
Norfolk, Virginia 23510-1096

Dear Mr. Martin:

It is my understanding that your project team is completing a Section 905(b) Analysis Report for the Lower Rappahannock River Basin Reconnaissance Study and the Norfolk District has determined that there is a Federal interest in conducting a comprehensive watershed feasibility study and will make a recommendation to higher headquarters to proceed into the feasibility phase. I look forward to receiving your report and reviewing the findings.

Please accept this letter as an expression of our interest in continuing to work with you and your team with the goal to proceed into the feasibility phase. I also look forward to meeting with you to discuss the Section 905(b) Report with the expectation that you will make a presentation to our Board of Supervisors in the near future.

Sincerely,

Stephen K. Whiteway
County Administrator

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