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Shoreline Situation Report

YORK COUNTY, VIRGINIA

Supported by the National Science Foundation, Research Applied to National Needs Program
NSF Grant Nos. GI 34869 and GI 38973 to the Wetlands/Edges Program, Chesapeake Research Consortium, Inc.
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Chesapeake Research Consortium Report Number 16

Special Report In Applied Marine Science and Ocean Engineering Number 82 of the

VIRGINIA INSTITUTE OF MARINE SCIENCE
William J. Hargis Jr., Director
Gloucester Point, Virginia 23062

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YORK COUNTY, VIRGINIA

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CHAPTER 1
Introduction

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INTRODUCTION

1.1 PURPOSES AND GOALS

It is the objective of this report to supply an assessment, and at least a partial integration, of those important shoreland parameters and characteristics which will aid the planners and the managers of the shorelands in making the best decisions for the utilization of this limited and very valuable resource. The report gives particular attention to the problem of shore erosion and to recommendations concerning the alleviation of the impact of this problem. In addition we have tried to include in our assessment some of the potential uses of the shoreline particularly with respect to recreational use, since such infromation could be of considerable value in the way a particular segment of coast is perceived by potential users.

The basic advocacy of the authors in the preparation of the repost is that the use of shorelands should be planned rather than haphazardly developed in response to the short term pressures and interests. Careful planning could reduce the conflicts which may be expected to arise between competing interests. Shoreland utilization in many areas of the country, and indeed in some places in Virginia, has proceeded in a manner such that the very elements which attracted people to the shore have been destroyed by the lack of planning and forethought.

The major man-induced uses of the shorelands are:

-- Residential, commercial, or industrial development.
-- Recreation
-- Transportation
-- Waste disposal
-- Extraction of living and non-living resources.

Aside from the above uses, the shorelands serve various ecological functions.

The role of planners and managers is to optimize the utilization of the shorelands and to minimize the conflicts arising from competing demands. Furthermore, once a particular use has been decided upon for a given segment of shoreland, both the planners and the users want that selected use to operate in the most effective manner. A park planner, for example, wants the alloted space to fulfill the design most efficiently. We hope that the results of our work are useful to the planner in designing the beach by pointing out the technical feasibility of altering or enhancing the present configuration of the shore zone. Alternately, if the use were a residential development, we would hope our work would be useful in specifying the shore erosion problem and by indicating defenses likely to secceed in containing the erosion. In summary our objective is to provide a useful tool for enlightened utilization of a limited resource, the shorelands of the Commonwealth.

Shorelands planning occurs, either formally or informally, at all levels, from the private owner of shoreland property to county governments, to planning districts and to the state and federal agency level. We feel our results will be useful at all these levels. Since the most basic level of comprehensive planning and zoning is at the county or city level, we have executed our report on that level, although we realize some of the information may be most useful at a higher governmental level. The Commonwealth of Virginia has traditionally chosen to place as much as possible, the regulatory decision processes at the county level. The Virginia Wetlands Act of 1972 (Chapter 2.1, Title 62.1, Code of Virginia), for example, provides for the establishment of County Boards to act on applications for alterations of wetlands. Thus, our focus at the county level is intended to interface with, and to support, the existing or pending county regulatory mechanisms concerning activities in the shorelands zone.

1.2 ACKNOWLEDGEMENTS

This report was prepared with funds provided by the Research Applied to National Needs Program (RANN) of the National Science Foundation administered through the Chesapeake Research Consortium (CRC), Inc. George Dawes and Gene Silberhorn of the VIMS Wetlands Section contributed many useful ideas and criticisms. Dennis Owen assisted with the data reduction. Beth Marshall typed the manuscript. Peter Rosen, Peggy Peoples, Joe Gilley, Russell Bradley, Ken Thornberry, and Bill Jenkins prepared the graphics. We also thank the numerous other persons in Maryland and Virginia who have criticized and commented upon our ideas and methods.

CHAPTER 2
Approach Used and Elements Considered

CHAPTER 2

APPROACH USED AND ELEMENTS CONSIDERED

2.1 APPROACH TO THE PROBLEM

In the preparation of this report the authors utilized existing information wherever possible. For example, for such elements as water quality characteristics, zoning regulations, or flood hazard, we reviewed relevant reports by local, state, or federal agencies. Much of the desired information, particularly with respect to erosional characteristics, shoreland types, and use was not available, so we performed the field work and developed classification schemes. In order to analyze successfully the shoreline behavior we placed heavy reliance on low altitude, oblique, color, 35 mm photography. We photographed the entire shoreline of each county and cataloged the slides for easy access at VIMS, where they remain available for use. We then analyzed these photographic materials, along with existing conventional aerial photography and topographic and hydrographic maps, for the desired elements. We conducted field inspection over much of the shoreline, particularly at those locations where office analysis left questions unresolved. In some cases we took additional photographs along with the field visits to document the effectiveness of shoreline defenses.

The basic shoreline unit considered is called a subsegment, which may range from a few hundred feet to several thousand feet in length. The end points of the subsegments were generally chosen on physiographic consideration such as changes in the character of erosion or deposition. In those cases where a radical change in land use occurred, the point of change was taken as a boundary point of the subsegment. Segments are a grouping of subsegments. The boundaries for segments also were selected on physiographic units such as necks or peninsulas between major tidal creeks. Finally, the county itself is considered as a sum of shoreline segments.

The format of presentation in the report follows a sequence from general summary statements for the county (Chapter 3) to tabular segment summaries and finally detailed descriptions and maps for each subsegment (Chapter 4). The purpose in choosing this format was to allow selective use of the report since some users' needs will adequately be met with the summary overview of the county while others will require the detailed discussion of particular subsegments.

2.2 CHARACTERISTICS OF THE SHORELANDS INCLUDED IN THE STUDY

The characteristics which are included in this report are listed below followed by a discussion of our treatment of each.

a) Shorelands physiographic classification
b) Shorelands use classification
c) Shorelands ownership classification
d) Zoning
e) Water quality
f) Shore erosion and shoreline defenses
g) Potential shore uses
h) Distribution of marshes
i) Flood hazard levels
j) Shellfish leases and public shellfish grounds
k) Beach quality

a) Shorelands Physiographic Classification:

The shorelands of the Chesapeake Bay System may be considered as being composed of three interacting physiographic elements: the fastlands, the shore and the nearshore. A graphic classification based on these three elements has been devised so that the types for each of the three elements portrayed side by side on a map may provide the opportunity to examine joint relationships among the elements. As an example, the application of the system permits the user to determine miles of high bluff shoreland interfacing with marsh in the shore zone.

Definitions:

Shore Zone

This is the zone of beaches and marshes. It is a buffer zone between the water body and the fastland. The seaward limit of the shore zone is the break in slope between the relatively steeper shoreface and the less steep nearshore zone. The approximate landward limit is a contour line representing one and a half times the mean tide range above mean low water (refer to Figure 1A). In operation with topographic maps the inner fringe of the marsh symbols is taken as the landward limit.

The physiographic character of the marshes has also been separated into three types (see Figure 1B). Fringe marsh is that which is less than 400 feet in width and which runs in a band parallel to the shore. Extensive marsh is that which has extensive acreage projecting into an estuary or river. An embayed marsh is a marsh which occupies a reentrant or drowned creek valley. The purpose in delineating these marsh types is that the effectiveness of the various functions of the marsh will, in part, be determined by type of exposure to the estuarine system. A fringe marsh

may, for example, have maximum value as a buffer to wave erosion of the fastland. An extensive marsh, on the other hand, is likely a more efficient transporter of detritus and other food chain materials due to its greater drainage density than an embayed marsh. The central point is that planners, in the light of ongoing and future research, will desire to weight various functions of marshes and the physiographic delineation aids their decision making by denoting where the various types exist. The classification used is:

Beach

Marsh

Fringe marsh, < 400 ft. (122 m) in width along shores

Extensive marsh

Embayed marsh, occupying a drowned valley or reentrant

Artificially stabilized

Fastland Zone

The zone extending from the landward limit of the shore zone is termed the fastland. The fastland is relatively stable and is the site of most material development or construction. The physiographic classification of the fastland is based upon the slope of the land near the water as follows:

Low shore, 20-ft. (6 m) contour > 400 ft. (122 m) from fastland-shore boundary

Moderately low shore, 20-ft. (6 m) contour < 400 ft. (122 m); with or without cliff

Moderately high shore, 40-ft. (12 m) contour < 400 ft. (122 m); with or without cliff

High shore, 60-ft. (18 m) contour < 400 ft. (122 m); with or without cliff

Dune

Artificial fill, urban and otherwise

Nearshore Zone

The nearshore zone extends from the shore zone to the 12-foot (MLW datum) contour. In the smaller tidal rivers the 6-foot depth is taken as the reference depth. The 12-foot depth is probably the maximum depth of significant sand transport by waves in the Chesapeake Bay area. Also, the distinct drop-off into the river channels begins roughly at the 12-foot depth. The nearshore zone includes any tidal flats.

The class limits for the nearshore zone classifications were chosen following a simple statistical study. The distance to the 12-foot underwater contour (isobath) was measured on the appropriate charts at one-mile intervals along the shorelines of Chesapeake Bay and the James, York, Rappahannock, and Potomac Rivers. Means and standard deviations for each of the separate regions and for the entire combined system were calculated and compared. Although the distributions were non-normal, they were generally comparable, allowing the data for the entire combined system to determine the class limits.

The calculated mean was 919 yards with a standard deviation of 1,003 yards. As our aim was to determine general, serviceable class limits, these calculated numbers were rounded to 900 and 1,000 yards respectively. The class limits were set at half the standard deviation (500 yards) each side of the mean. Using this procedure a narrow nearshore zone is one 0-400 yards in width, intermediate 400-1,400, and wide greater than 1,400.

The following definitions have no legal significance and were constructed for our classification purposes:

Narrow, 12-ft. (3.7 m) isobath located < 400 yards from shore

Intermediate, 12-ft. (3.7 m) isobath 400-1,400 yards from shore

Wide, 12-ft. (3.7 m) isobath > 1,400 yards

Subclasses: with or without bars
with or without tidal flats
with or without submerged vegetation

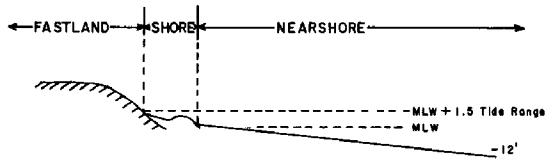


Figure 1A

An illustration of the definition of the three components of the shorelands.

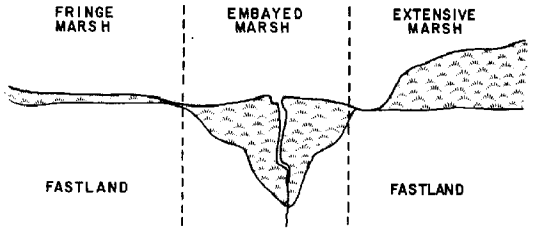


Figure 1B

A generalized illustration of the three different marsh types.

b) Shorelands Use Classification:

Fastland Zone

Residential

Includes all forms of residential use with the exception of farms and other isolated dwellings. In general, a residential area consists of four or more residential buildings adjacent to one another. Schools, churches, and isolated businesses may be included in a residential area.

Commercial

Includes buildings, parking areas, and other land directly related to retail and wholesale trade and business. This category includes small industry and other anomalous areas within the general commercial context. Marinas are considered commercial shore use.

Industrial

Includes all industrial and associated areas. Examples: warehouses, refineries, shipyards, power plants, railyards.

Government

Includes lands whose usage is specifically controlled, restricted, or regulated by governmental organizations: e.g., Camp Peary, Fort Story.

Recreation and Other Public Open Spaces

Includes designated outdoor recreation lands and miscellaneous open spaces. Examples: golf courses, tennis clubs, amusement parks, public beaches, race tracks, cemeteries, parks.

Preserved

Includes lands preserved or regulated for environmental reasons, such as wildlife or wildfowl sanctuaries, fish and shellfish conservation grounds, or other uses that would preclude development.

Agricultural

Includes fields, pastures, croplands, and other agricultural areas.

Unmanaged

Includes all open or wooded lands not included in other classifications:

a) Open: brush land, dune areas, wastelands; less than 40% tree cover.

b) Wooded: more than 40% tree cover.

The shoreland use classification applies to the general usage of the fastland area to an arbitrary distance of half mile from the shore or beach zone or to some less distant, logical barrier. In multi-usage areas one must make a subjective selection as to the primary or controlling type of usage.

Shore Zone

Bathing
Boat launching
Bird watching
Waterfowl hunting

Nearshore Zone

Pound net fishing
Shellfishing
Sport fishing
Extraction of non-living resources
Boating
Water sports

c) Shorelands Ownership Classification

The shorelands ownership classification used has two main subdivisions, private and governmental, with the governmental further divided into federal, state, county, and town or city. Application of the classification is restricted to fastlands alone since the Virginia fastlands ownership extends to mean low water. All bottoms below mean low water are in State ownership.

d) Water Quality

The ratings of satisfactory, intermediate or unsatisfactory assigned to the various subsegments are taken from a listing at the Virginia Bureau of Shellfish Sanitation, based on information from water samples collected in the various tidewater shellfishing areas. The Bureau attempts to visit each area at least once a month.

The ratings are defined primarily in regard to number of coliform bacteria. For a rating of satisfactory the maximum limit is an MPN (Most Probable Number) of 70 per 100 ml. The upper limit for fecal coliforms is an MPN of 23. Usually any count above these limits results in an unsatisfactory rating, and, from the Bureau's standpoint, results in restricting the waters from the taking of shellfish for direct sale to the consumer.

There are instances, however, when the total coliform MPN may exceed 70, although the fecal MPN does not exceed 23, and other conditions are acceptable. In these cases an intermediate rating may be assigned temporarily, and the area will be permitted to remain open pending an improvement in conditions.

Although these limits are somewhat more stringent than those used in rating recreational waters

(see Virginia State Water Control Board, Water Quality Standards 1946, amended 1970), they are used here because the Bureau of Shellfish Sanitation provides the best areawide coverage available at this time. In general, any waters fitting the satisfactory or intermediate categories would be acceptable for water recreation.

e) Zoning

In cases where zoning regulations have been established the existing information pertaining to the shorelands has been included in the report.

f) Shore Erosion and Shoreline Defenses

The following ratings are used for shore erosion:

slight or none - less than 1 foot per year

moderate - - - - 1 to 3 feet per year

severe - - - - - greater than 3 feet per year

The locations with moderate and severe ratings are further specified as being critical or non-critical. The erosion is considered critical if buildings, roads, or other such structures are endangered.

The degree of erosion was determined by several means. In most locations the long term trend was determined using map comparisons of shoreline positions between the 1850's and the 1940's. In addition, aerial photographs of the late 1930's and recent years were utilized for an assessment of more recent conditions. Finally, in those areas experiencing severe erosion field inspections and interviews were held with local inhabitants.

The existing shoreline defenses were evaluated as to their effectiveness. In some cases repetitive visits were made to monitor the effectiveness of recent installations. In instances where existing structures are inadequate, we have given recommendations for alternate approaches. Furthermore, recommendations are given for defenses in those areas where none currently exist. The primary emphasis is placed on expected effectiveness with secondary consideration to cost.

g) Potential Shore Uses

We placed particular attention in our study on evaluating the recreational potential of the shore zone. We included this factor in the consideration of shoreline defenses for areas of high recreational potential. Furthermore, we gave consideration to the development of artificial beaches if this method were technically feasible at a particular site.

h) Distribution of Marshes

The acreage and physiographic type of the marshes in each subsegment is listed. These estimates of acreages were obtained from topographic maps and should be considered only as approximations. Detailed county inventories of the wetlands are being conducted by the Virginia Institute of Marine Science under the authorization of the Virginia Wetlands Act of 1972 (Code of Virginia 62.1-13.4). These surveys include detailed acreages of the grass species composition within individual marsh systems. The material in this report is provided to indicate the physiographic types of marshes and to serve as a rough guide on acreages until detailed surveys are completed. Additional information of the wetlands characteristics may be found in Coastal Wetlands of Virginia: Interim Report by Marvin L. Wass and Thomas D. Wright, SRAMSOE Report No. 10, Virginia Institute of Marine Science, 1969, and in other VIMS publications.

i) Flood Hazard Levels

The assessment of tidal flooding hazard for the whole of the Virginia tidal shoreland is still incomplete. However, the United States Army Corps of Engineers has prepared reports for a number of localities which were used in this report. Two tidal flood levels are customarily used to portray the hazard. The Intermediate Regional Flood is that flood with an average recurrence time of about 100 years. An analysis of past tidal floods indicates it to have an elevation of approximately 8 feet above mean water level in the Chesapeake Bay area. The Standard Project Flood level is established for land planning purposes which is placed at the highest probable flood level.

j) Shellfish Leases and Public Grounds

The data in this report show the leased and public shellfish grounds as portrayed in the Virginia State Water Control Board publication "Shellfish growing areas in the Commonwealth of Virginia: Public, leased and condemned," November 1971, and as periodically updated in other similar reports. Since the condemnation areas change with time they are not to be taken as definitive. However, some insight to the conditions at the date of the report are available by a comparison between the shellfish grounds maps and the water quality maps for which water quality standards for shellfish were used.

k) Beach Quality

Beach quality is a subjective judgement based on such considerations as the nature of the beach material, the length and width of the beach area, and the general aesthetic appeal of the beach setting.

CHAPTER 3
Present Shorelands Situation

CHAPTER 3
PRESENT SHORELANDS SITUATION

3.1 NATURE OF THE SHORELANDS; PHYSIOGRAPHY, LAND USE, AND OWNERSHIP

York County, as a part of the James - York Peninsula, has shorelands which border on the York River and the Chesapeake Bay. Since regional planning will consider the county as a whole it is important to compare the physiographic differences of the shorelands of these two sections of York County.

The shorelands bordering the Chesapeake Bay are primarily marshes separated by tidal rivers and creeks which in turn form sub-peninsulas or "necks". The low-lying fastland of the Chesapeake Bay shorelands is fronted primarily by extensive or fringe marshes. The York River portion is a relatively straight flank of the Peninsula occasionally incised by small tidal creeks. This portion of the county's shoreline is marked by high cliffs with a variety of shore zone types. The three main shore zone types along the York River are fringe marsh, beach, and artificially stabilized. Excluding tidal creek shoreline the majority of the shoreline is artificially stabilized.

Although York County does not contain extensive stretches of natural beach shoreline, it does have 6,991 acres of relatively unspoiled marshes. In addition to constituting a vital link in the marine food chain, the marshes serve as a habitat for waterfowl, a natural erosion prevention mechanism, and a water cleansing system. In recognition of their vital importance as a marine resource, the Virginia Wetlands Act of 1972 (Chapter 2.1, Title 62.1, Code of Virginia) was passed to establish a mechanism to preserve this resource.

The distribution of shorelands physiography and of fastland use and ownership is shown in Table 1 and graphically displayed in Maps 1A through 1D. Approximately eighty-two percent of York County's shoreline is low shore, eleven percent is moderately low shore, and the remaining seven percent is moderately high to high shore, usually with bluffs. Approximately ten percent of the shore zone is beach.

Fifty-five percent of the one hundred twenty-nine square miles which York County covers is controlled by the military. This is reflected directly in the significant amount of shoreline, thirty percent, which the federal government controls. The largest percentage of the shoreline, sixty-two percent, is used for private residential purposes. The remaining eight percent is divided between commercial, industrial, recreational, preserved, and unmanaged. Only one percent of the county's shoreline is set aside for public recreational use, the majority of which is encompassed in the public beach at Yorktown. The Plum Tree Island Wildlife Refuge is the only preserved area.

Table 2 and Maps 2 through 8 are a segment by segment condensation of present subsegment descriptions and are presented in Chapter 4.

3.2 SHORE EROSION PROCESSES AND PATTERNS: SHORE DEFENSES

The magnitude of shore erosion in York County must be classed moderate. Where buildings and other structures are endangered, the situation is critical. Map 1E is a summary of the erosion situation in York County. As the erosional characteristics of the Chesapeake Bay and the York River shores differ, they will be discussed separately.

3.21 The Chesapeake Bay Shore. The erosion of the Goodwin Islands, and along the faces of Crab Neck and the Big Salt Marsh has continued virtually unchecked. The only exception is York Point, where landowners have implemented bulkheading behind the natural marsh grass fringe. The outer Bay faces of these marshes display many similarities in mechanics and features to the barrier islands of the Eastern Shore of Virginia. For the greater part, the outer marshes are simple low-lying segments with small backshore dunes and a bayside veneer of sand. As the littoral drift is relatively small, the situation is one of significant erosion. It is particularly important to consider what happens during coastal storms.

Processes. Along the Chesapeake Bay coastline the most damaging storms are the "northeasters" and the occasional hurricanes. Aside from the intense wave action there is generally a one to three-foot storm surge. The surge has two important effects. The erosive power of the waves is translated further up onto the marsh beach allowing the high waves to wash backshore dune sand into the Bay and to smear sand over the marsh surface. The sand washed over the marsh

raises the ground elevation. In time, the highly productive marsh grass is replaced by other species, and the sand in the washovers is temporarily lost from the active beach littoral transport system. The washovers can also affect the circulation within the marshes and bays by filling some of the tidal channels and forcing a redistribution of flow.

These processes are natural responses of the marsh beaches. As the shoreface retreats, former marsh deposits are excavated, and the washover deposits and wind-shaped dunes supply sand to the beach. The physiographic components, beach, dunes, and washovers, found on the marsh beaches today existed a century ago even though the entire ensemble is retreating. The erosion rates and areal loss on an area by area basis are:

Goodwin and Tue Islands - 104 acres in the last 100 years
Crab Neck Marsh - 2.2 feet per year
Big Salt Marsh - 3.5 feet per year

These rates and areal retreats were determined by comparison of the shoreline positions in 1854 and 1944. The magnitude of erosion in any given year, of course, is controlled by the frequencies and characteristics of the storms during that year. Two overriding facts must be borne in mind when considering the marsh beach erosion problems:

(1) Mean Sea Level is rising.
(2) The marsh beaches are not receiving a large enough supply of sand from fastland erosion to feed the littoral drift system.

The consequence of these facts is an eroding shoreline.

Aside from their other properties, marshes act as an excellent deterent to erosion. Although the extensive marshes of the Goodwin Islands, Crab Neck, and Plumtree Island have suffered severe erosion, they continue to function as an effective buffer to upland developments. Within the tidal creeks of York County the fringe and embayed marshes do an excellent job of protecting the fastland from minor erosion due to boat wakes and small wind-generated waves. The exceptions are those cases where the natural fringe marsh has been jeopardized by the emplacement of riprapping or bulkheading. In many instances those shore protection devices are in reality cosmetic, where the landowner's desire was to increase the size of his property or to increase the aesthetic value rather than in response to a serious erosion problem.

3.22 The York River Shore.

Processes. Waves generated by local winds are the dominant agent of erosion within the Chesapeake Bay and its tributary estuaries (e.g., the York River). The growth and height of the waves is controlled by four factors: the over water distance across which the wind blows, known as the fetch; the speed of the wind; the duration of the wind; and the depth of the water.

Due to the weather patterns affecting the Chesapeake Bay area and York River area, peak winds occur during frontal passages and storms. The winds of northeast storms during the fall, winter, and early spring generate waves which attack the western shore of the Bay and particularly lower sections of the York River. To a lesser extent, summer regional winds (southwest and south) also generate wave activity but the destructive wave action is greater with the northerly winds. The winds and the low barometric pressure along the ocean coastline have an additional, indirect effect on the Bay System erosional patterns during the storms, by forcing additional water into the Bay. Frequently this local "wind tide" or storm surge may be two or three feet above the normal tide level. For example, the severe northeast storm of March 1962 caused water elevations in Norfolk Harbor to reach an elevation of 7.4 feet above mean sea level. This elevation is approximately 6 feet higher than the average spring tide. When this occurs the wave driven erosional action is concentrated higher on the fastland, above the beach or marsh which normally acts as a buffer.

After a storm passes, the winds frequently shift to the northwest and north. In this case the south shore of the York River is exposed to intense wave action. In some cases this occurs before the extra water in the Bay has had sufficient time to drain out, resulting again in the wave activity being concentrated above the usual beach level. These effects of storms are, of course, further enhanced if they occur in conjunction with the higher spring tides during the lunar month.

In addition to the height of the waves, the direction at which they impinge upon the shore controls the magnitude of transport along the shoreline (littoral drift), a factor which is central to the question of shoreline stability. In theory, the transport of material along the beach is greatest when the waves break on the shoreline at an angle of forty-five degrees. Consider a hypothetical case of a shoreline several miles in length, where the fastland is a bluff composed of a mixture of stratified gravel, sand,

silt, and clay, a situation which is typical of much of the York River shoreline. Under wave attack, particularly if the water level is high due to the tide or storm surge, the cliff itself may be undercut causing face material to slump to the base. Continued wave action on the slumped material would winnow away the silts and clays leaving the sand and gravel to form a beach. Some of the sand and gravel will be transported along the beach. The beach itself acts as a buffer to wave energy as the waves break and run up and back down the sloping foreshore. If there is sufficient sand drifting along the shore zone from the up-drift segment of the coast, the beach at any given site may remain full enough to cushion the effects of a particular storm. However, if the sand supply up-drift is stopped, for one reason or another, the buffer effect is reduced and erosion will ensue.

Much of the sand drifted along the Virginia coastline is ultimately deposited as spits or bars in front of lesser tributary creeks, where it may contribute to the choking off of the entrance channel.

The erosional behavior of any particular segment of shoreline may be expected to vary from year to year depending upon the frequency and the intensity of storms. Furthermore, similar variability may also arise from differences in average mean sea level elevations. The long-term (decades) trend is for a relative rise in sea level. In the lower Chesapeake Bay the trend is about 0.01 feet per year. However, yearly variations of 0.15 feet per year are not uncommon. Although these differences are small they can be significant in terms of horizontal distances across a gently sloping shore. The long-term trend has dramatic consequences.

The role played by beaches in the physical processes of the coastline merits reiteration: beaches are natural land forms which serve to absorb incidental wave energy thereby inhibiting erosion of the fastland. The details of the configuration of any given beach may change, hour by hour or day by day, as the accumulation of sand adjusts to changing conditions. By and large, the natural maintenance of beach along Virginia's shoreline systems is attained at the expense of erosion of the fastlands. For any particular segment of shoreline, the beach sand is derived from erosion of the fastland at the site or from erosion at an up-drift site.

Erosion and Shore Defenses in York County. Historically, the necks directly exposed to the Bay and the lower portions of the York River have undergone the most severe erosion. Specifically, the Goodwin Islands, the Crab Neck marshes, the Plumtree Island marshes, and the high cliffs along the Colonial National Historical Park and Parkway were the sites of the most extensive erosion. Of particular national concern were the Revolutionary War fortifications along the cliff edge at Yorktown. Park Service surveys and the VIMS Erosion Report revealed a linear cliff retreat of 125 to 150 feet prior to the Army Corps of Engineers cliff stabilization program in that area. The well-placed, large stone riprap, implemented by the Corps, has halted the erosion, although some cliff slumping due to rain runoff is still witnessed. Another area of concern is the picnic area at the east end of Water Street in Yorktown. As shown in Figure 2, recent storms have removed large sections of the dredge spoil fastland, including several trees and a concrete picnic table. Although working against a lower cliff, several private erosion control measures along the York River portion of Goodwin Neck (Fig. 3) graphically display the result of using improper bulkhead construction materials. These bulkheads probably would have been successful had they been constructed of solid concrete with tiebacks and groins instead of poorly lain cinder blocks. Aside from the destruction due to wave action, the saline waters of the York deteriorated the mortar allowing wave action to complete the destruction.

Although properly implemented riprap and bulkheads offer the greatest protection against bluff retreat, it is generally impossible to maintain any beach above the high tide line due to the wave reflection from the face of these structures during high water. Groins should be used in conjunction with riprap or bulkhead if the maintenance of a beach is desired along with bluff protection. If the groins are successful in trapping sand, the beach, thus formed, protects the riprapped or bulkheaded face.

Although the planning of shore erosion defenses for any particular segment of the Bay and River shoreline of York County requires detailed evaluation, it is possible to recommend certain generalized guidelines:

a) In those areas experiencing rapid bluff recession and where there is limited up-drift sand supply, the application of groins alone should be discouraged.
b) If bluff stabilization is the main objective, properly designed bulkheading or stone riprap should be used. If possible these installations should be augmented

with a groin system to establish a beach for frontal protection.

c) If possible the individual groins in a groin system should be placed in a time sequential manner with the most down-drift groins being first installed. In those cases where groins alone are being utilized, this procedure will reduce the likelihood of flanking. Furthermore, the observed trapping characteristics will assist in the determination of the spacing between groins.

d) Where possible, groin systems should be artificially filled with sand in order to establish sand by-passing to the down-drift shoreline as soon as possible.

e) If there is a need for shore protection in an area with fringe marsh bordering the shore, the riprapping or bulkheading should be installed between the fastland and the marsh.

Finally, it must be emphasized that installation of shore defenses in one location generally has an impact on the adjacent down-drift shoreline. The impact can be both direct and indirect. In the case of bluff stabilization by bulkheads or riprap, the act of stabilization removes a source of sand which normally would pass to down-drift beaches. The installation of groin fields is a more aggressive action with a correspondingly greater impact on the down-drift beaches, as it prevents by-passing of sand until the system is filled.

In all cases shore erosion defenses should be planned under guidance of persons trained or experienced in coastal processes.

3.3 SHORE USE POTENTIAL AND UNIQUE FEATURES

Several factors come to bear when considering potential uses for the shorelands of York County. Present use and the physiographic nature of the shoreline in most areas prevent developing or enhancing the use of the shorelands. This is particularly so along the York River where extensive sections are managed by the federal government. The extensive marshes of the Chesapeake Bay shore, with few exceptions, also preclude uses other than as preserved areas.

3.31 The Chesapeake Bay Shore. The Black Walnut Ridge section of the Big Salt Marsh is an outstanding area for developing as an unusual and unique public recreational facility. Contained within a relatively small area are several types of coastal marsh environments. Through this facility the many valuable functions of Virginia's wetlands could be emphasized. As Tidewater is an established tourist area, the facility would offer yet another facet to the recreational attractions of the Peninsula. Although a comprehensive plan would be necessary prior to implementation, possible features could include: a visitors' center, open pile walkways across the marsh, observation towers, film and lectures on wetlands, guided tours, and other associated features. The facility would not only serve as a tourist attraction but could provide a living classroom for the various schools in the area.

The Goodwin Islands are another unique shorelands area within York County. Developmental pressures have been exerted to use these low-lying islands for industrial expansion in the lower York or for residential purposes. Particularly due to the high flood hazard, this area is not suitable for this type of development. The Goodwin Islands represent the same variety of shorelands environments seen at the Black Walnut Ridge area. This area could also be considered a candidate for this type of development, where the emphasis is on preservation through education rather than sacrificing a relatively unspoiled area. As with the Black Walnut Ridge area, a comprehensive plan would be necessary before implementation.

Elsewhere in York County, the zoning ordinance and existing installations, in many cases, have determined the course of shorelands use. It can only be reemphasized that care should be taken to limit additional alterations to natural marsh conditions which exist throughout most of the portion of York County's shorelands.

3.32 The York River Shore. Due to the physiographic nature and the extensive shore protective measures along this portion of York County's shoreline, only one area has potential for further or alternate use development. The area is the Yorktown beach area, which could be further developed for recreational use.

Yorktown beach is the only public beach in York County. It receives heavy use during the summer months from local residents as well as tourists. This pressure can be expected to increase, particularly during the Bicentennial celebration. Visitors and residents will expect to find an adequate, safe, and accessible public beach. The beach at Yorktown is adequate and relatively accessible but certain sections are not safe. As detailed in the Segment 5 description a restricted and guarded swimming area needs to be established. Consideration should also be given to an overall plan for maximizing the use of downtown Yorktown.

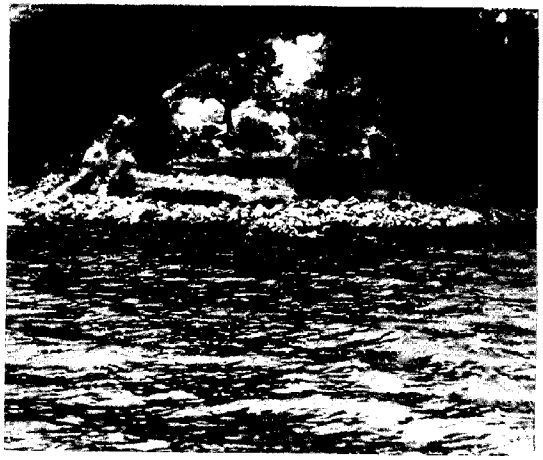


Figure 2

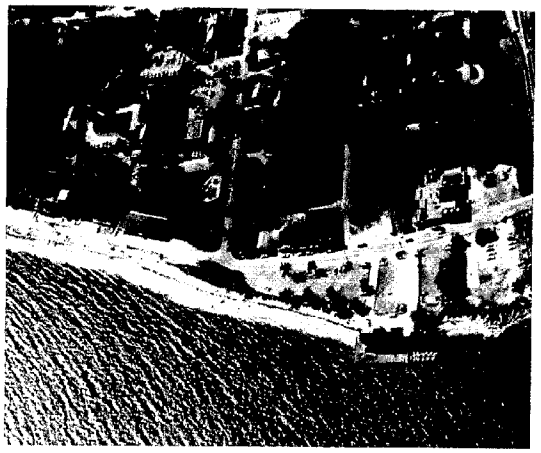


Figure 3

Figure 4

Figure 5

FIGURE 2: Large stone riprap which protects much of the nonmarsh York River shoreline. However, there is no beach along these sections at high tide.

FIGURE 3: Yorktown Beach, the only public beach in York County.

FIGURE 4: Wave erosion at the Park Service picnic grounds in Yorktown.

FIGURE 5: One example of the many poorly designed and constructed bulkheads in York County.

Figure 6

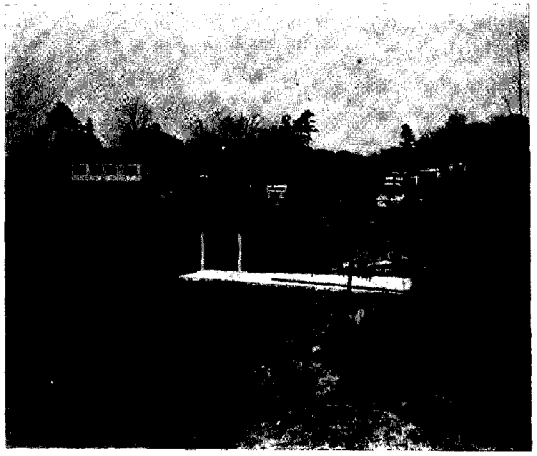


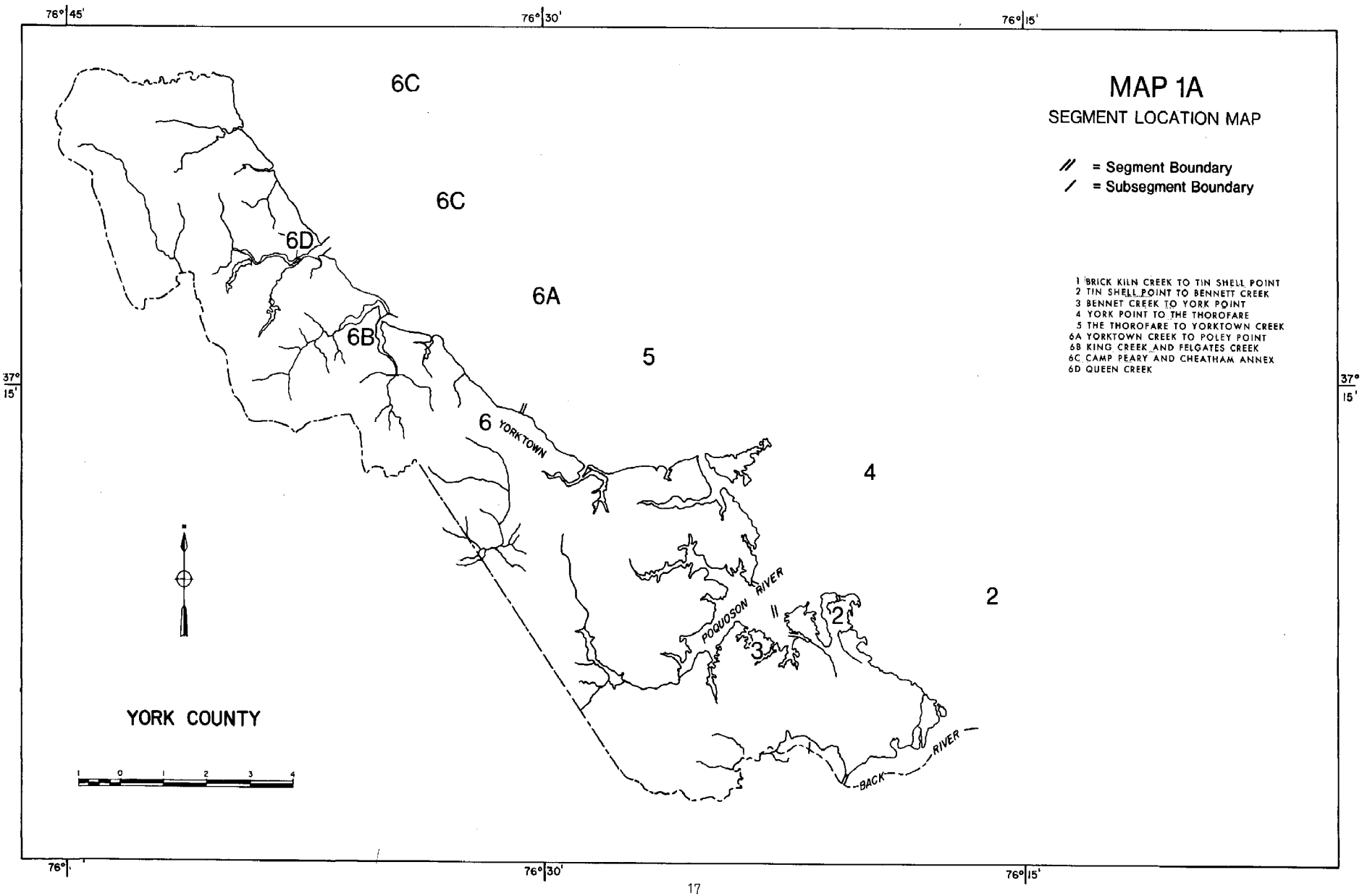
Figure 7

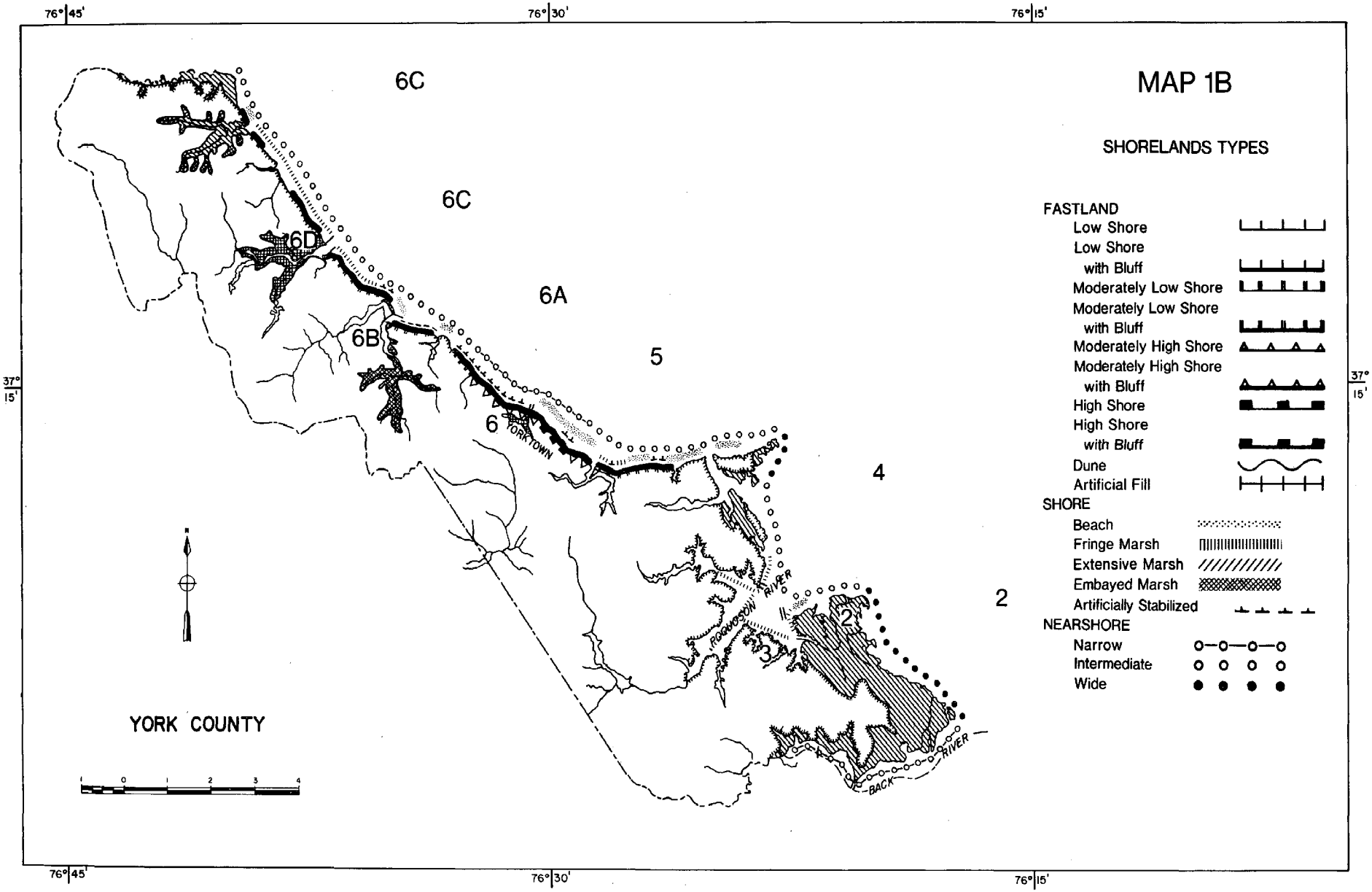
Figure 8

FIGURE 6: The Plumtree Island Wildlife Refuge marsh with its small barrier beach.

FIGURE 7: One of the many dead end canals in York County.

FIGURE 8: Another example of a dead end canal and spoiled marsh. Such practices are environmentally unsound in addition to placing homes in high flood hazard areas.


76°45'
76°30'
76°15'
37°15'
6C
6C
6D
6A
6B
5
6 YORKTOWN
4
2
3
2
POQUOSON RIVER
BACK RIVER
YORK COUNTY
0 1 2 3 4
MAP 1A
SEGMENT LOCATION MAP
// = Segment Boundary
/ = Subsegment Boundary
1 BRICK KILN CREEK TO TIN SHELL POINT
2 TIN SHELL POINT TO BENNETT CREEK
3 BENNET CREEK TO YORK POINT
4 YORK POINT TO THE THOROFARE
5 THE THOROFARE TO YORKTOWN CREEK
6A YORKTOWN CREEK TO POLEY POINT
6B KING CREEK AND FELGATES CREEK
6C CAMP PEARY AND CHEATHAM ANNEX
6D QUEEN CREEK



MAP 1B
SHORELANDS TYPES
FASTLAND
Low Shore
Low Shore with Bluff
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
Moderately High Shore with Bluff
High Shore
High Shore with Bluff
Dune
Artificial Fill
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
Artificially Stabilized
NEARSHORE
Narrow
Intermediate
Wide
YORK COUNTY
YORKTOWN
ROQUOSON RIVER
BACK RIVER
6C
6C
6D
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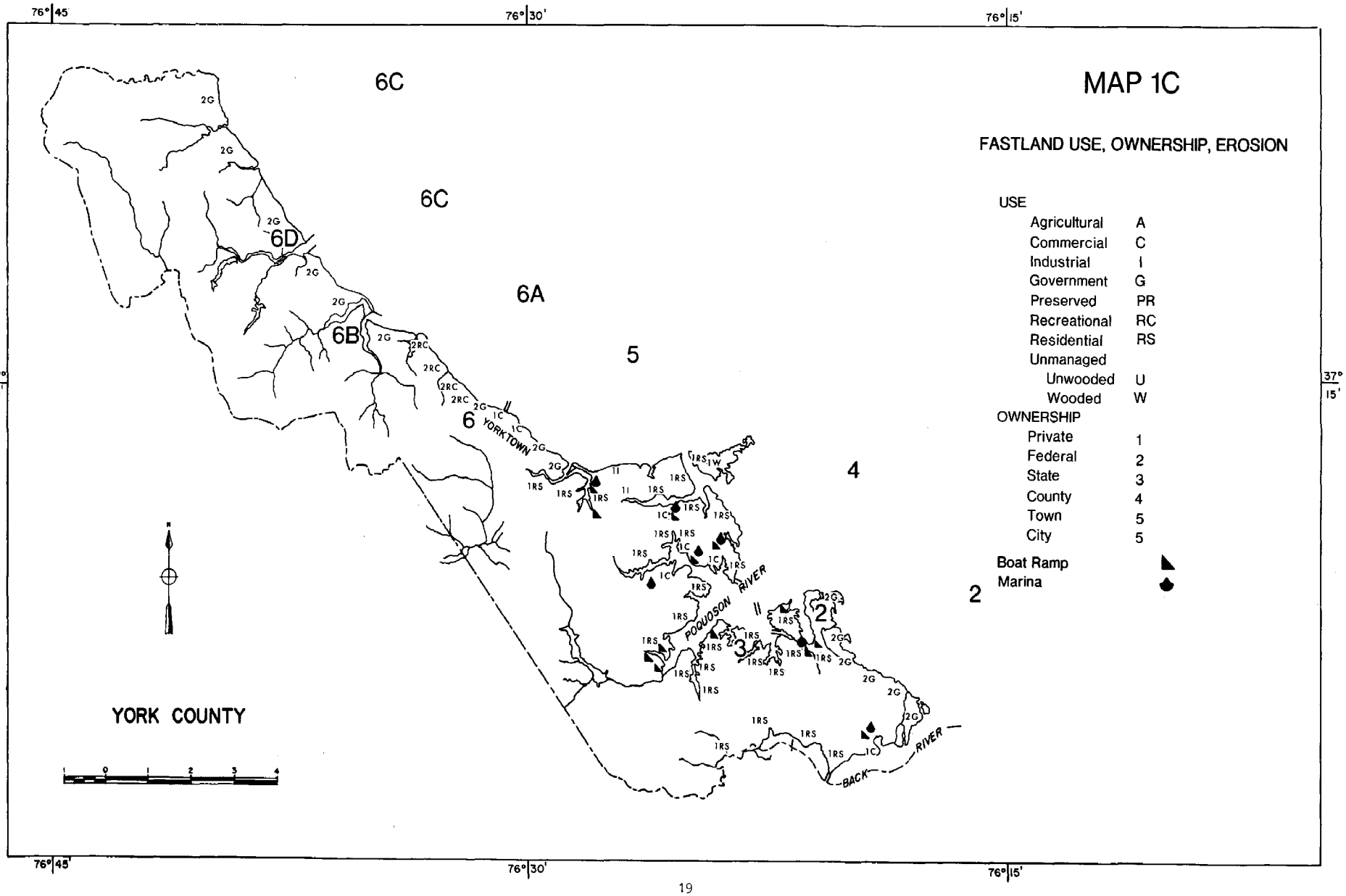
2
2
3
76°45'
76°30'
76°15'
37° 15'


76°45'
76°30'
76°15'
37°15'
6C
6C
6D
6A
6B
5
6
4
2
3
YORKTOWN
POQUOSON RIVER
BACK RIVER
YORK COUNTY
MAP 1C
FASTLAND USE, OWNERSHIP, EROSION
USE
Agricultural A
Commercial C
Industrial I
Government G
Preserved PR
Recreational RC
Residential RS
Unmanaged
Unwooded U
Wooded W
OWNERSHIP
Private 1
Federal 2
State 3
County 4
Town 5
City 5
Boat Ramp
Marina

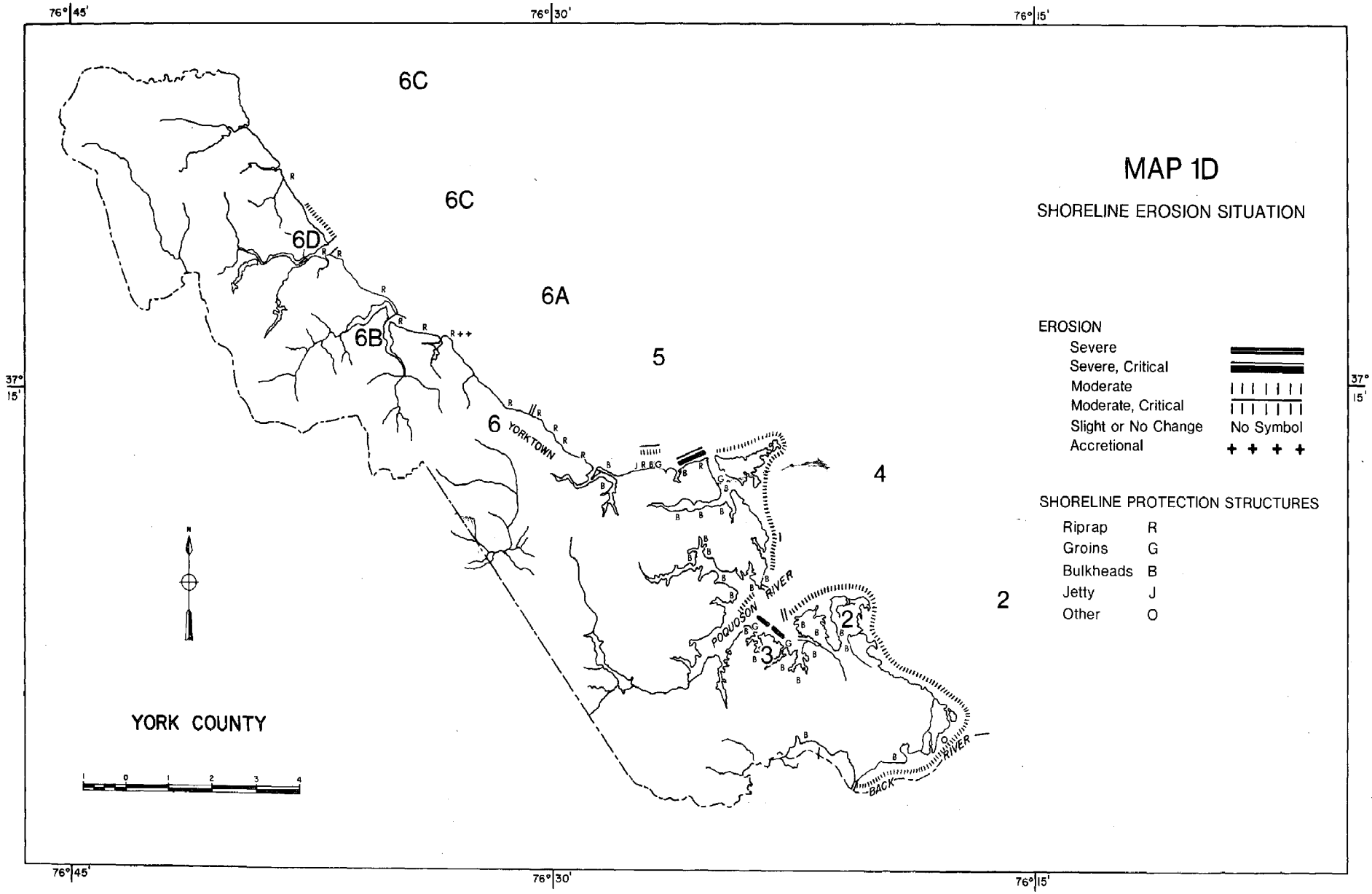

76° 45'
76° 30'
76° 15'
37° 15'
6C
6C
6D
6A
6B
5
6 YORKTOWN
4
2
3
POQUOSON RIVER
BACK RIVER
YORK COUNTY
0 1 2 3 4
MAP 1D
SHORELINE EROSION SITUATION
EROSION
Severe
Severe, Critical
Moderate
Moderate, Critical
Slight or No Change
No Symbol
Accretional
SHORELINE PROTECTION STRUCTURES
Riprap R
Groins G
Bulkheads B
Jetty J
Other O

TABLE 1. SUMMARY OF YORK COUNTY SHORELANDS PHYSIOGRAPHY, FASTLAND USE AND OWNERSHIP (STATUTE MILES)

Physiographic, use and ownership classification / Subsegment	SHORELANDS PHYSIOGRAPHY													FASTLANDS USE							OWNERSHIP			TOTAL MILES
	FASTLANDS					SHORE					NEARSHORE													
	LOW SHORE	LOW SHORE WITH BLUFF	MODERATELY LOW SHORE WITH BLUFF	MODERATELY HIGH SHORE WITH BLUFF	HIGH SHORE WITH BLUFF	BEACH	FRINGE MARSH	EXTENSIVE MARSH	EMBAYED MARSH	ARTIFICIALLY STABILIZED	NARROW	INTERMEDIATE	WIDE	COMMERCIAL	INDUSTRIAL	PRESERVED	GOVERNMENTAL	RECREATIONAL	RESIDENTIAL	UNMANAGED	PRIVATE	CITY	FEDERAL	
1	4.6							4.6											4.6		4.6			4.6
2	18.7					7.0		11.7			8.1	1.6	9.0	0.2		15.7				2.8	4.7		14.0	18.7
3	92.2		4.8			6.7	76.0	5.6		8.7	0.7	5.0		4.8					92.2		97.0			97.0
4	22.1					1.0	11.9	8.6		0.6		4.2	1.6	0.7	0.4				21.0		22.1			22.1
5	1.0		3.6	3.5	3.5	2.2	6.2			3.2	2.0	4.7		1.2	1.2		4.6		4.6		7.0	0.4	4.2	11.6
6A		1.8	2.0	1.4		0.5	0.4			4.3	1.6	3.6					5.2						5.2	5.2
6B			9.7			0.5	1.4		7.8								9.7						9.7	9.7
6C		9.8		5.0		1.2	4.6	1.0	6.8	1.2	3.4	5.2					14.8						14.8	14.8
6D		5.0	2.0	4.0					11.0								6.0	2.0	3.0		5.0		6.0	11.0
TOTAL	138.6	16.6	22.1	13.9	3.5	19.1	100.5	32.5	25.6	18.0	12.7	24.3	10.6	6.9	1.6	15.7	40.3	2.0	125.4	2.8	140.4	0.4	53.9	194.7
% of SHORELINE	71.2	9.5	11.3	7.0	1.0	9.8	51.6	16.3	13.1	9.2	6.5	12.5	5.4	3.5	0.8	8.0	20.7	1.0	64.4	1.4	72.1	0.2	27.7	100.0

CHAPTER 4

4.1 Table of Subsegment Summaries

4.2 Segment and Subsegment Descriptions

4.3 Segment and Subsegment Maps

4.1 Table of Subsegment Summaries

TABLE 2. SHORELINE SITUATION REPORT SUBSEGMENT SUMMARY FOR YORK COUNTY, VIRGINIA

SUBSEGMENT	SHORELANDS TYPE	SHORELANDS USE	OWNERSHIP	ZONING	FLOOD HAZARD	WATER QUALITY	BEACH QUALITY	SHORE EROSION SITUATION				POTENTIAL USE ENHANCEMENT
								RATE	ENDANGERED STRUCTURES	SHORE PROTECTIVE STRUCTURES	SUGGESTED ACTION	
1 BRICK KILN CREEK to SHELL POINT 24,500 feet	FASTLAND: Low shore. SHORE: Extensive marsh; dredge spoil piles. NEARSHORE: Back River is broad and shallow.	FASTLAND: Residential. SHORE: Mostly unused, some development. NEARSHORE: Water sports, commercial fishing.	Private.	Residential.	High, critical.	Unsatisfactory.	None.	Slight or none; noncritical.	None.	Effective 200-foot bulkhead.	None.	Low. Marsh areas should be left in their natural state.
2 TIN SHELL POINT to BENNETT CREEK 83,100 feet	FASTLAND: Low shore. SHORE: Extensive marsh with some fringe beaches. NEARSHORE: One-third borders Back River channel; the rest is Poquoson Flats.	FASTLAND: Commercial, governmental, and unmanaged, wooded. SHORE: Recreational and Plumtree Island Wildlife Refuge. NEARSHORE: Boating, sport fishing, commercial fishing.	Private and Federal.	Commercial, Residential, Federal.	High, critical.	Unsatisfactory.	Poor. All beaches are thin, narrow, and generally covered by high tide waters.	Moderate; noncritical.	None.	Well maintained bulkhead; effective breakwater.	None.	Low. Area should not be developed any further, marsh lands should be left as they are. Nature walk across Blackwalnut Ridge could be valuable to public recreation.
3 BENNETT CREEK to YORK POINT 512,160 feet	FASTLAND: Low shore and moderately low shore. SHORE: Fringe and extensive marsh, beach and artificially stabilized shoreline. NEARSHORE: Mostly intermediate width, some wide.	FASTLAND: Residential - 95%, commercial - 5% (6 marinas). SHORE: Private recreation. NEARSHORE: Water sports, commercial fishing.	Private.	Commercial, Residential.	High, critical.	Intermediate.	Poor. All beaches are small, narrow, and thin.	Severe to none, noncritical.	None.	Fairly effective wooden bulkhead, some concrete riprap.	Discourage installation of structures, encourage natural marsh grass growth where feasible.	Low. Marsh should be left as it is due to its natural water cleansing, wildlife and marine sheltering and natural erosion protection.
4 YORK POINT to the THOMPARE 116,640 feet	FASTLAND: Low shore. SHORE: Extensive and fringe marsh, pocket beaches, and artificially stabilized shoreline. NEARSHORE: Intermediate to wide.	FASTLAND: Residential - 95%, commercial - 3%, industrial - 2%. SHORE: Mostly private, some commercial boat access. NEARSHORE: Recreation, sport fishing, crabbing, commercial fishing, shellfishing.	Private.	Residential, Commercial, Industrial.	High, critical.	Intermediate.	Poor. The beaches are small, narrow, and thin.	Severe, noncritical, except Back Creek which is slight or none, noncritical.	None.	Effective bulkheading, and riprap.	Discourage cosmetic bulkheading; encourage natural marsh fringe.	Low. Every attempt should be made to preserve the natural state of the marshes.
5 THE THOMPARE to YORKTOWN CREEK 61,240 feet	FASTLAND: Moderately low shore - 31%, moderately high shore - 30%, low shore - 9%. SHORE: Fringe marsh and artificially stabilized shoreline. NEARSHORE: Narrow to intermediate width.	FASTLAND: Commercial, residential, governmental, industrial. SHORE: Public and private recreation. NEARSHORE: Water sports and commercial crabbing and clamming.	Private - 62%; Federal - 30%; City - 8%.	Commercial, Residential, Industrial, Federal.	Low, noncritical for most. High, critical for sections of Goodwin Neck and businesses of Yorktown.	Intermediate.	Good. Sand is clean, and the beach is wide and long.	Slight to severe, noncritical.	Picnic tables, one house.	Very effective areas of riprap; many bulkheads, usually in disrepair or cosmetic. Yorktown seawall is being undercut.	Bulkheads should be repaired or replaced by adequate size riprap. Groins should be placed to enhance the beach.	High in Yorktown Beach area. Improved swimming and parking areas could greatly help meet the demand for adequate, safe, and accessible public recreational facilities.
6A YORKTOWN CREEK to POLEY POINT 27,700 feet	FASTLAND: Moderately low shore - 38%; moderately high shore - 28%; and low shore - 34%. SHORE: Artificially stabilized - 83%; beach - 10%; and fringe marsh - 7%. NEARSHORE: Intermediate.	FASTLAND: Recreational, The Colonial National Historical Park and The Naval Weapons Station. SHORE: Sport fishing, crabbing, picnicking, sightseeing. NEARSHORE: Commercial crabbing and fishing, sport fishing, boating.	Federal - 85%; City - 15%.	Federal.	Low, noncritical.	Intermediate.	Poor to fair. Narrow and thin in front of Weapons Station. Fair by entrance to Yorktown Creek.	Slight, noncritical.	None.	Effective riprap covers about 83% of shoreline; 200-foot seawall not totally effective.	Strengthen the seawall or replace with riprap.	Low. Extensive riprap decreases potential for increased shore zone use. Proper engineering could create and maintain a larger beach in certain sections.
6B KING CREEK and PELATES CREEK 51,200 feet	FASTLAND: Moderately low shore. SHORE: Embayed marsh - 80%, fringe marsh - 15%, beach - 5%. CREEK: Shallow, shifting shoals at entrance.	FASTLAND: Naval Supply Depot (Cheatham Annex) and Yorktown Naval Weapons Station. SHORE: Cheatham Annex and Naval Weapons Station. CREEK: Crabbing, fishing.	Federal.	Federal.	Low, noncritical.	Intermediate.	None.	Slight to none; noncritical.	None.	None.	None.	Low. Present use precludes any changes or suggestions in that use.
6C CAMP PEARY and CHEATHAM ANNEX 132,000 feet	FASTLAND: Low shore and some moderately high shore with 20-foot cliffs. SHORE: Fringe, embayed, and extensive marsh, small beaches and artificially stabilized shoreline. NEARSHORE: Intermediate with soft, sandy-mud bottom.	FASTLAND: Camp Peary Naval Reservation and U.S. Naval Supply Center. SHORE: Controlled by Naval Reservation and Cheatham Annex. NEARSHORE: Commercial fishing and crabbing, gill netting, pound netting, sport fishing.	Federal.	Federal.	Low, noncritical.	Intermediate.	Fair to poor; used only by Camp Peary personnel.	Slight.	None.	Very effective rubble groin, bulkheads and rubble riprap. One ineffective bulkhead.	Planting of marsh grass in the breaches, or placement of large, stone riprap.	Low. Present use precludes any changes.
6D QUEEN CREEK	FASTLAND: Low shore, moderately high shore, and moderately low shore. SHORE: Embayed marsh. CREEK: Long, shallow, tidal creek.	FASTLAND: Governmental and residential. SHORE: Commercial (marina). CREEK: Crabbing and access to Queen Creek Marina.	Federal - 75%; Private - 25%.	Federal, Residential.	Medium, critical.	Intermediate.	None.	Slight to none, noncritical.	None.	Effective bulkheads at Queen Creek Marina. Decayed boat slips and piers at Camp Peary. Concrete rubble on marsh.	Posted and enforced speed limits in creek.	Low. Every attempt should be made to maintain the marshes in their natural state.

4.2 Segment and Subsegment Descriptions

BRICK KILN CREEK TO TIN SHELL POINT,

YORK COUNTY, VIRGINIA

SEGMENT 1 (Maps 1A, 1B, 1C)

EXTENT: 24,500 feet (4.6 mi.) from Brick Kiln Creek to Tin Shell Point.

SHORELANDS TYPE
FASTLAND: Entirely low shore.
SHORE: Extensive marsh, except for dredge spoil piles at Cedar Landing and Tin Shell Point.
NEARSHORE: The Back River in this section is broad and shallow (4 ft.).

SHORELANDS USE
FASTLAND: Primarily used for residential purposes.
SHORE: Except for encroaching developments, the marsh has been left in its natural state.
NEARSHORE: The Back River is used primarily by water sport enthusiasts and for some commercial fishing.

WIND AND SEA EXPOSURE: The Back River runs basically E - W. The fetch throughout the segment is $\frac{1}{2}$ mile or less.

OWNERSHIP: Private.

ZONING: Residential.

FLOOD HAZARD: High, critical. According to the Corps of Engineers Flood Hazard Report for the Town of Poquoson; this segment is subject to flooding from each of the projected flood levels covered in that report.

WATER QUALITY: Satisfactory.

BEACH QUALITY: There are no beaches in this segment.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight to none, noncritical.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: At Cedar Landing, there is a 200-foot, wooden, tongue and groove bulkhead. This well emplaced structure appears effective in retaining fill.

Suggested Action: None.

OTHER SHORE STRUCTURES: None.

POTENTIAL USE ENHANCEMENT: As the predominant shore type is extensive marsh, every effort should be made to preserve this valuable resource. These marshes provide numerous necessary biological functions in addition to the natural erosion protection properties.

MAPS: USGS, 7.5 Min.Ser. (Topo.), NEWPORT NEWS NORTH and HAMPTON Quadrs., 1965, photorevised 1970.
C&GS, #494, 1:40,000 scale, MOBJACK BAY and YORK RIVER ENTRANCE, 1971.

PHOTOS: Aerial-VIMS 30Apr73 YK-1 1-29.

TIN SHELL POINT TO BENNETT CREEK,

YORK COUNTY, VIRGINIA

SEGMENT 2 (Maps 1A, 1B, 1C and 2A, 2B, 2C)

EXTENT: Approximately 98,800 feet (8.7 mi.) from Tin Shell Point to Bennett Creek. The centerline of Bennett Creek is the dividing line between segments 2 and 3.

SHORELANDS TYPE
FASTLAND: Low shore.
SHORE: Extensive marsh with occasional fringe beaches.
NEARSHORE: The first third borders the Back River Channel whose depths range from 12 to 15 feet. From Flat Gut to Cow Island there are the extensive shallow Drum Island Flats and the Plumtree Bar. These flats have a varied shallow bathymetry with a soft muddy bottom.

SHORELANDS USE
FASTLAND: Commercial, governmental, and unmanaged, open.
SHORE: Recreational and the Plumtree Island Wildlife Refuge.
NEARSHORE: Boating, sport fishing, and extensive commercial fishing.

OFFSHORE: The channel entrance to the York River is bounded by the Poquoson Flats and the York Spit. Dredged channel depth is 40 feet.

ZONING: Commercial, Residential, and Federal.

WIND AND SEA EXPOSURE: There are three basic shore orientations in this segment. Tin Shell Point to Plumtree Island trends SW - NE, fetches are NE - 16 miles, E - 16 miles, and SE - unlimited through the bay mouth. Plumtree Island to Marsh Point trends SE - NW, fetches are SE - unlimited, E - 16 miles, and NE - 16 miles. The shoreline trend from Marsh Point to Cow Island is E - W, fetches are N - 12 miles, NE - 30 miles, and E - 16 miles.

OWNERSHIP: Private and Federal.

FLOOD HAZARD: High, critical. According to the Corps of Engineers Flood Hazard report for Poquoson, this area is susceptible to flooding from all predicted flood levels. This is due to the extreme lowness of the fastland area. Past storms (1933, 1962) have given graphic evidence to this very real hazard.

WATER QUALITY: Intermediate.

BEACH QUALITY: Poor. Thin, narrow, sand beaches exist at the outboard fringes of the Big Salt Marsh. These beaches are too small to support anything but limited recreational use.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Moderate, noncritical.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There is well maintained bulkheading at Amory's Wharf and Messick Point for protection of commercial ventures. One quarter mile south of Plumtree Island there is an effective, large stone, riprap breakwater.

Suggested Action: None.

OTHER SHORE STRUCTURES: None.

POTENTIAL USE ENHANCEMENT: The major portion of this segment is the Plumtree Island Wildlife Refuge, which precludes any other present day use. In other areas of the segment, encroachment by housing developments has covered and threatened to expand to use the marsh lands as building land in order to abate the growing housing pressure in York County and the Town of Poquoson. Every attempt should be made to keep these marshes as they are, for their natural water cleansing function in addition to their natural erosion control.

The marshes around Blackwalnut Ridge provide an excellent opportunity for observing the various types of marsh environments. With this valuable resource in close proximity to a growing urban and suburban population, the need arises to protect and preserve the area and use it for the education and recreation of the populace. Thus, consideration should be given to establishing a marsh nature walk through the Blackwalnut Ridge area. This would necessitate a planning study which would further outline environmental impact and design considerations. The result could be an unusual and valuable addition to the public recreational facilities of the area, as well as preserving one of Virginia's most valuable resources.

MAPS: USGS, 7.5 Min.Ser. (Topo.), POQUOSON EAST Quadr., 1964, photorevised 1970, and HAMPTON Quadr., 1965, photorevised 1970.
C&GS, #494, 1:40,000 scale, MOBJACK BAY and YORK RIVER ENTRANCE, 1972.

PHOTOS: Aerial-VIMS 30Apr73 YK-2 30-51;
VIMS 27Oct73 YK-2 52-72.

BENNETT CREEK TO YORK POINT, YORK COUNTY, VIRGINIA

SEGMENT 3

(Maps 2A, 2B, 2C, 3A, 3B, 3C and 4A, 4B, 4C)

EXTENT: 512,160 feet (97 mi.) from Bennett Creek to York Point. The centerline of Bennett Creek is the dividing line between segments 2 and 3.

SHORELANDS TYPE

FASTLAND: All low shore except moderately low shore from Moores Creek to Harwoods Mill Reservoir.

SHORE: From Cow Island to Easton Cove is extensive marsh. From Easton Cove to Roberts Creek is fringe marsh with several sections being artificially stabilized. From Roberts Creek to Hunts Point is beach backed by artificial stabilizers with some fringe marsh near the mouth of Roberts Creek. From Hunts Point to Hodges Cove is fringe marsh with an occasional section of artificially stabilized shore. From Hodges Cove to Ship Point is beach with a small section of fringe marsh in the middle. From Ship Point to York Point the shore is fringe marsh with some artificially stabilized portions.

NEARSHORE: Most of the segment falls within the intermediate range except for the portion from Hodges Cove to Ship Point where the nearshore zone is narrow. From off of Calthrop Neck to the mouth of the Poquoson River there is a 300-yard wide, 10-foot deep, channel.

SHORELANDS USE

FASTLAND: Primarily residential (95%) except for 4 commercial marinas in Chisman Creek and 2 in White House Cove (5%).

SHORE: Except in the cases of pier accesses and bulkheaded waterfront, shore use is limited by the extensive fringe marsh within the segment. Those sections with beaches are used for private recreational purposes by the landowners.

NEARSHORE: The nearshore zone is used extensively for water sports as well as commercial access by watermen.

OFFSHORE: There is a 750-foot wide channel which runs from the mouth of the Poquoson River to Buoy "2" where it joins the York River Channel. Depths range from 16 feet near the Poquoson River to 30 feet near the York River Channel.

WIND AND SEA EXPOSURE: There is no one shore orientation for the segment. Chisman Creek basically lies E - W, the Poquoson River lies SW - NE. Griffins Beach to Hunts Point trends E - W, fetches for this section are NW - 2 miles, N - 8 miles, NE - 28 miles, and E - 20 miles. Hodges Cove to Ship Point trends N - S, fetches are NE - 28 miles and E - 22 miles. Only the two areas which have demonstrated previous moderate and severe erosion will be discussed here.

OWNERSHIP: Private.

ZONING: Commercial and Residential.

FLOOD HAZARD: High, critical. The Army Corps of Engineers Coastal Flooding Report for the Town of Poquoson indicates a severe flood hazard potential for the entire segment. Past storms have inundated major portions of the Town of Poquoson. Those residences and businesses located below an elevation of 9.0 feet above mean sea level can expect to be flooded at least once in the next 100 years. Those residences and businesses situated below the 7-foot contour can expect to be flooded at least once in the next 25 years.

WATER QUALITY: Intermediate.

BEACH QUALITY: Poor. Small beaches exist between Griffins Beach and Hunts Point and between Hodges Cove and Ship Point. They are thin, narrow, and generally covered by high tide waters. They primarily exist through replenishment from local sources of erosion rather than as a part of a definite long shore drift mechanism.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Severe to none, noncritical. Historically those areas most affected by erosion are located between Griffins Beach and Hunts Point (3.6 ft/yr.) and between the cove south of Hodges Cove and Ship Point (1.5 ft/yr.). Present day evidences of erosion still persist despite attempts to slow its encroachment. Elsewhere, erosion has been or is now, slight or no change.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: It is difficult to give the exact number of shoreline structures within this segment. From aerial photos and spot checks it is known there are in excess of 110 sets of shoreline protective structures. The predominant type of structure is wooden bulkheading. There are a few sites where concrete rubble riprap has been employed. In most cases the structures are used for cosmetic purposes or to abate boat wake erosion, the latter being particularly so in housing development canals. Again, between Griffins Beach and Hunts Point and between Hodges Cove and Ship Point the structures are in response to definite erosion problems. Most of the bulkheading and riprapping is doing an effective job in retaining backfill or reducing boat wake erosion. Those structures in the areas of definite erosion problems are moderately effective. Extreme exposure and limited sand supply will continue to make them marginally effective.

Suggested Action: Except in the previously defined areas of erosion, installation of structures should be discouraged unless a definite need is established. Rather, the encouragement of natural marsh grasses through transplanting and fertilizing should be implemented. Even in relatively high energy areas such as between Hodges Cove and Ship Point, existent stands of marsh grass have done an excellent job of preventing erosion. In those areas such as some of the narrower housing development canals where grasses might prove impractical, placed riprap stone and filter cloth is recommended. In most cases this variegated face is more effective in reducing wave energy than bulkheading. Also, it provides numerous shelters for crabs, small fishes, and other marine organisms, and has the ability to relieve ground water pressure more readily than bulkheading. Even within these canals a natural stand of supratidal marsh grasses will tend to grow along the fastland near the canal. Rather than being considered an eyesore, the root systems of these grasses and trees act to hold the soil in place.

OTHER SHORE STRUCTURES: There are numerous piers along the shore of this segment.

POTENTIAL USE ENHANCEMENT: Low. Although fringe marsh precludes direct use of the shore, its natural water cleansing, wildlife and marine life sheltering, and natural erosion protection characteristics are much more valuable than those sections of shore bulkheaded for cosmetic purposes.

MAPS: USGS, 7.5 Min.Ser. (Topo.), POQUOSON EAST Quadr., 1964, photorevised 1970 and POQUOSON WEST Quadr., 1965, photorevised 1970.
C&GS, #494, 1:40,000 scale, MOBJACK BAY and YORK RIVER ENTRANCE, 1971.

PHOTOS: Aerial-VIMS 30Apr73 YK-3 73-185.

Ground - VIMS 4Feb74 YK-3 158-164.

YORK POINT TO THE THOROFARE, YORK COUNTY, VIRGINIA

SEGMENT 4 (Maps 4A, 4B, 4C and 5A, 5B, 5C)

EXTENT: 116,640 feet (22.1 mi.) from York Point to the western shore of the Thorofare. It includes Back Creek, the Goodwin Islands, Claxton Creek, Bay Tree Creek, and the intervening shore.

SHORELANDS TYPE

FASTLAND: Entirely low shore.

SHORE: The shore zone consists mainly of two types of marsh, fringing and extensive. The major portions of extensive marsh occur at the Goodwin Islands, 206 acres, and Bay Tree Marsh, 252 acres. With the exception of a few small pocket beaches and those portions artificially stabilized, the rest of the shore is fringe marsh. The small pocket beaches occur along the western side of the Thorofare near Goodwin Neck Estates and in front of Bay Tree Marsh from York Point to Green Point.

NEARSHORE: For the most part, the nearshore zone is intermediate except off the southeast side of Tue Point where the nearshore zone is wide and in excess of 2,800 yards. Between the Goodwin Islands and Goodwin Neck, through the Thorofare, there is a 1,700-yard long, 60-foot wide, and 4-foot deep, dredged channel. This connects to a deeper natural channel which enters Poquoson Bay to the York River. A branch of this natural channel extends approximately one-half mile up into Back Creek.

SHORELANDS USE

FASTLAND: The primary use of this segment is residential (95%) with a small section of Back Creek being used for commercial (3%) and industrial (2%) purposes. The Goodwin Islands are not used at the present.

SHORE: Due to the large percentage of marsh (92%) which covers the shore of this segment, shore use is limited to private and some commercial boat access, these activities being restricted to those portions of the shore which have been altered by structures, such as piers and bulkheading. Less than 3% of the shore is beach thus affording limited recreational use.

NEARSHORE: Within Back Creek the nearshore zone is used primarily for recreation and some fishing and crabbing. The nearshore waters in and around the Goodwin Islands are used for commercial fishing and shellfishing.

OFFSHORE: The deep water channel for the York River runs $\frac{3}{4}$ of a mile north of the Goodwin Islands and the channel between York Spit and Poquoson Flats is 4 miles off the Goodwin Islands. Inshore of this channel are extensive flats and shallows used for gill netting, pound netting, crabbing, and clamming. The deep waters of the York Channel are often the fishing sites of several menhaden boats.

WIND AND SEA EXPOSURE: Excluding the creeks and the Goodwin Islands the bay front portions of the shore generally have a NW - SE orientation. Back Creek trends E - W. Fetches for the Goodwin Islands are NW - 3 miles, N - 3 miles, NE - 10 miles, E - 20 miles, SE - 30 miles, and S - 1 mile. Fetches for the Bay fronting shore are N - 1 mile, NE - 22 miles, E - 19 miles, and SE - 20 miles.

OWNERSHIP: Private.

ZONING: Residential, with a limited amount of industrial and commercial in Back Creek.

FLOOD HAZARD: High, critical, due to the extreme lowness of the fastland area. All structures are below the 7-foot contour. According to the Corps of Engineers Flood Hazard report for Poquoson, this area is susceptible to flooding from all predicted flood levels. Past storms (1933, 1962) have given graphic evidence to this very real hazard.

WATER QUALITY: Intermediate.

BEACH QUALITY: The few beaches in this segment are all small, narrow, and thin. The beach in front of the bulkhead at Goodwin Neck Estates is approximately 350 feet long, 15 to 20 feet wide (MHW) and thin. It is enclosed on either end by fringe marsh. The physical characteristics of the pocket beaches which occur at breaches in the marsh front from York Point to Green Point are similar to those described at Goodwin Neck Estates, the only difference being the absence of bulkheading behind the beach.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Portions of the shore within this segment have undergone severe erosion. Overall the segment has lost approximately 360 acres of land in the last 100 years. That being most severely eroded (3.9 ft/yr.) is the portion between York Point and Green Point. Here the overall shoreline retreat ranges from 200 feet to almost 350 feet. In this same 100-year span the Goodwin Islands have lost approximately 110 acres.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: Of this segment, 5,870 feet of the shoreline is protected. Of this, 5,600 feet is bulkheaded, with the remainder being riprapped. Except for the structures along the Thorofare and at York Point, the purpose of the structures is cosmetic and in and around marinas to prevent boat wake erosion. All structures are working well.

Suggested Action: Except in those areas which display a definite erosion problem, cosmetic bulkheading should be discouraged. The natural marsh fringe provides good erosion protection in addition to providing natural water cleansing.

OTHER SHORE STRUCTURES: None.

POTENTIAL USE ENHANCEMENT: Low. Every attempt should be made to preserve the natural state of the marshes. Upland areas should be used to meet the growing demand for suburban housing.

MAPS: USGS, 7.5 Min.Ser. (Topo.), POQUOSON WEST Quadr., 1965, photorevised 1970.
C&GS, #494, 1:40,000 scale, MOBJACK BAY and YORK RIVER ENTRANCE, 1971.

PHOTOS: Aerial-VIMS 30Apr73 YK-4 159-233;
VIMS 10Sep73 YK-4 454-465.

Ground - VIMS 28Aug73 YK-4 152-157.

THE THOROFARE TO YORKTOWN CREEK,

YORK COUNTY, VIRGINIA

SEGMENT 5 (Maps 4A, 4B, 4C and 5A, 5B, 5C)

EXTENT: 61,240 feet (11.6 mi.) from the Thorofare to Yorktown Creek. Includes the tidal creek shoreline of Wormley Creek (4.9 mi.).

SHORELANDS TYPE

FASTLAND: One mile of the York River portion of Goodwin Neck is low shore. The rest of the shoreline ranges from moderately low shore to high shore, characterized by a cliff immediately behind the shore zone. These cliffs range from 10 feet, near the American Oil Pier, to 60 feet, near the Yorktown Battlefield shore.

SHORE: The dominant feature of this zone is the extensive sections of artificially stabilized shore. Approximately 2.5 miles of the shore is covered by shoreline defense structures with the majority, 67%, being riprap. Elsewhere on the York River portion of segment 5, the unprotected sections are beaches. Small growths of fringe marsh occur near the mouth of Wormley Creek. Within Wormley Creek most of the shore is fringe marsh. The other portion is protected by bulkheading. Except at Wormley Creek marina, this bulkheading is cosmetic.

NEARSHORE: The nearshore ranges from narrow, near the George P. Coleman bridge, to intermediate off the Thorofare. The limits of this range are 20 yards under the bridge to 600 yards off the Thorofare. It is generally characterized by a gently sloping, shallow shelf with a sandy bottom, except near the Thorofare where the bottom is soft sandy-mud.

SHORELANDS USE

FASTLAND: The fastland within this segment is used in a variety of ways. In Yorktown proper there is commercial and residential use. Adjacent to this on the south is the National Park Service property which in turn bounds the Coast Guard Reserve Training Center facility. The south shore of the West Branch of Wormley Creek is a residential area. The north shore of the West Branch is part of the Coast Guard Reserve Training Center facility. Wormley Creek proper is used residentially and a small portion commercially in the form of Wormley Creek marina. The York River portion of Goodwin Neck is used primarily by industry. Directly on the shore between the American Oil Company property and VEPCO properties is a section of private residential houses.

SHORE: Yorktown and the National Park Services shore zone is used primarily as a recreational beach. This beach is one of only a few adequate public beaches in the area. It receives extensive use by local residents as well as heavy tourist usage. The National Park Service has provided a well managed and policed picnic area behind the portion of the shore wide enough to support such a facility. The shore zone from the Colonial National Historical Park picnic area to Wormley Creek is 90% artificially stabilized. Some recreational use is made of the small beach on the north side of the Coast Guard Pier. Wormley Creek shore is primarily used for private recreation such as fishing, birdwatching, and mooring of private boats. Wormley Creek Marina, near the entrance to Wormley Creek, is entirely artificially stabilized. The shore from Wormley Creek to the Thorofare has a varied physiographic make up which reflects its use. Some private recreational use is made of the beach portion fronting the tank farm. Small pocket beaches also exist in front of the residences at the end of Goodwin Neck which are used for private recreation.

NEARSHORE: In permitted areas the nearshore zone is used extensively for commercial crabbing and clamming. In front of the Yorktown beach the nearshore zone is used extensively for swimming and other water sports.

OFFSHORE: The offshore zone is also used extensively for commercial shellfishing. There is also extensive recreational boating and sport fishing during the appropriate seasons. Recreational boating during the summer months is particularly heavy. In the deep portions of the York River Channel, again according to the season, there is heavy menhaden fishing. Throughout the year numerous Navy ships and oil tankers use the York River Channel to supply and resupply the Naval Weapons Station and the Goodwin Neck Tank Farm.

WIND AND SEA EXPOSURE: The shore is basically oriented E - W. Fetches are NW - 2⅛ miles, N - 2 miles, NE - 8 miles, and E - 20 miles.

OWNERSHIP: Private - 62%; Federal - 30%, City - 8%.

ZONING: Commercial, Residential, Industrial, Federal, and City.

FLOOD HAZARD: Low, noncritical, for most of the segment, as structures are above the maximum range of the projected 100-year storm. High, critical, for the outer sections of Goodwin Neck and the business section of Yorktown, which are threatened by the projected 25 and 100-year flood levels.

WATER QUALITY: Satisfactory.

BEACH QUALITY: The beach of Yorktown is good. Sand is clean, the beach is wide and it is relatively long. The beaches on Goodwin Neck are small and thin but generally clean. At present they are used primarily for private recreational purposes, but with enhancement they could be expanded to support higher density recreational use.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight to severe, critical. The erosion rate for this segment ranges from 0.7 to 3.5 feet per year. Due to the considerable implementation of shoreline protective structures present day erosion has been checked in much of the segment. Severe erosion still continues between the tank farm settling pond outfall and the residences at the end of Goodwin Neck. There is also severe erosion at the Colonial National Historical picnic area in Yorktown.

ENDANGERED STRUCTURES: Some of the picnic tables near the erosion scarp at the picnic area in Yorktown are being threatened. One house on Goodwin Neck is threatened by flanking of its concrete rubble riprap.

SHORE PROTECTIVE STRUCTURES: Riprap is employed in three areas in this segment. There is a small concrete rubble pile at the Yorktown boat ramp and another between the George P. Coleman Bridge support and the Yorktown Post Office. The most extensive implementation of riprap (4,800 ft.) occurs at the base of the headlands next to the Park Service picnic area and along the cliffs of the Colonial National Historical Park to its terminus 600 feet from the Coast Guard pier. Elsewhere there are approximately

30 bulkhead installations. The 660 feet of stone bulkhead in front of Cornwallis' Cave is being undercut. Between Wormley Creek and the Thorofare there are 20 bulkheads in various states of disrepair. Within Wormley Creek there are eight, well constructed bulkheads used primarily for cosmetic purposes.

Suggested Action: To avert additional damage, the York River bulkheads should be either replaced or repaired. Those individuals whose bulkheads are destroyed or in disrepair might consider the use of properly placed, adequate size riprap, if they are only concerned with stopping erosion. However, the enhancement of a beach in this area would require groins. Due to the extensive amount of shoreline protection in this segment and that a significant amount of the beach sand is supplied by local sources of erosion, only properly designed and constructed groins would be of any value.

OTHER SHORE STRUCTURES: There are two large piers, one at the Coast Guard Reserve Training Center and the other services the large tankers at AMOCO Tank Farm. The VEPCO Power Station has two large, sheet pile jetties, used as an intake duct. The concrete pilings and platform, in Yorktown, support the Wharf Restaurant and the Yorktown Post Office. The George P. Coleman Bridge, world's largest double-swing, single-span bridge, is found in this segment. There are several old piers and unused pilings near a boat ramp in Yorktown.

POTENTIAL USE ENHANCEMENT: The section of this segment with the most potential for full and increased use of its shoreline is the Yorktown area. At present it is one of only two public recreational beaches on the Peninsula. The ever increasing suburban population of York County and the Peninsula will demand adequate, safe and accessible public beaches. Two of these criteria, however, are not being fully met. Certain portions of the Yorktown beach are not safe for average swimmers, in particular, the area near the Yorktown Post Office. Here the bottom drops off to deep water quickly and quite close to the shore. Besides this hazard, during the high velocity portions of the tidal cycle strong offshore currents are present. A restricted and guarded swimming area should be established starting 400 feet east of the post office. This roped off area should extend to approximately the 8-foot contour. This would also alleviate the hazard of boaters straying close to a heavily used swimming area.

The other problem is not as easily remedied. It represents a problem throughout Yorktown, access and parking, the latter being the most serious. No easy solution is apparent without a redesign of the downtown portion of Yorktown. Due to the present limited parking, people in their desire to use the beach and commercial facilities are forced to park anywhere they can. Many times these are not the safest areas. Two possible, although expensive, solutions would be to build a multilevel parking ramp up against the bluff, and/or to tunnel into the bluff and provide underground parking. The solution to the access problem is directly tied to the solution of the parking problem.

Other increased use facilities which might be considered are a fishing pier, a service marina, a boardwalk, a nature walk on Yorktown Creek, bicycle facilities, etc. The employment of a professional coastal zone development planner is recommended, not only to use the area more efficiently under present demands but also to meet the extreme demands that will be placed upon Yorktown during the Bicentennial Celebration. If properly prepared the Yorktown area could serve as a model of a well thought out tourist and recreational facility. This would not only meet the increased demands of the tourists but more adequately serve the resident population.

MAPS: USGS, 7.5 Min.Ser. (Topo.), POQUOSON WEST and YORKTOWN Quadrs., 1965, photorevised 1970. C&GS, #494, 1:40,000 scale, MOBJACK BAY and YORK RIVER ENTRANCE, 1970.

PHOTOS: Aerial-VIMS 30Apr73 YK-5 234-286, 317-323;
VIMS 27Oct73 YK-5 287-301, 305-306;
VIMS 10Sep73 YK-5 442-453.

Ground - VIMS 1Jun73 YK-5 81-127;
VIMS 28Aug73 YK-5 128-151.

YORKTOWN CREEK TO POLEY POINT,

YORK COUNTY, VIRGINIA

SUBSEGMENT 6A (Maps 6A, 6B, 6C)

EXTENT: Approximately 27,700 feet (5¼ mi.), excluding the small creeks.

SHORELANDS TYPE

FASTLAND: Moderately low shore 38% (1.9 mi.), low shore 34% (1.7 mi.), and moderately high shore 28% (1.4 mi.). The fastland is characterized at the shore by a 10 to 20-foot bluff, except at and near the entrances to the small tidal creeks.

SHORE: Artificially stabilized 83% (4.5 mi.), beach 10% (0.5 mi.), and fringe marsh 7% (0.4 mi.).

NEARSHORE: Intermediate. The nearshore zone varies in width from 1,300 yards off Poley Point to 100 yards off Yorktown Creek. The nearshore zone is a gently sloping, muddy-sand terrace which increases its slope at about the 12-foot contour, here it falls off into the York River Channel.

SHORELANDS USE

FASTLAND: The fastland immediately adjacent to the shore is used for recreation. The Colonial National Historical Park controls 85% and the other 15% is controlled by the Town of Yorktown. Immediately inland from the 400-foot strip, which the Colonial National Historical Park controls, is the Naval Weapons Station.

SHORE: At those points along the Colonial Parkway where there is public access, the shore is utilized for extensive sport fishing, crabbing, picnicking, and sightseeing.

NEARSHORE: The shallow nearshore zone is used extensively for commercial crabbing and fishing and by numerous sport fishermen and boaters. The area nearshore is closed to persons not having a shellfish permit. This is due to the treated sewage which enters Yorktown Creek at its head waters.

OFFSHORE: Offshore is the York River Channel. The Channel is 1,100 yards wide and with an average depth of 45 feet off Poley Point. It is approximately 800 yards wide, with an average depth of 60 feet off Yorktown Creek. Approximately three miles of this channel is restricted as noted on C&GS chart 495.

WIND AND SEA EXPOSURE: This extent of shore displays two orientations. From Poley Point to Sandy Point the shore is oriented WNW - ESE. Fetches are NW - 21 miles, N - 3 miles, and NE - 2 miles. From Sandy Point to Yorktown Creek the shoreline trend is NW - SE. Fetches are N - 2½ miles, NE - 2 miles, E - 1½ miles, and ESE - 14 miles.

OWNERSHIP: Federal - 85%; City - 15%.

ZONING: Federal.

WATER QUALITY: Unsatisfactory.

BEACH QUALITY: The beaches fronting the Naval Weapons Station section of the subsegment are poor. They are narrow, thin, and front highly vegetated, 25-foot bluffs. The sand and beach material is very coarse with a large percentage of shell fragments. The beach by the entrance to Yorktown Creek is fair. Sand is clean and light colored, but the beach is relatively narrow and undergoing slight erosion. Effluent from the Colonial National Historical Park enters the York River through Yorktown Creek.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight, noncritical. Erosion in the past has been quite severe along this subsegment. The rate ranges from 0.6 to 1.7 feet per year. This is quite marked considering that a 25-foot cliff was being eroded. There is very little present erosion due to the extensive amount of shore protective structures employed in this subsegment. The small beach which borders the entrance to Yorktown Creek is being eroded slightly.

ENDANGERED STRUCTURES: None provided present shoreline protective structures remain working.

SHORE PROTECTIVE STRUCTURES: Of the York River shoreline within this subsegment, 83% has been artificially stabilized. This 4¼ miles of shoreline protection is almost all well placed, effective riprap. There is a short section, approximately 200 feet, of jeopardized seawall protecting the houses at the southern end of the York River Cliffs. Continuous riprap extends from inside the mouth of Felgates Creek to Sandy Point. Riprap begins again behind Sandy Point marsh and extends to Sandy Point. These sections of riprap are all large, placed stone. The next section of riprap, about 200 feet of small stone, starts approximately 200 yards down river from the Naval Weapons Station pier. The headland on the north flank of the entrance to Ballard Creek is protected by approximately 500 feet of large stone riprap. Beginning at the south flank of Ballard Creek entrance, along the York River Cliffs and to the previously mentioned seawall, there is approximately 2,200 feet of heavy stone riprap.

Suggested Action: The seawalled section of this subsegment is the only portion which could be strengthened. The center portion of it has been breached and recently replaced with concrete bags. The bags appear to be working but because they are not secured to each other by any other means than weight and cohesion by the set cement, large wind generated waves during high water storm conditions could breach the structure again. The entire length of seawall has not been backfilled and has allowed some flanking on its southern end. There are also several cracks through the seawall which would have to be repaired before backfill could be held within the structure. To prevent the associated problems of mating dissimilar types of structures and materials, consideration should be given to replacing the jeopardized seawalls by Yorktown Creek with riprap and filter cloth. A system of shoreline defense structures possibly incorporating riprap should be designed for the beach adjacent to Yorktown Creek.

OTHER SHORE STRUCTURES: The only other shore structures present are the two large piers at the Naval Weapons Station. The large closed pier encompasses a section of the York River approximately 2,200 feet by 1,800 feet and the second singular pier extends approximately 1,600 feet out into the York.

POTENTIAL USE ENHANCEMENT: Low. Restricted access as well as the extensive amount of riprapping do not allow increased use of the shore zone. The Colonial National Historical Parkway has maximized the use of the unrestricted portions of the subsegment.

MAPS: USGS, 7.5 Min.Ser. (Topo.), YORKTOWN and CLAY BANK Quadrs., 1965, photorevised 1970 and 1972.
C&GS, #495, 1:40,000 scale, YORK RIVER, Yorktown to West Point, 1971.

PHOTOS: Aerial-VIMS 10Oct72 YK-6A 307-316, 351-352, 360-361, 367;
VIMS 27Oct72 YK-6A 302-304, 366, 368;
VIMS 30Apr73 YK-6A 324-350, 353-359, 362-365;
VIMS 10Sep73 YK-6A 441.

Ground - VIMS 24May73 YK-6A 55-59;
VIMS 1Jun73 YK-6A 60-80.

KING CREEK AND FELGATES CREEK,

YORK COUNTY, VIRGINIA

SUBSEGMENT 6B (Maps 6A, 6B, 6C and 7A, 7B, 7C)

EXTENT: 51,200 feet (9.6 mi.), tidal creek shoreline of King Creek and Felgates Creek.

SHORELANDS TYPE
FASTLAND: Moderately low shore.
SHORE: Embayed marsh (80%), fringe marsh (15%), and beach (5%).
CREEK: Shallow, shifting shoals at entrance.

SHORELANDS USE
FASTLAND: The north shore of King Creek is used by the Naval Supply Depot (Cheatham Annex). The south shore and Felgates Creek are used by Yorktown Naval Weapons Station.
SHORE: Used entirely by Cheatham Annex and the Naval Weapons Station.
CREEK: Crabbing and some fishing.

WIND AND SEA EXPOSURE: The shoreline of King Creek trends SW - NE. Felgates Creek trends S - N.

OWNERSHIP: Federal.

ZONING: Federal.

FLOOD HAZARD: Low, noncritical. Buildings and presently used land are situated well above projected flood levels.

WATER QUALITY: Unsatisfactory.

BEACH QUALITY: There are no beaches in this subsegment.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight to none, noncritical.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: None.

Suggested Action: None.

OTHER SHORE STRUCTURES: None.

POTENTIAL USE ENHANCEMENT: Present use by Cheatham Annex and the Naval Weapons Station precludes any changes or suggestions for change.

MAPS: USGS, 7.5 Min.Ser. (Topo.), CLAY BANK Quadr., 1965, photorevised 1972.
C&GS, #495, 1:40,000 scale, YORK RIVER, Yorktown to West Point, 1971.

PHOTOS: Aerial-VIMS 10Sep73 YK-6B 436-440.

Ground - VIMS 24May73 YK-6B 49-53.

CAMP PEARY AND CHEATHAM ANNEX,

YORK COUNTY, VIRGINIA

SUBSEGMENT 6C (Maps 7A, 7B, 7C and 8A, 8B, 8C)

EXTENT: Approximately 137,280 feet (26 mi.) from King Creek to Skimino Creek. Includes tidal creek shoreline of Skimino Creek and Carter Creek, but not Queen Creek.

SHORELANDS TYPE

FASTLAND: Mostly low shore (23 mi.), and some moderately high shore (2.5 mi.). The moderately high shore forms a 20-foot cliff at the shoreline.

SHORE: Fringe marsh (7 mi.) and embayed marsh (8.4 mi.) make up the majority of the shore type. There is also 1.2 miles of shoreline fronting Ferry Point, which is an extensive marsh. There are also several small pocket beaches (0.5 mi.) and some artificially stabilized shoreline (0.8 mi.).

NEARSHORE: Intermediate width. Ranging from 800 yards off Penniman Spit to more than 1,500 yards off Carter Creek. It is generally characterized by a gradually sloping, shallow shelf with a soft sandy-mud bottom.

SHORELANDS USE

FASTLAND: The entire extent of this subsegment is taken up by the Camp Peary Naval Reservation and the U.S. Naval Supply Center, Cheatham Annex.

SHORE: Entirely controlled by Camp Peary Naval Reservation and Cheatham Annex. Occasional military residences occupy the fastland but there are no accesses to the shore fronting the York River. The southern shore, at the mouth of Skimino Creek, is utilized as a picnic area and recreational beach for Camp Peary military personnel. Also at Cheatham Annex there are two large piers used as loading structures.

NEARSHORE: The nearshore zone is used extensively for commercial fishing. Heavy crabbing, gill netting, and pound netting are employed along the entire extent of this subsegment. Sport fishing is also popular along this subsegment.

OFFSHORE: There is one large bar offshore. It begins 2,200 yards offshore of the mouth of Skimino Creek and extends to approximately 200 yards off of Beaver Dam Swamp. The York River Channel varies from 2,300 yards off the mouth of Skimino Creek to 900 yards off Penniman Spit. From Skimino Creek to off Queen Creek the channel is 500 yards wide with an average depth of 35 feet. At Queen Creek it is 1,500 yards offshore and widens to approximately 1,000 yards, with depths ranging from 27 to 53 feet.

WIND AND SEA EXPOSURE: The York River portion of this subsegment trends NW - SE, fetches are N - 3 miles, NE - 2 miles, E - 3 miles, and SE - 6 miles. The tidal creeks generally trend E - W.

OWNERSHIP: Federal.

ZONING: Federal.

FLOOD HAZARD: Low. All structures within the subsegment are above predicted flood levels.

WATER QUALITY: Unsatisfactory.

BEACH QUALITY: Only two beaches of lengths more than one hundred feet exist within this subsegment. These are located at the entrance to Skimino Creek and at Penniman Spit at the entrance to King Creek. The Skimino Creek beach is a narrow, thin, eroding beach fronting the Ferry Point Marsh. It is used by Camp Peary personnel for recreation. The beach on Penniman Spit is a clean, narrow beach. The backshore is thickly vegetated. The extreme end and backside of Penniman Spit is bounded by a small fringing marsh.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight to moderate, noncritical. The historical rate of erosion for this subsegment is 0.9 to 2.6 feet per year. There are evidences of minor erosion at the mouth of Skimino Creek and several small sections of Camp Peary and Cheatham Annex shore. These small sections are usually directly behind a breach in the fringe marsh which bounds the York River shore of these two installations.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: Four percent (5,500 ft.) of the shoreline is artificially stabilized. There is one, 75-foot long, concrete rubble groin, flanking the south side of the entrance to Carter Creek. There are two bulkheads, one protecting a small building on the north side of the entrance to Carter Creek and the other, of approximately 200 feet, protects the bluff on the south side of the entrance to Queen Creek. Another 1,200 feet of riprap joins the previously mentioned bulkhead at Queen Creek. Its construction is concrete rubble, concrete cylinders, and stone. From Cheatham Annex pier north, approximately 1,500 feet consists of concrete rubble and large stone.

All structures except one are working well. The bulkheading on the south bank of the entrance to Queen Creek has several boards missing, is not backfilled, and is not properly tied to the riprap or the bluff.

Suggested Action: The few instances of unchecked erosion which exist behind breaches in the fringe marsh do not at this time present a serious problem. If action were taken, planting of marsh grass in the breaches would be the cheapest and easiest solution. If conventional techniques were used, large stone riprap would probably be the most effective. It also appears that much of the erosion is caused by land runoff rather than being entirely due to wave action at high water.

OTHER SHORE STRUCTURES: There are two open pile piers (2,800 ft. and 2,600 ft.) extending from the Cheatham Annex section of the subsegment, and several small fish traps along the Camp Peary section of the shore.

POTENTIAL USE ENHANCEMENT: Present day use of the fastland precludes suggesting any changes in that use.

MAPS: USGS, 7.5 Min.Ser. (Topo.), WILLIAMSBURG and CLAY BANK Quadrs., 1965, photorevised 1972. C&GS, #495, 1:40,000 scale, YORK RIVER, Yorktown to West Point, 1971.

PHOTOS: Aerial-VIMS 10Oct72 YK-6C 370-371, 374, 376, 380, 385;
VIMS 27Oct72 YK-6C 369, 372, 373, 375, 377-379, 381-384, 386, 387;
VIMS 10Sep73 YK-6C 394-421, 426-435.

Ground - VIMS 24May73 YK-6C 1-11, 28-32, 38-48, 54;
VIMS 17Jun73 YK-6C 12-27.

QUEEN CREEK, YORK COUNTY, VIRGINIA

SUBSEGMENT 6D (Maps 7A, 7B, 7C)

EXTENT: Queen Creek is a tidal creek with approximately 11 miles of shoreline. It is bounded on its north bank by Camp Peary and its south bank by Cheatham Annex.

SHORELANDS TYPE

FASTLAND: The north shore is approximately 5 miles of low shore. The south shore is approximately 4 miles of moderately high shore and 1½ miles of moderately low shore.

SHORE: Queen Creek is an embayed marsh of 580 acres.

CREEK: Long, narrow, tidal creek. The upper portion is shallow, the lower portion supports a maintained small boat channel and provides access to Queen Creek Marina. The channel is marked with day markers.

SHORELANDS USE

FASTLAND: The north shore is entirely government, used by Camp Peary. The south shore fastland is split between Cheatham Annex (3 mi.) and Queens Lake Development (2 mi.).

SHORE: The only section presently used is the Queen Creek Marina (40 slips).

CREEK: The creek is used for crabbing and as an access to Queen Creek Marina.

WIND AND SEA EXPOSURE: Queen Creek trends E - W with the mouth being the only portion affected by wind waves. Fetches are N - 4 miles, NE - 2½ miles, E - 3 miles, and SE - 6½ miles.

OWNERSHIP: Federal - 75%; Private - 25%.

ZONING: Federal - 75%; Residential - 25%, from the county line to the small gut which borders the east side of the Queen Lake development.

FLOOD HAZARD: Medium, critical. The Queen Creek Marina is highly susceptible to flooding by severe storms.

WATER QUALITY: Intermediate.

BEACH QUALITY: There are no beaches within Queen Creek.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or none, noncritical. No areas of significant erosion were noted, although there were evidences of minor marsh bank erosion, probably due to boat wakes. Historically the channel has changed its course but no data can be given on net loss or gain to the creek areas.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: The only presently maintained shore structures are the bulkheads, piers, and slips at the Queen Creek Marina. Several old decayed boat slips and piers exist on the Camp Peary shore of Queen Creek. These are in great disrepair and offer only marginal protection to the shore. On the south shore, near the mouth, there is an unexplained pile of concrete rubble which has been dumped on the marsh.

Suggested Action: The increase in demand for shorefront property has and will continue to make Queen Creek a desirable place to live. With this will come an increase in boating activity which leads to increased erosion of the marsh banks by boat wakes. Besides the loss of valuable marsh this erosion accelerates the filling of the creek making it less accessible to boats. Posted and enforced speed limits within the creek should be established.

OTHER SHORE STRUCTURES: Piers.

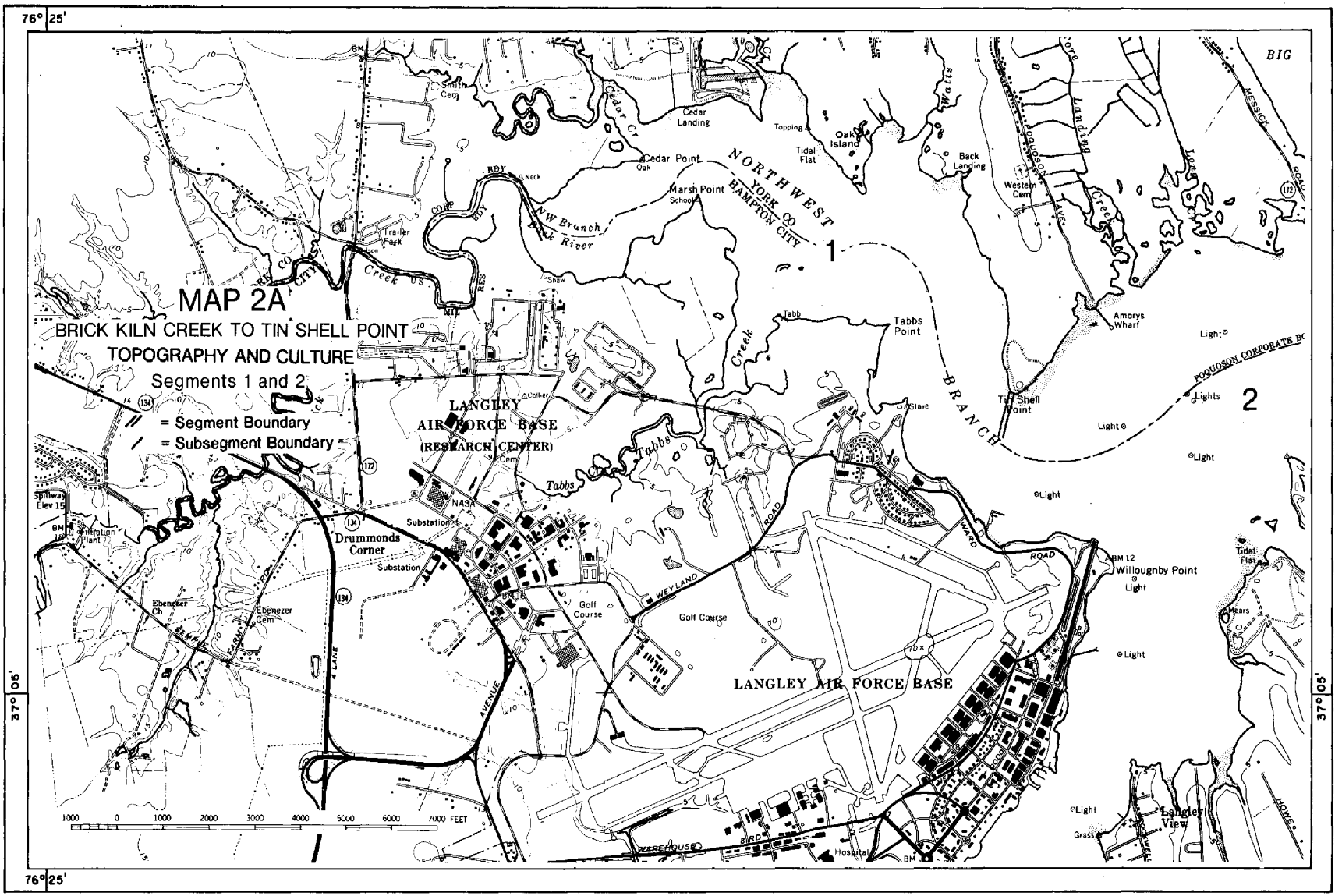
POTENTIAL USE ENHANCEMENT: Low. The increased number of housing developments should be restricted to upland areas. Every attempt should be made to maintain the marshes in their natural state. Boating facilities should be restricted to one central area, such as Queen Creek Marina. Although this concentrates a potential pollution hazard to a point source, it allows for a managed and guided use of the area. In this way destruction of the marsh areas by the construction of individual dredged canals can be prevented.

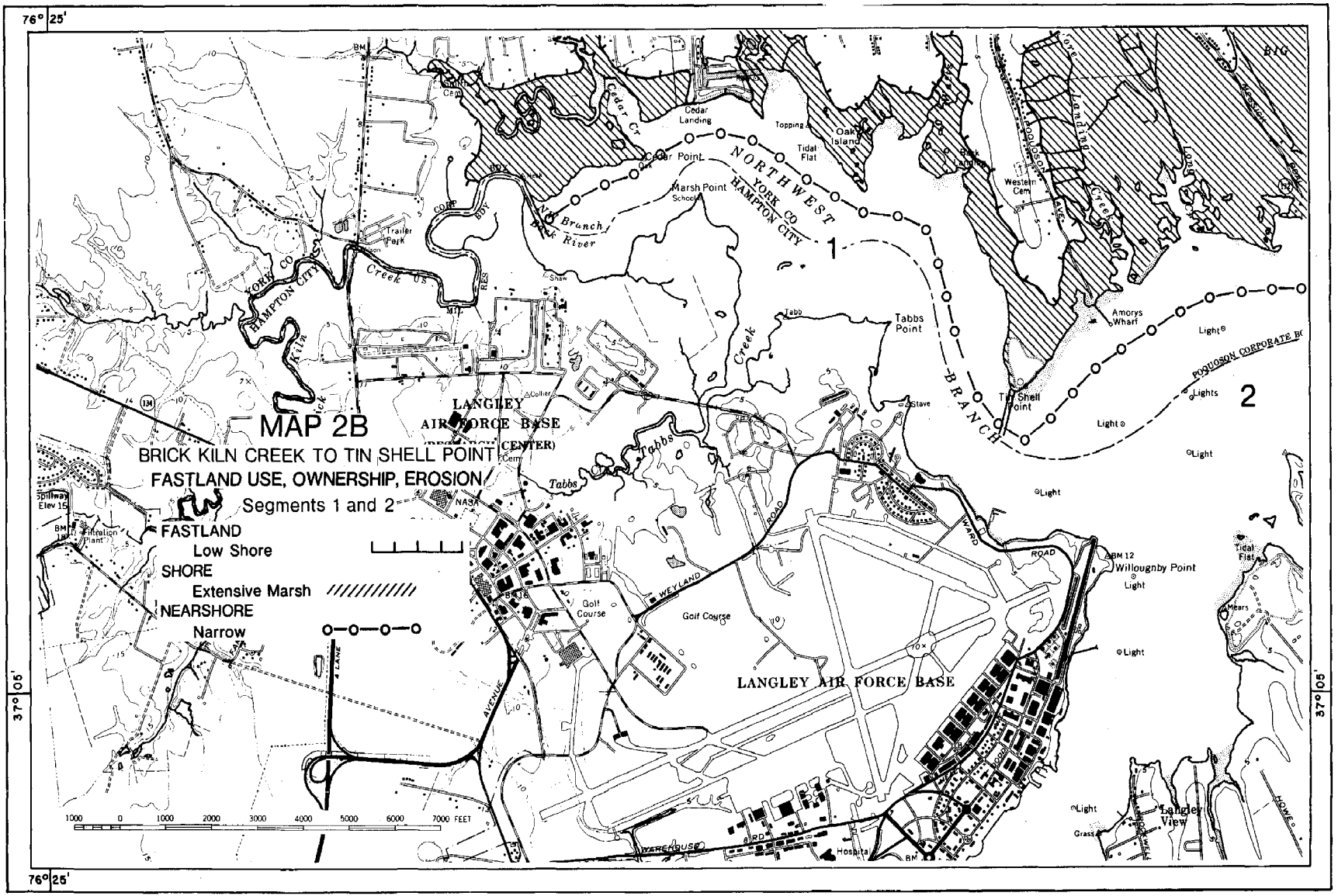
MAPS: USGS, 7.5 Min.Ser. (Topo.), WILLIAMSBURG and CLAY BANK Quadrs., 1965, photorevised 1972.
C&GS, #495, 1:40,000 scale, YORK RIVER, Yorktown to West Point, 1971.

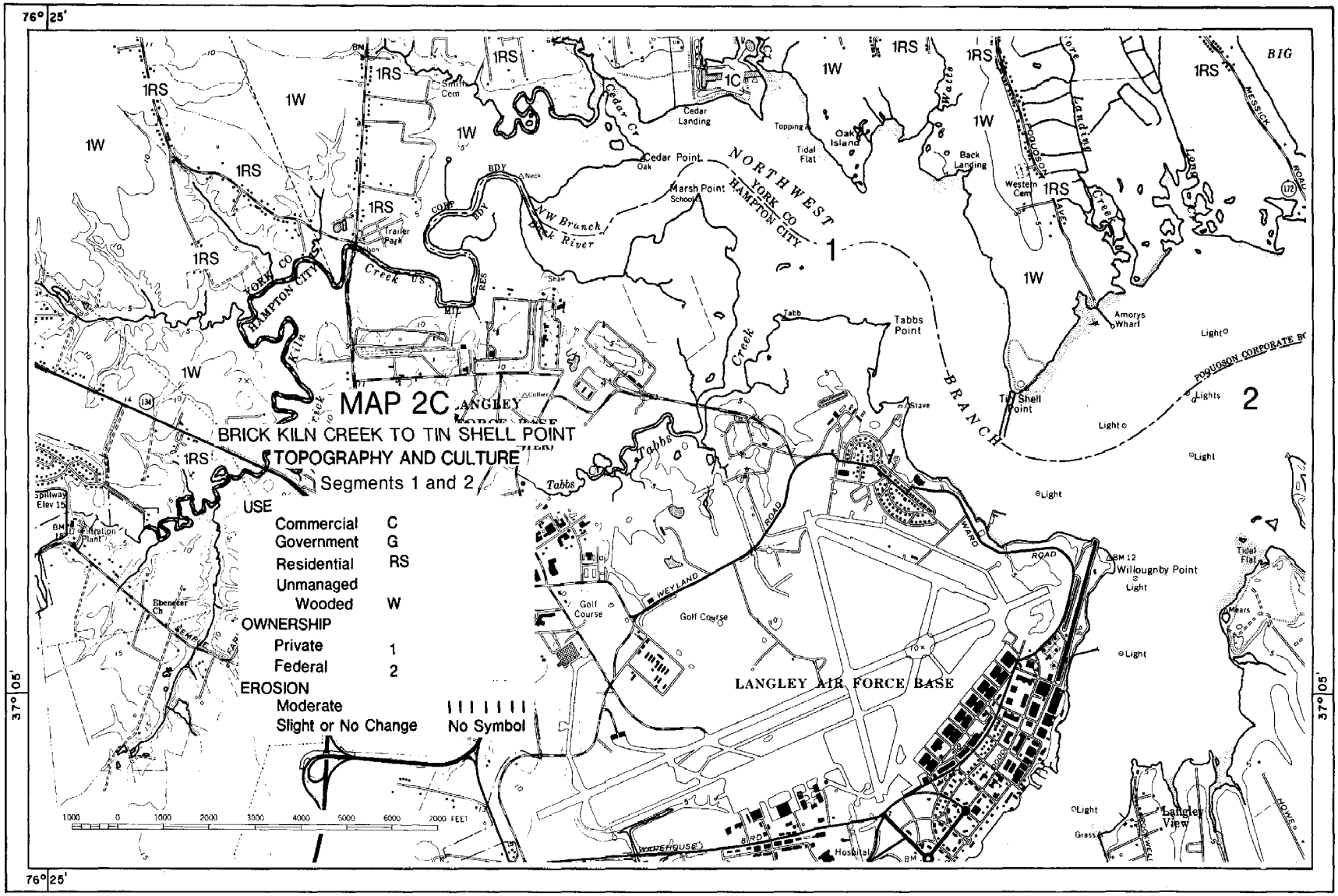
PHOTOS: Aerial-VIMS 10Oct72 YK-6D 389-393;
VIMS 27Oct72 YK-6D 388;
VIMS 10Sep73 YK-6D 422-425.

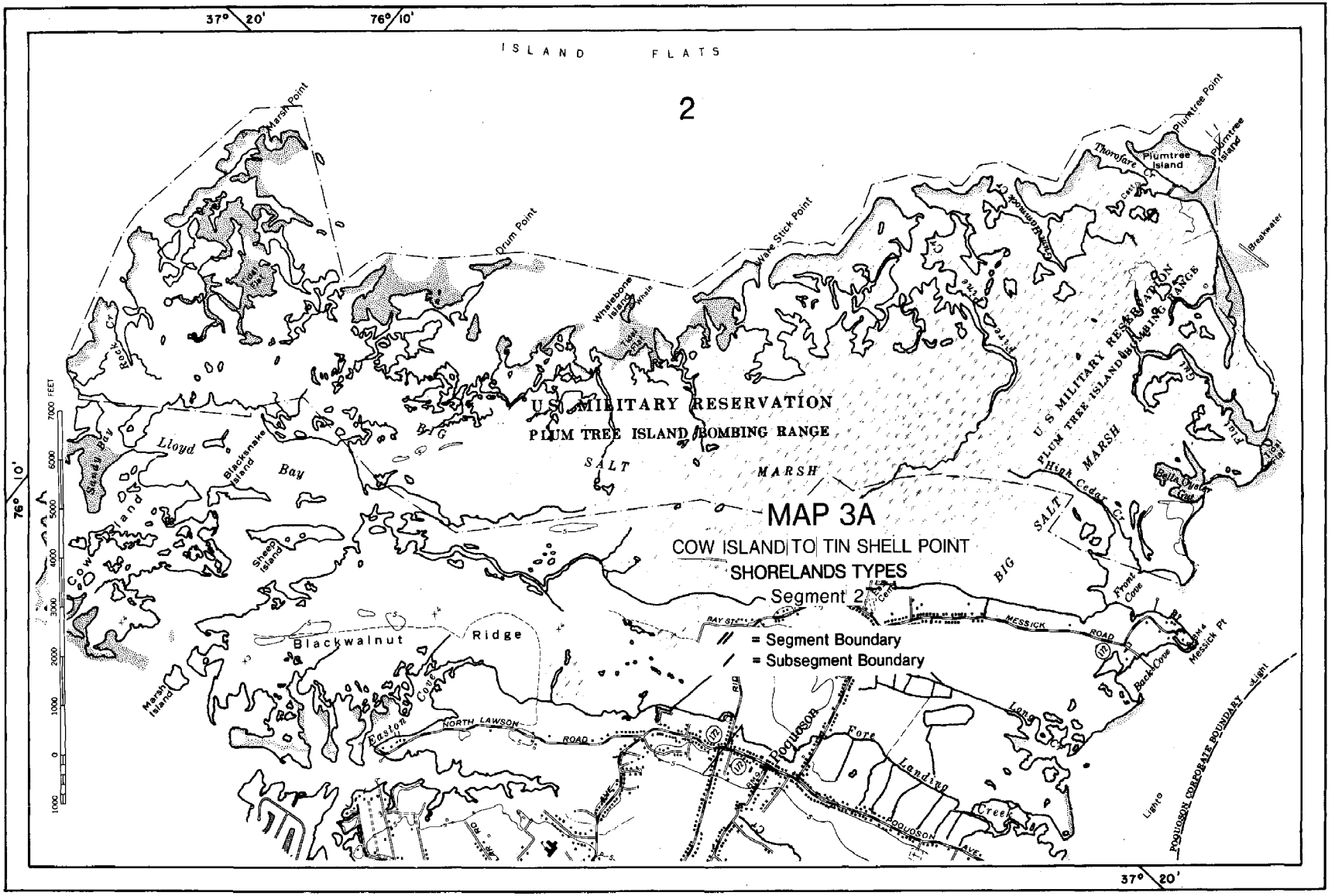
Ground - VIMS 24May73 YK-6D 33-37.

4.3 Segment and Subsegment Maps

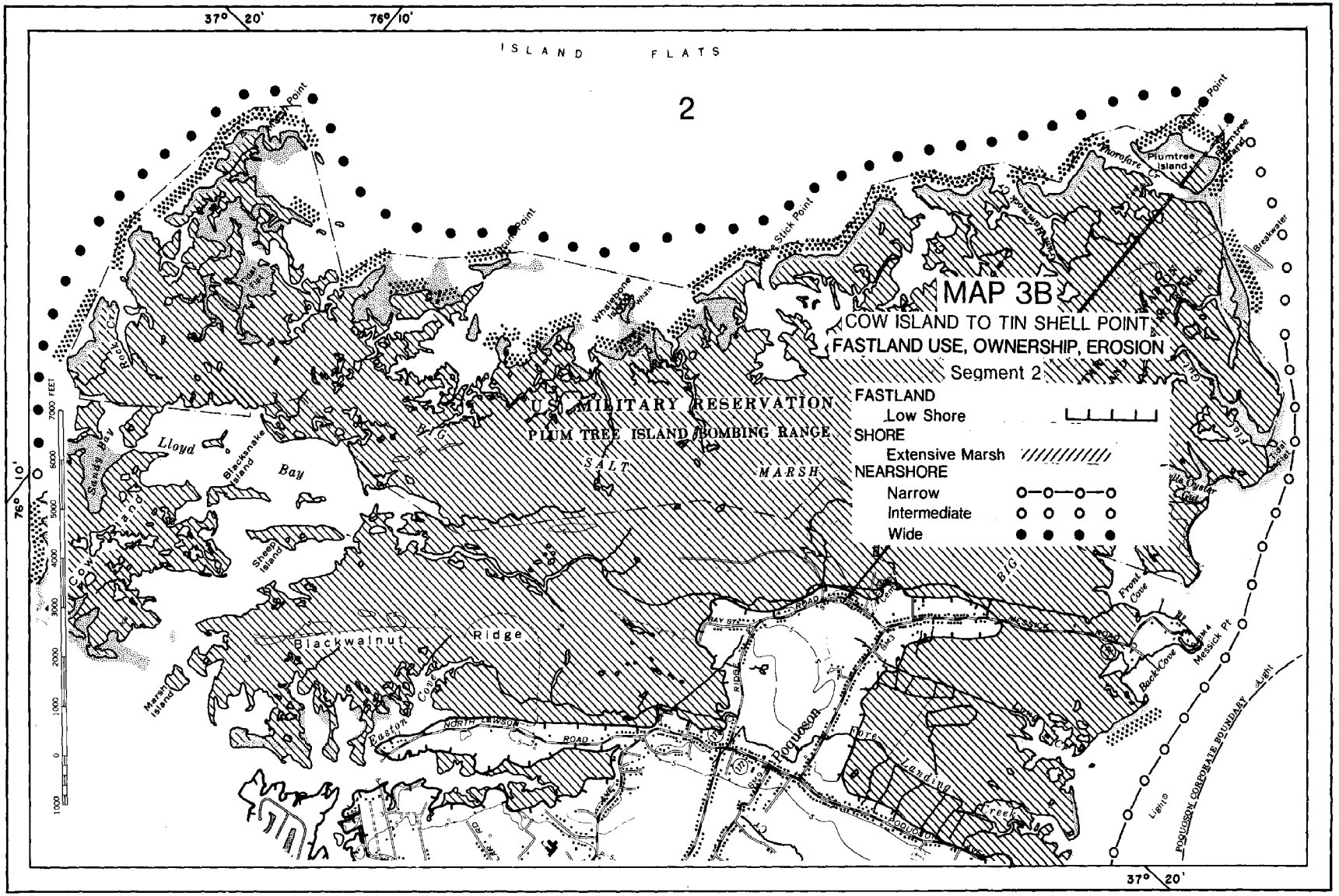



MAP 2B
BRICK KILN CREEK TO TIN SHELL POINT
FASTLAND USE, OWNERSHIP, EROSION
Segments 1 and 2
FASTLAND
Low Shore
SHORE
Extensive Marsh
NEARSHORE
Narrow
76° 25'
37° 05'
LANGLEY AIR FORCE BASE
NORTHWEST BRANCH
YORK CO
HAMPTON CITY
Cedar Landing
Cedar Point
Marsh Point
Oak Island
Tidal Flat
Tabbs Point
Tin Shell Point
Amorys Wharf
Willoughby Point
Golf Course
Trailer Park
Western Cem
Hospital
Langley View
POQUOSON CORPORATE BO
1
2
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

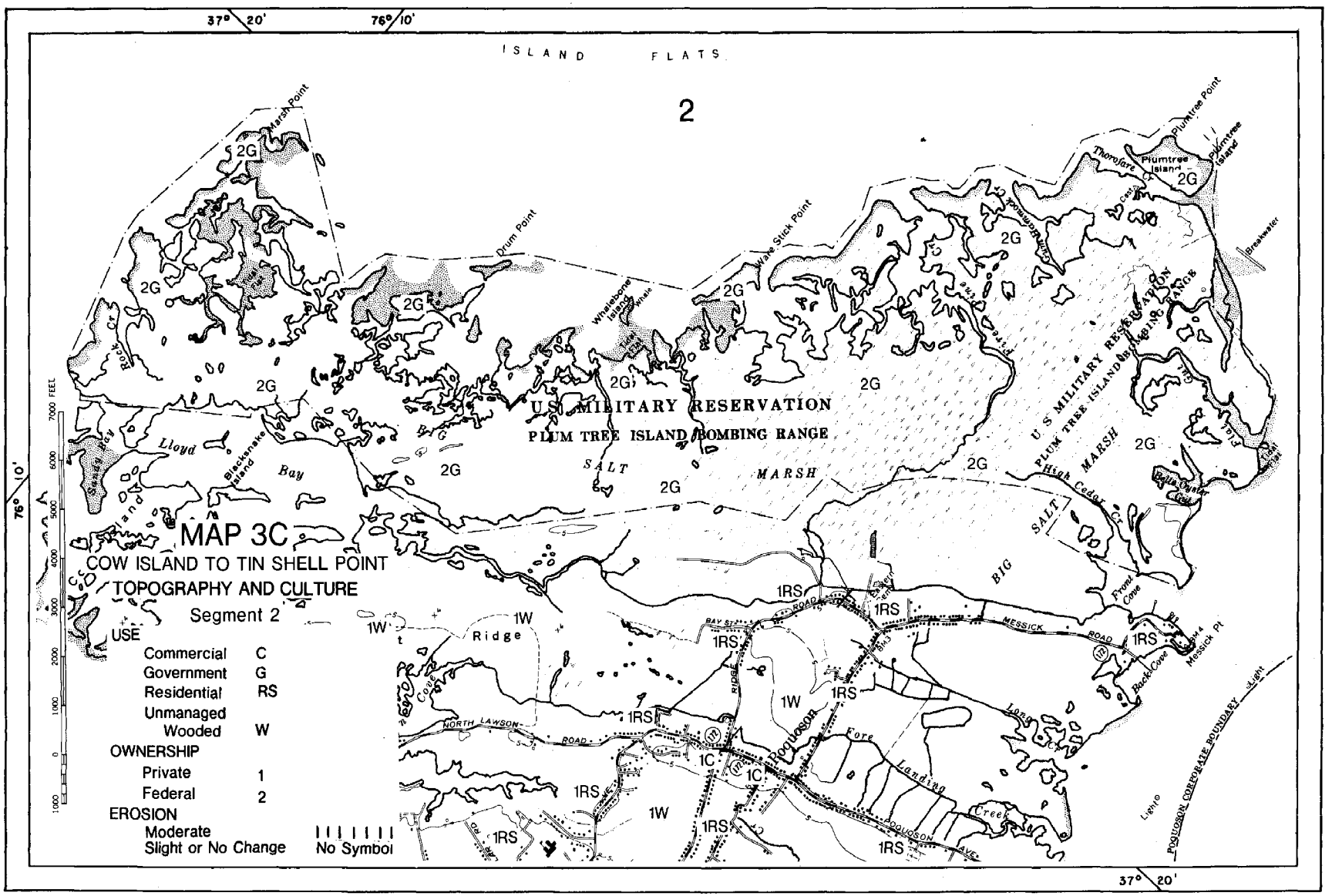

MAP 2C
BRICK KILN CREEK TO TIN SHELL POINT
TOPOGRAPHY AND CULTURE
Segments 1 and 2
USE
Commercial C
Government G
Residential RS
Unmanaged
Wooded W
OWNERSHIP
Private 1
Federal 2
EROSION
Moderate
Slight or No Change No Symbol
LANGLEY AIR FORCE BASE
NORTHWEST BRANCH
YORK CO
HAMPTON CITY
POQUOSON CORPORATE BK
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
76°25'
37°05'

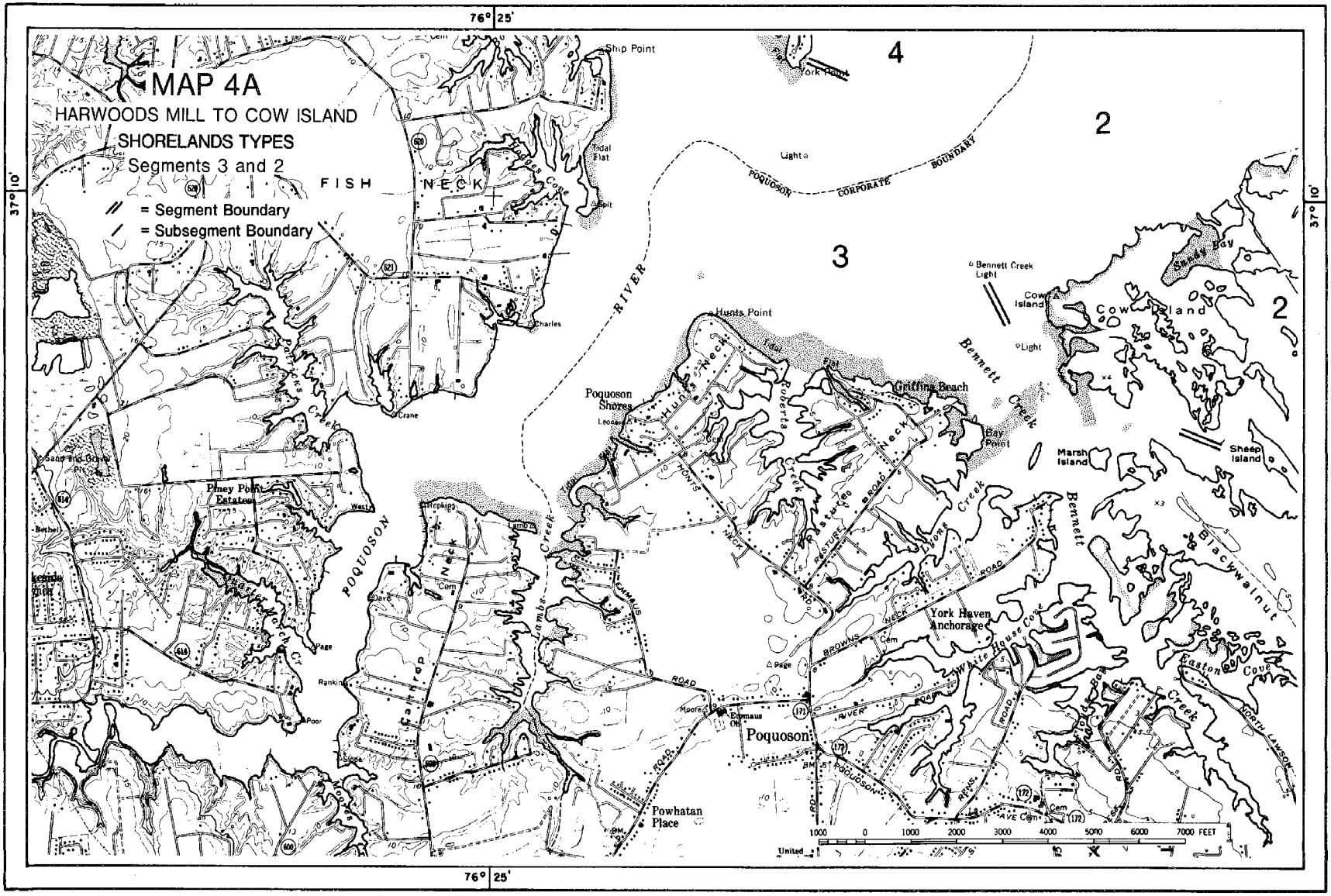


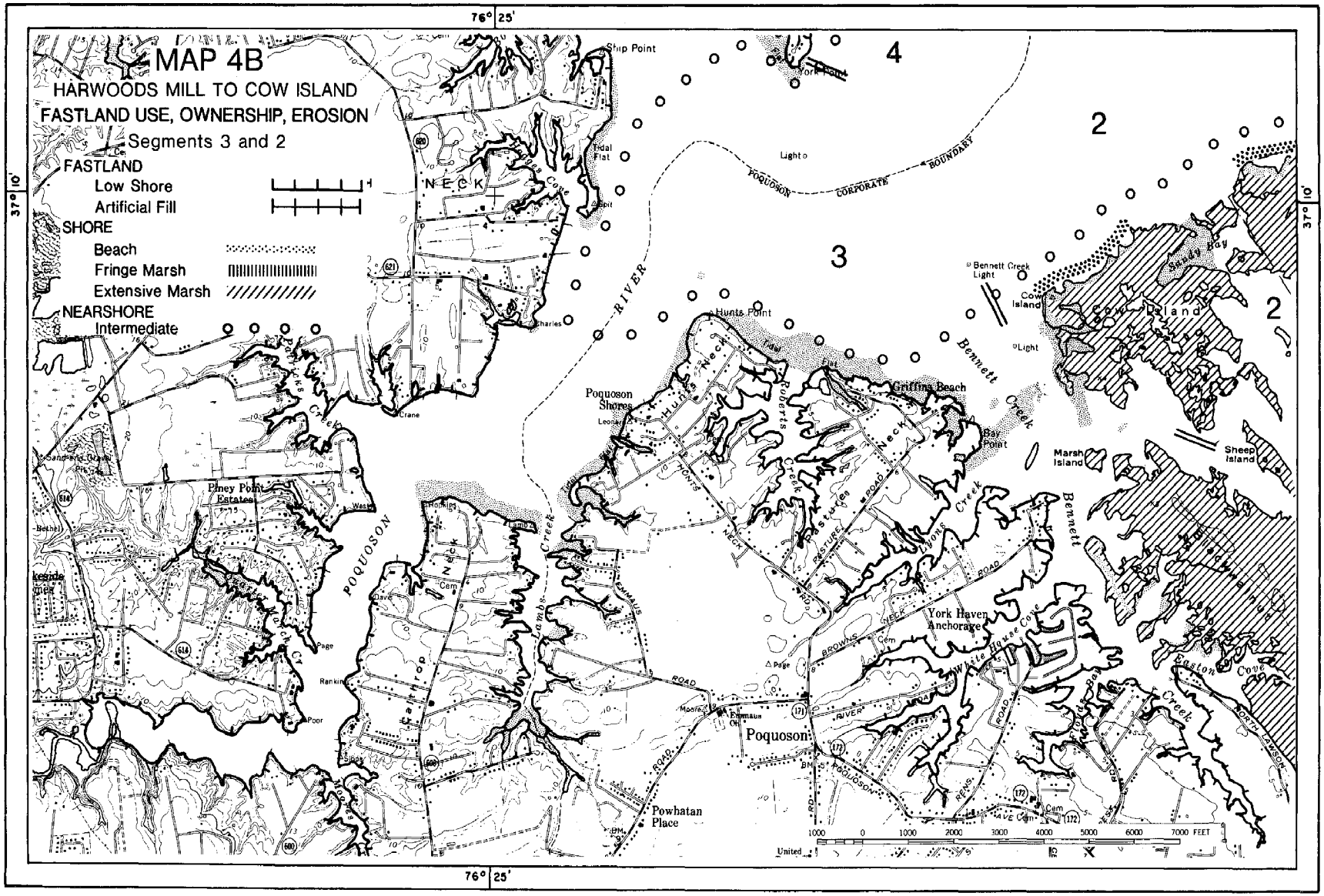
37° 20'
76° 10'
ISLAND FLATS
2
Marsh Point
Drum Point
Whalebone Island
Ware Stick Point
Plumtree Point
Plumtree Island
Thorofare
Breakwater
U.S. MILITARY RESERVATION
PLUM TREE ISLAND BOMBING RANGE
BIG SALT MARSH
Lloyd Bay
Blacksnake Island
Sheep Island
Cow Island
Blackwalnut Ridge
Marsh Island
Easton Cove
NORTH LAWSON ROAD
Poquoson
Fore Landing Creek
POQUOSON AVE
MESSICK ROAD
Front Cove
Back Cove
Messick Pt
High Cedar Cr
Belle Oyster Gut
Tidal Flat
Light
POQUOSON CORPORATE BOUNDARY
7000 FEET
6000
5000
4000
3000
2000
1000
0
1000
MAP 3A
COW ISLAND TO TIN SHELL POINT
SHORELANDS TYPES
Segment 2
= Segment Boundary
= Subsegment Boundary

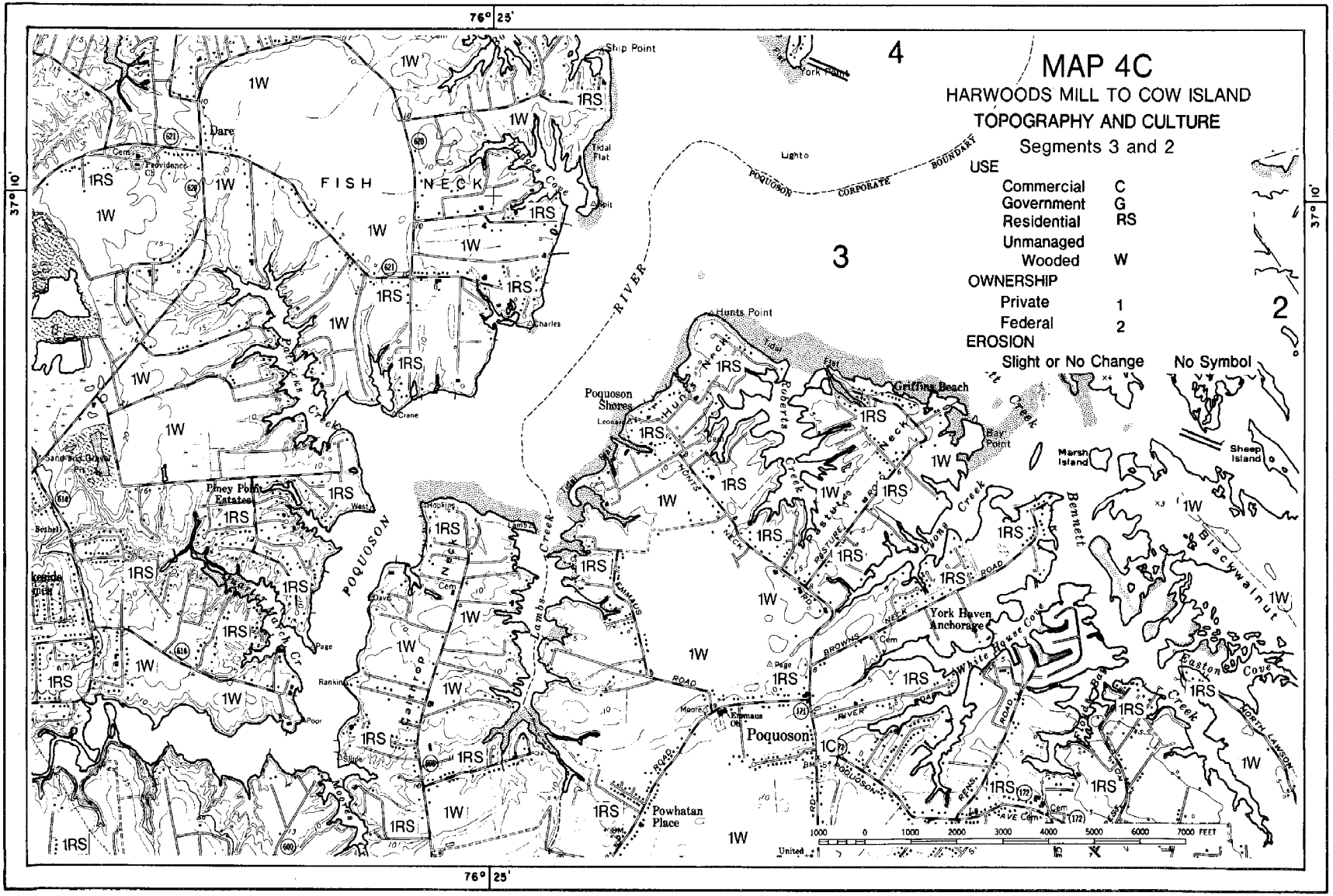


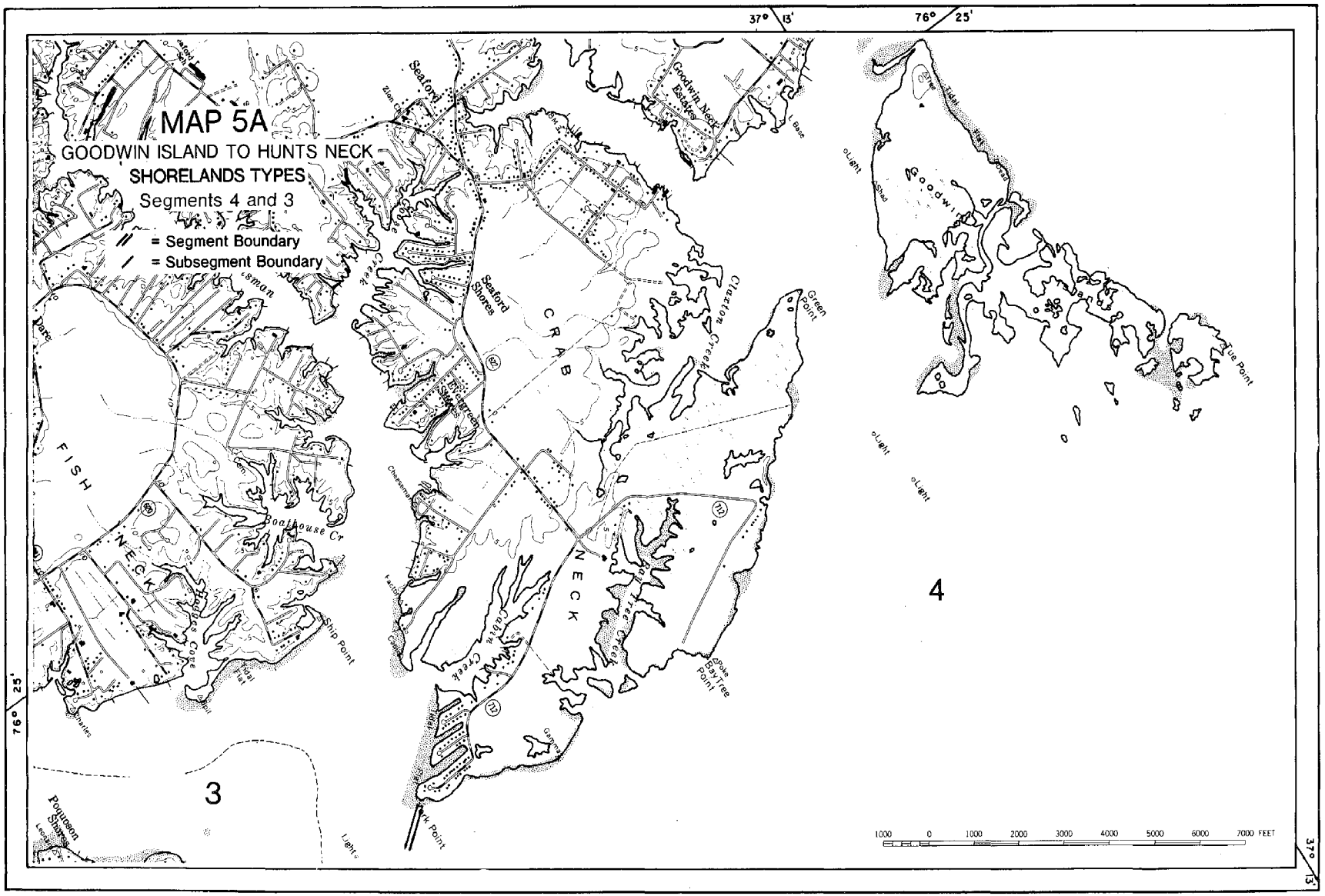
MAP 3B
COW ISLAND TO TIN SHELL POINT
FASTLAND USE, OWNERSHIP, EROSION
Segment 2
FASTLAND
Low Shore
SHORE
Extensive Marsh
NEARSHORE
Narrow
Intermediate
Wide
ISLAND FLATS
2
US MILITARY RESERVATION
PLUM TREE ISLAND BOMBING RANGE
BIG SALT MARSH
Lloyd Bay
Blacksnake Island
Sheep Island
Blackwalnut Ridge
Marsh Island
Easton Cove
Poquoson
Fore Landing Creek
Plumtree Island
Messick Pt
Back Cove
Front Cove
Breakwater
POQUOSON CORPORATE BOUNDARY
37° 20'
76° 10'

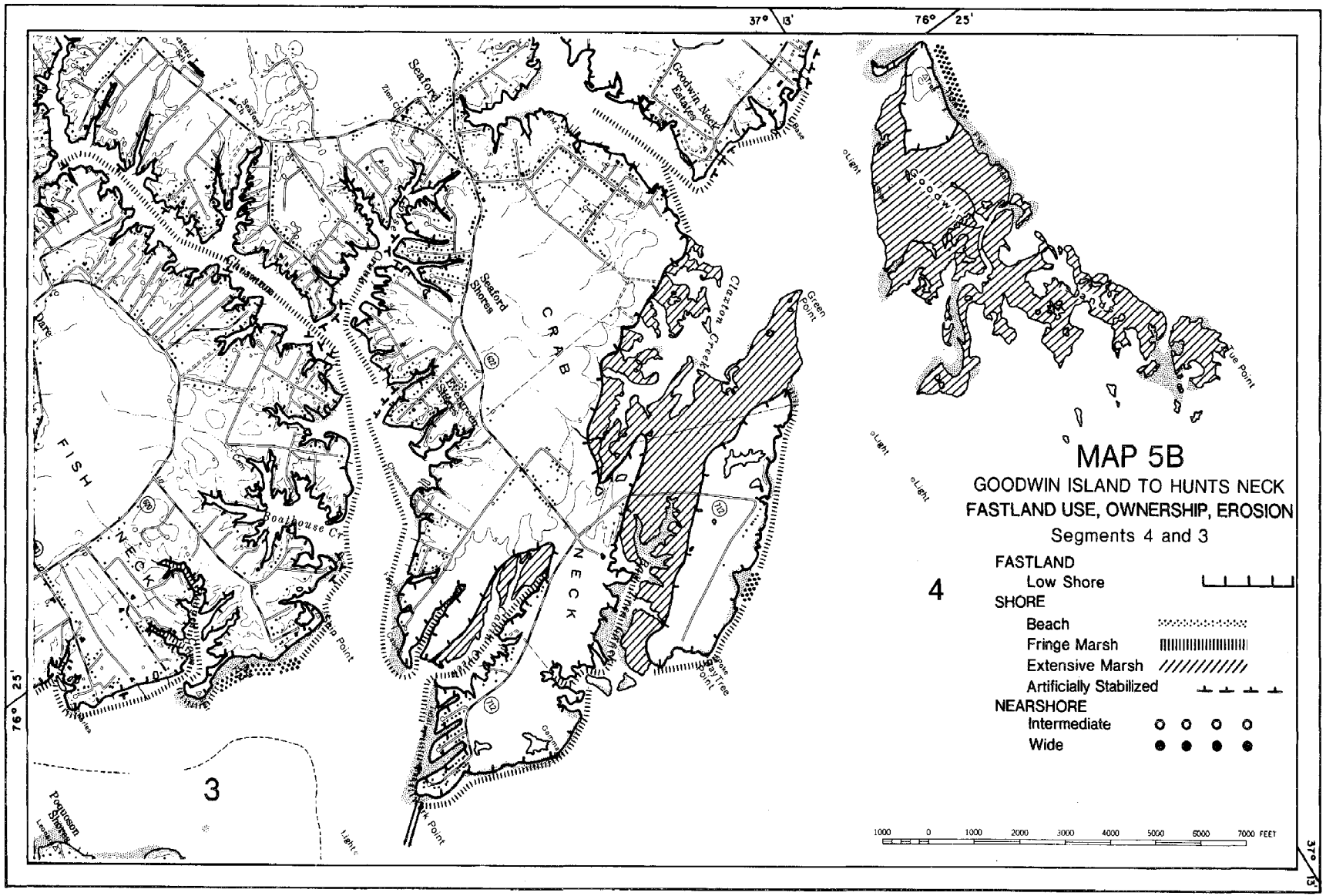

MAP 3C
COW ISLAND TO TIN SHELL POINT
TOPOGRAPHY AND CULTURE
Segment 2
USE
Commercial C
Government G
Residential RS
Unmanaged Wooded W
OWNERSHIP
Private 1
Federal 2
EROSION
Moderate
Slight or No Change
No Symbol
ISLAND FLATS
2
U.S. MILITARY RESERVATION
PLUM TREE ISLAND BOMBING RANGE
BIG SALT MARSH
Lloyd Bay
Blacksnake Island
Drum Point
Wave Stick Point
Plumtree Point
Plumtree Island
Thorofare
Marsh Point
Whalebone Island
Ridge
NORTH LAWSON ROAD
MESSICK ROAD
Poquoson
Fore Landing Creek
Messick Pt
Front Cove
Back Cove
High Cedar Cr
POQUOSON CORPORATE BOUNDARY
37° 20'
76° 10'
7000 FEET

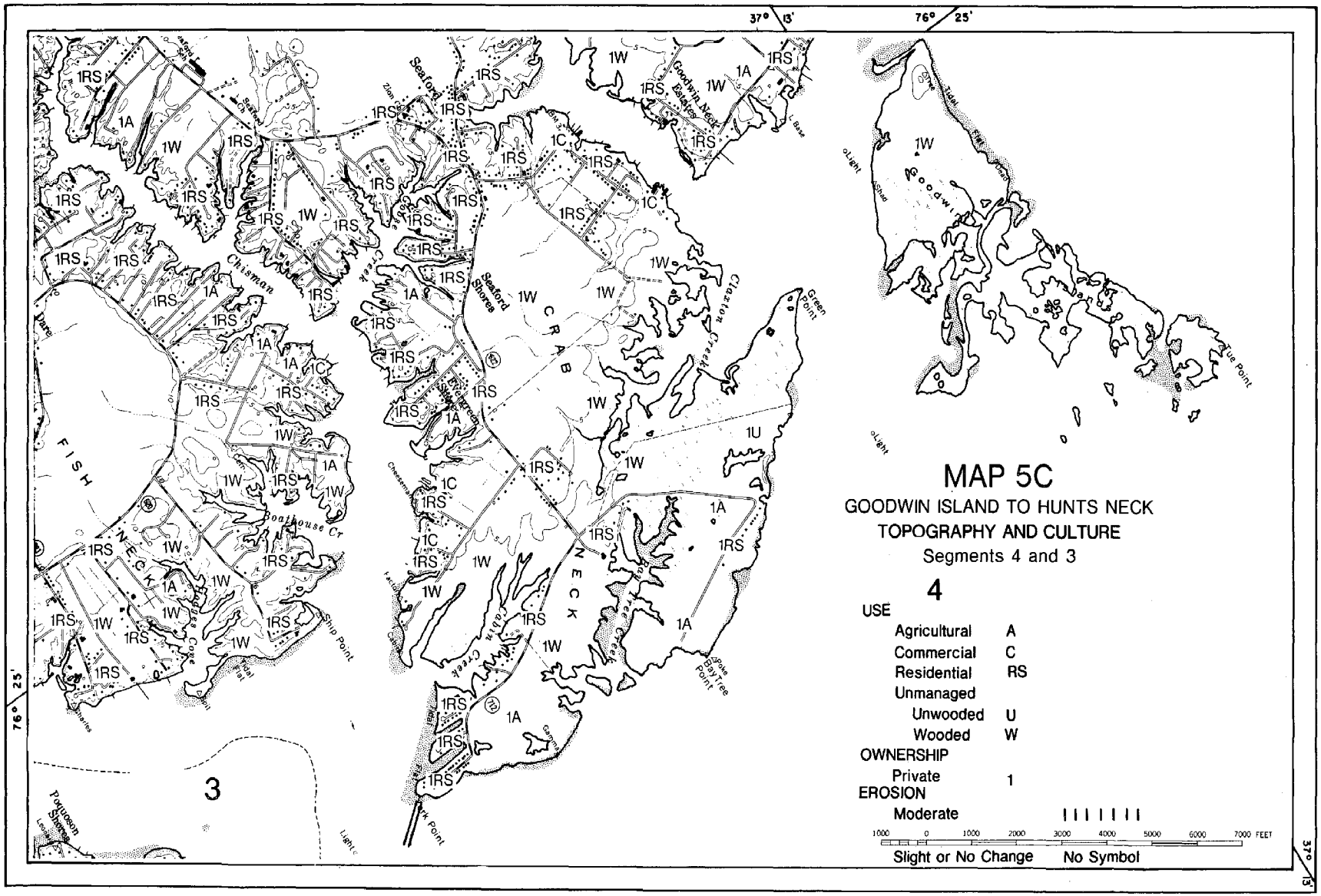

MAP 4A
HARWOODS MILL TO COW ISLAND
SHORELANDS TYPES
Segments 3 and 2
= Segment Boundary
= Subsegment Boundary
76° 25'
37° 10'
FISH NECK
POQUOSON RIVER
POQUOSON CORPORATE BOUNDARY
Ship Point
York Point
Hunts Point
Poquoson Shores
Griffins Beach
Bennett Creek Light
Cow Island
Bay Point
Marsh Island
Sheep Island
Blackwalnut
Sandy Bay
Piney Point Estates
Poquoson
York Haven Anchorage
Powhatan Place
Emmaus
Lambs Creek
Roberts Creek
Bennett Creek
Lyons Creek
White House Cove
Easton Cove
Cow Island
Charles
Crane
Page
Rankin
Poor
Moore
Cem
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
United

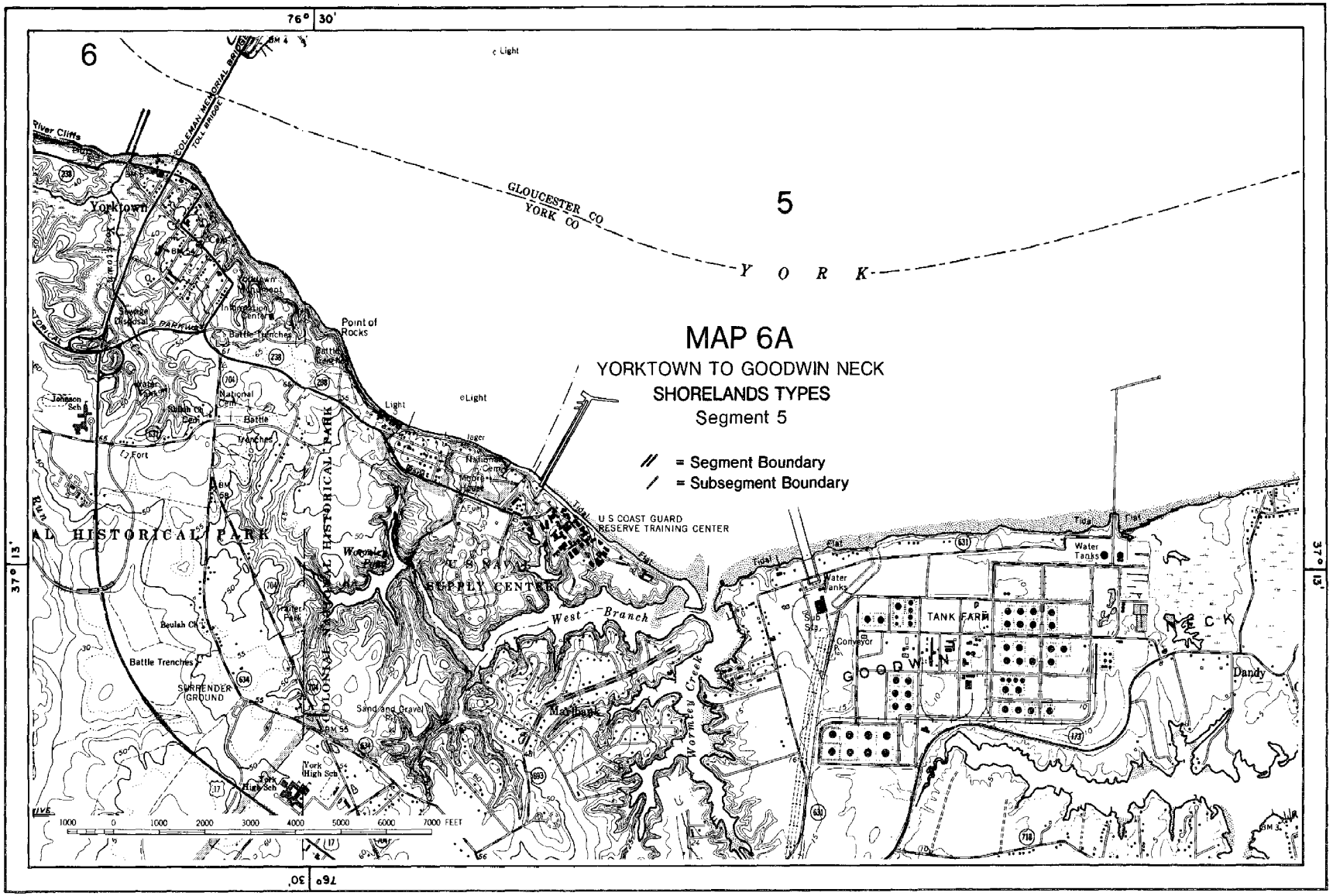

MAP 4B
HARWOODS MILL TO COW ISLAND
FASTLAND USE, OWNERSHIP, EROSION
Segments 3 and 2
FASTLAND
Low Shore
Artificial Fill
SHORE
Beach
Fringe Marsh
Extensive Marsh
NEARSHORE
Intermediate
76° 25'
37° 10'
4
2
3
2
Ship Point
York Point
Light
POQUOSON CORPORATE BOUNDARY
Tidal Flat
Spit
NECK
Charles
Crane
Hunts Point
Poquoson Shores
Hunts Neck
Roberts Creek
Griffins Beach
Bennett Creek Light
Cow Island
Light
Bennett Creek
Bay Point
Marsh Island
Sheep Island
Sandy Bay
Piney Point Estates
POQUOSON
Lambs Creek
Lyons Creek
York Haven Anchorage
White House Cove
Easton Cove
Poquoson
Powhatan Place
Page
Rankin
Poor
Moore
Emmaus Ch
Cem
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
United

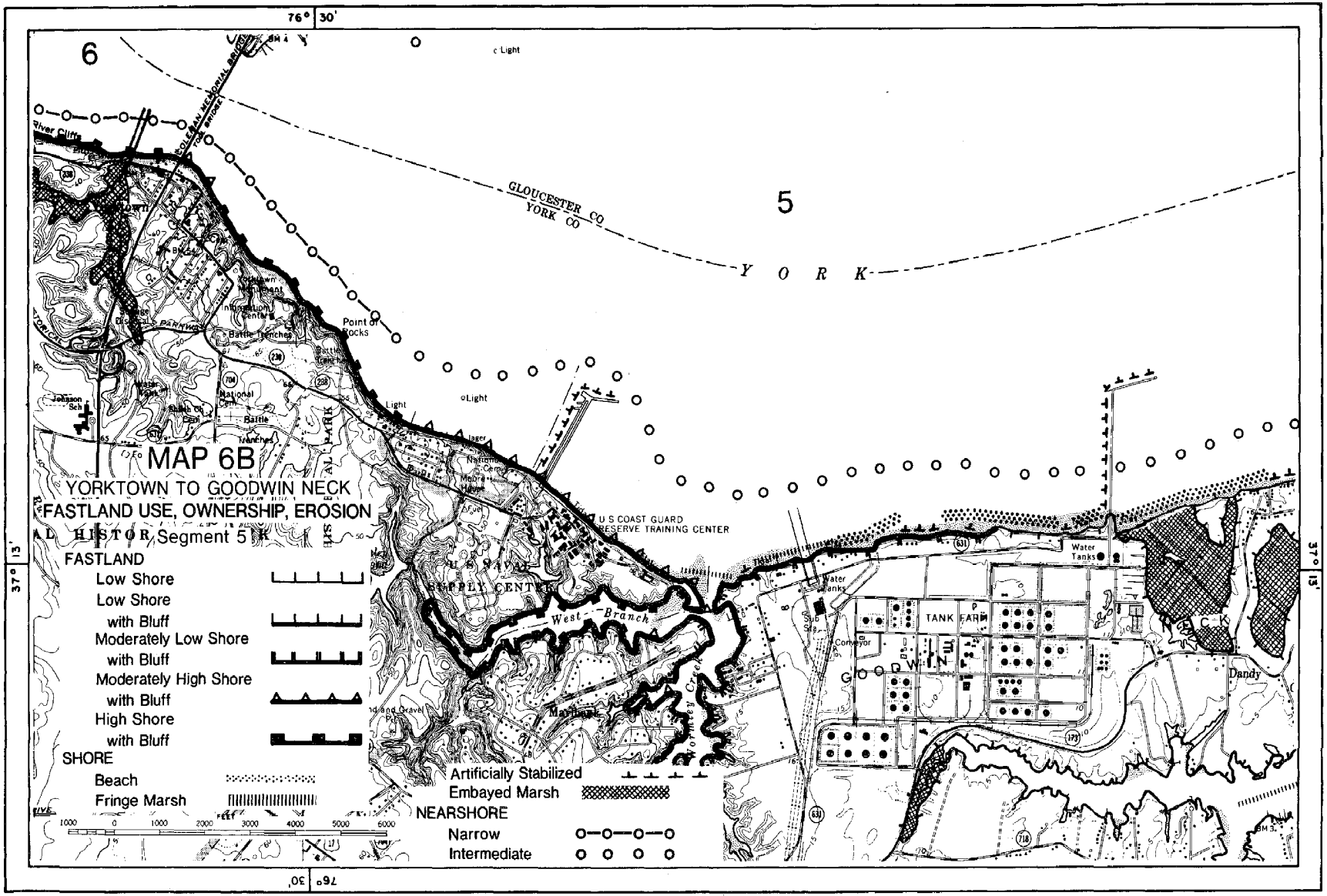

MAP 4C
HARWOODS MILL TO COW ISLAND
TOPOGRAPHY AND CULTURE
Segments 3 and 2
USE
Commercial C
Government G
Residential RS
Unmanaged Wooded W
OWNERSHIP
Private 1
Federal 2
EROSION
Slight or No Change No Symbol
76° 25'
37° 10'
FISH NECK
POQUOSON RIVER
Poquoson
Poquoson Shores
Hunts Point
Griffins Beach
Bay Point
Marsh Island
Sheep Island
York Haven Anchorage
Powhatan Place
Piney Point Estates
Dare
Ship Point
York Point
Lighto
POQUOSON CORPORATE BOUNDARY
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

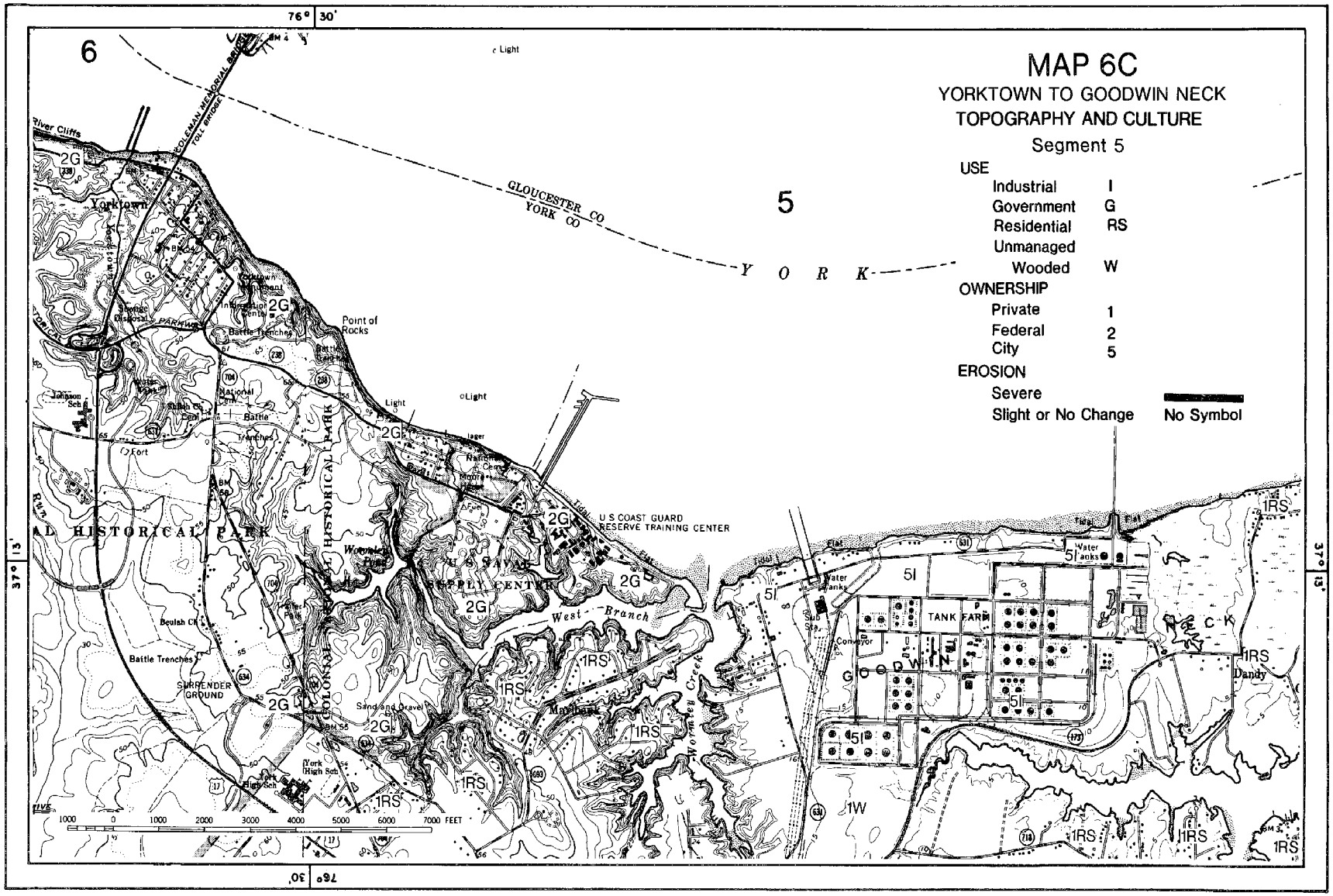

MAP 5A
GOODWIN ISLAND TO HUNTS NECK
SHORELANDS TYPES
Segments 4 and 3
= Segment Boundary
= Subsegment Boundary
37° 13'
76° 25'
Seaford
Goodwin Neck Estates
Seaford Shores
CRAB
NECK
FISH
NECK
Claxton Creek
Green Point
Tue Point
Boathouse Cr
Ship Point
Poquoson Shores
Cabin Creek
Bay Tree Creek
Poke Bay Tree Point
Goodwin
Islands
4
3
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

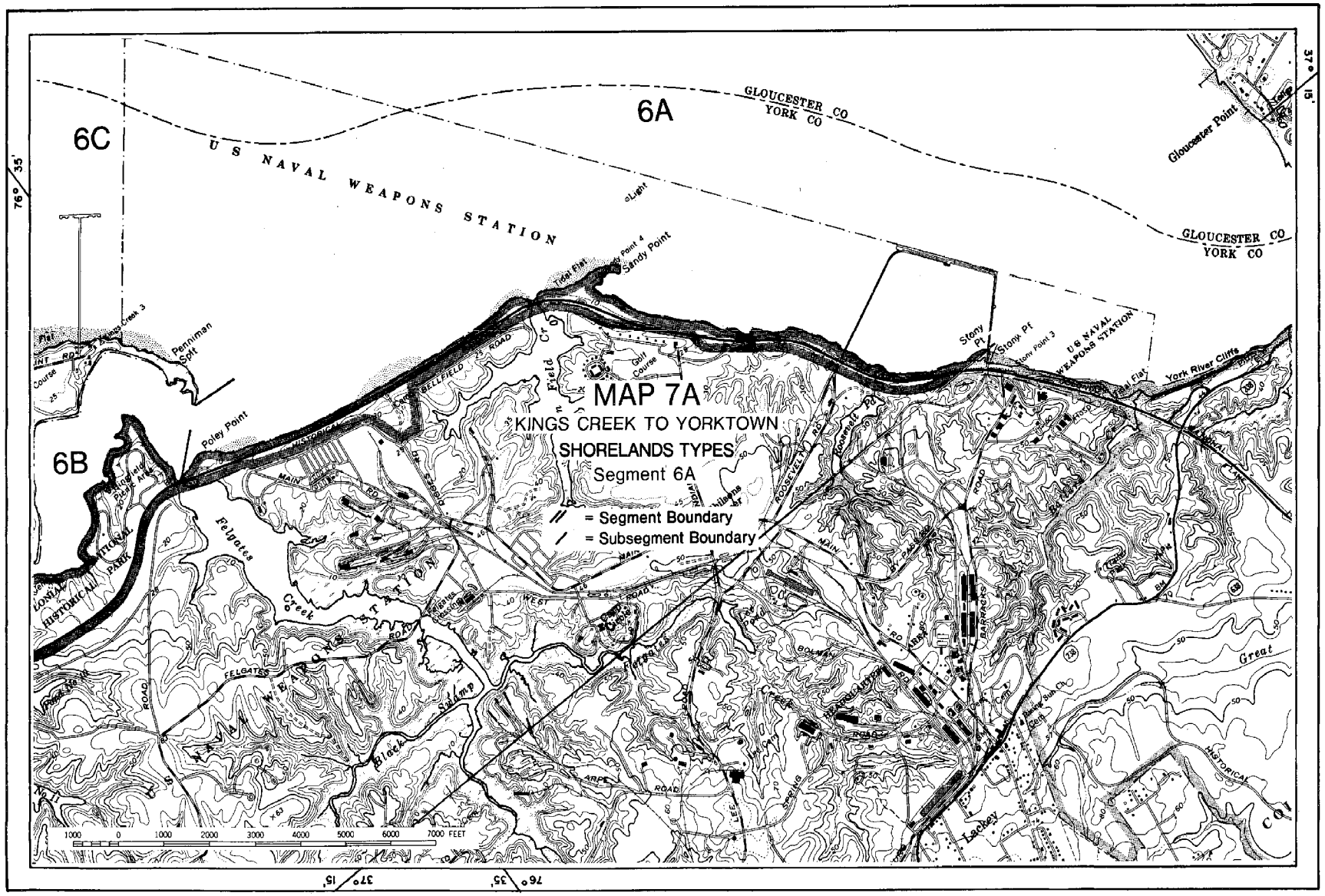

MAP 5B
GOODWIN ISLAND TO HUNTS NECK
FASTLAND USE, OWNERSHIP, EROSION
Segments 4 and 3
FASTLAND
Low Shore
SHORE
Beach
Fringe Marsh
Extensive Marsh
Artificially Stabilized
NEARSHORE
Intermediate
Wide
4
3
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
37° 13'
76° 25'
Seaford
Seaford Shores
Goodwin Neck Estates
Claxton Creek
Green Point
Tue Point
Boathouse Cr
Poquoson Shores
FISH NECK
CRAB NECK
Light


MAP 5C
GOODWIN ISLAND TO HUNTS NECK
TOPOGRAPHY AND CULTURE
Segments 4 and 3
4
USE
Agricultural A
Commercial C
Residential RS
Unmanaged
Unwooded U
Wooded W
OWNERSHIP
Private 1
EROSION
Moderate
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
Slight or No Change No Symbol
37° 13'
76° 25'
Seaford
Seaford Shores
Chisman
Goodwin Neck Estates
Claxton Creek
Green Point
Tue Point
Boathouse Cr
Ship Point
Poke Bay Tree Point
Cabin Creek
Bay Tree Creek
Poquoson Shores
FISH NECK
CRAB NECK
3

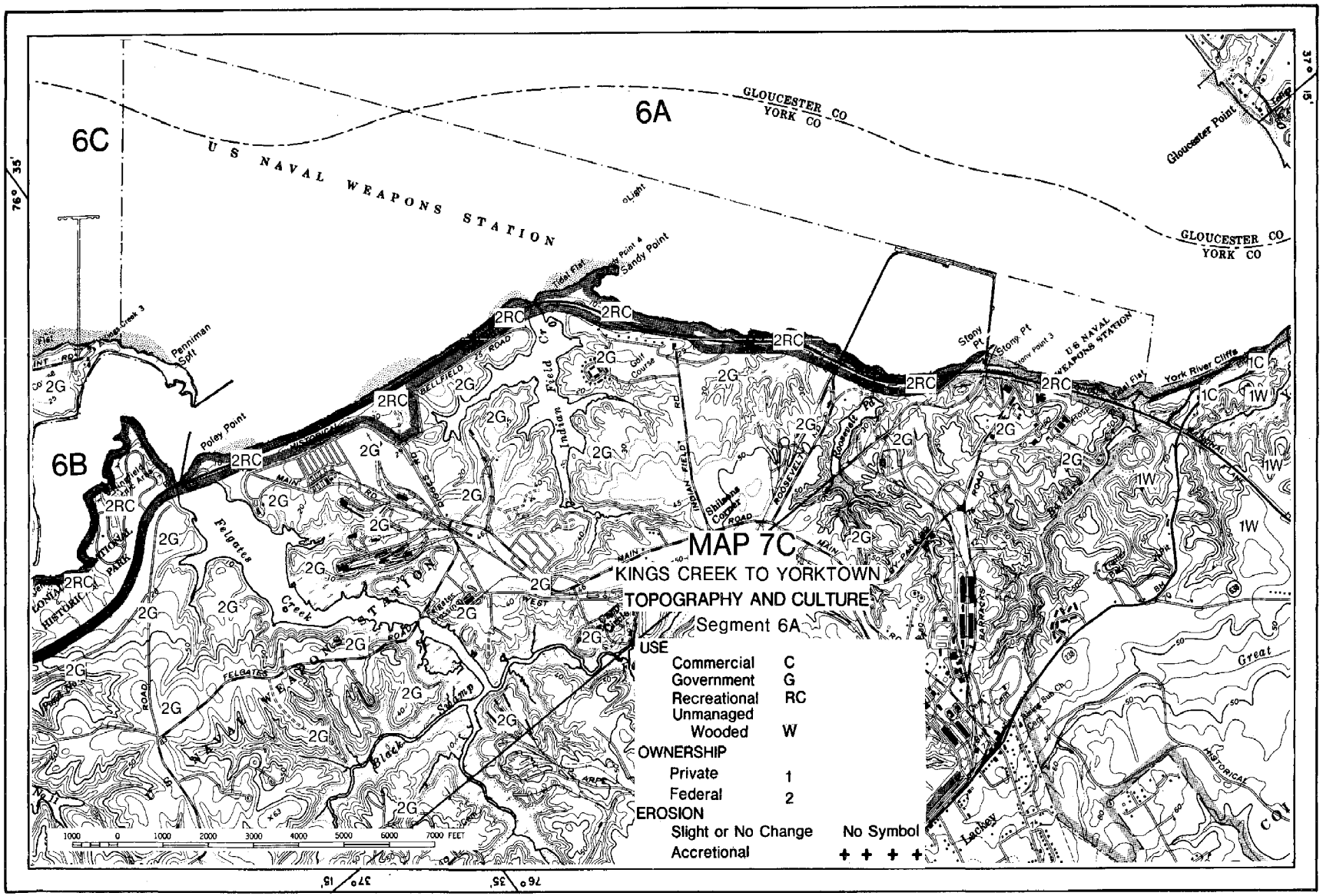

MAP 6A
YORKTOWN TO GOODWIN NECK
SHORELANDS TYPES
Segment 5
// = Segment Boundary
/ = Subsegment Boundary
6
5
76° 30'
37° 13'
GLOUCESTER CO
YORK CO
Y O R K
Yorktown
Point of Rocks
U S COAST GUARD
RESERVE TRAINING CENTER
U S NAVAL SUPPLY CENTER
West Branch
Wormley Creek
Marlbank
TANK FARM
GOODWIN
NECK
Dandy
Water Tanks
Conveyor
Battle Trenches
SURRENDER GROUND
Sand and Gravel
York High Sch
Beulah Ch
Johnson Sch
Fort
Light
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

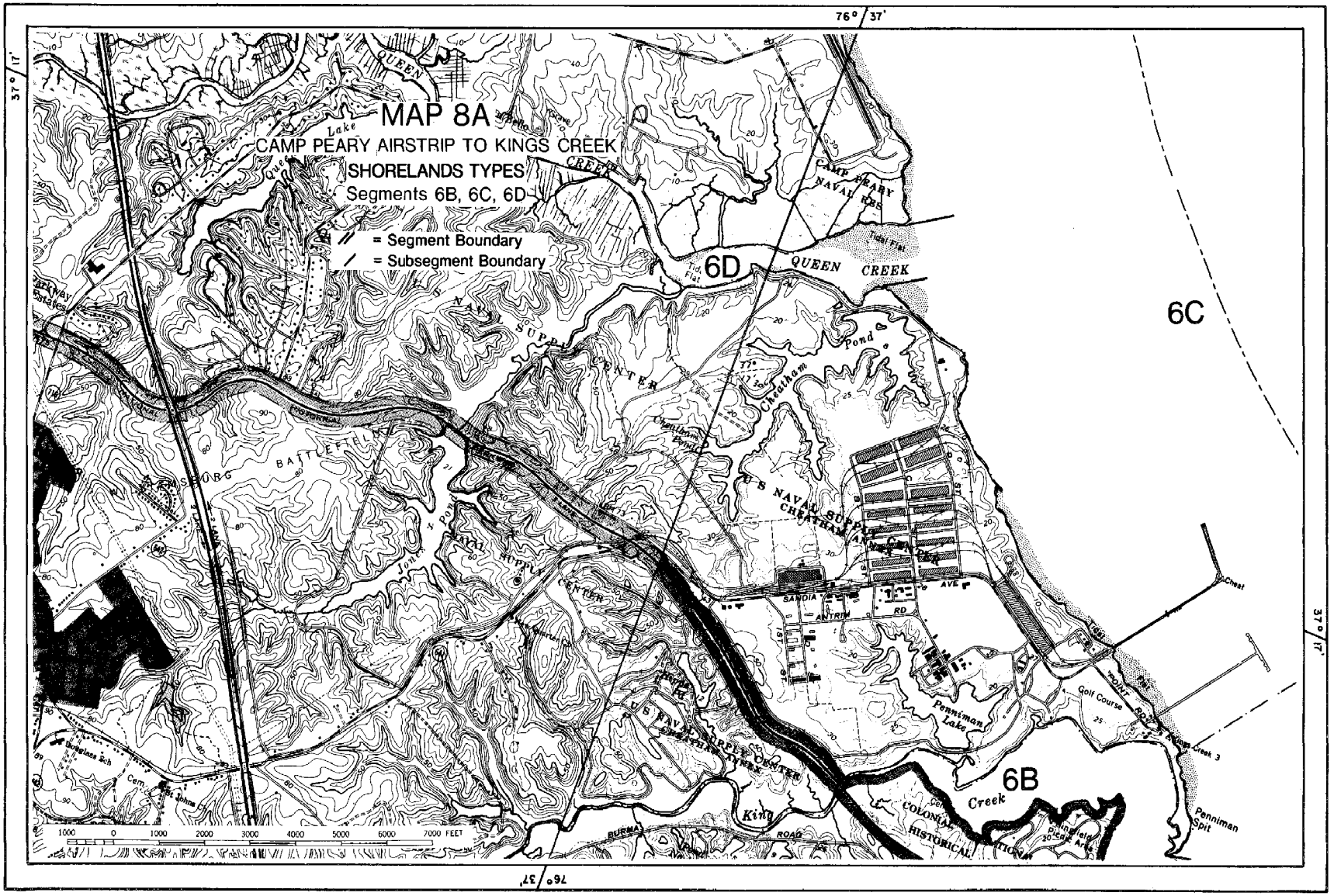

MAP 6B
YORKTOWN TO GOODWIN NECK
FASTLAND USE, OWNERSHIP, EROSION
Segment 5
FASTLAND
Low Shore
Low Shore with Bluff
Moderately Low Shore with Bluff
Moderately High Shore with Bluff
High Shore with Bluff
SHORE
Beach
Fringe Marsh
Artificially Stabilized
Embayed Marsh
NEARSHORE
Narrow
Intermediate
6
5
GLOUCESTER CO
YORK CO
Y O R K
U S COAST GUARD RESERVE TRAINING CENTER
U S NAVAL SUPPLY CENTER
West Branch
TANK FARM
GOODWIN
Dandy
Point of Rocks
Water Tanks
Conveyor
76° 30'
37° 13'

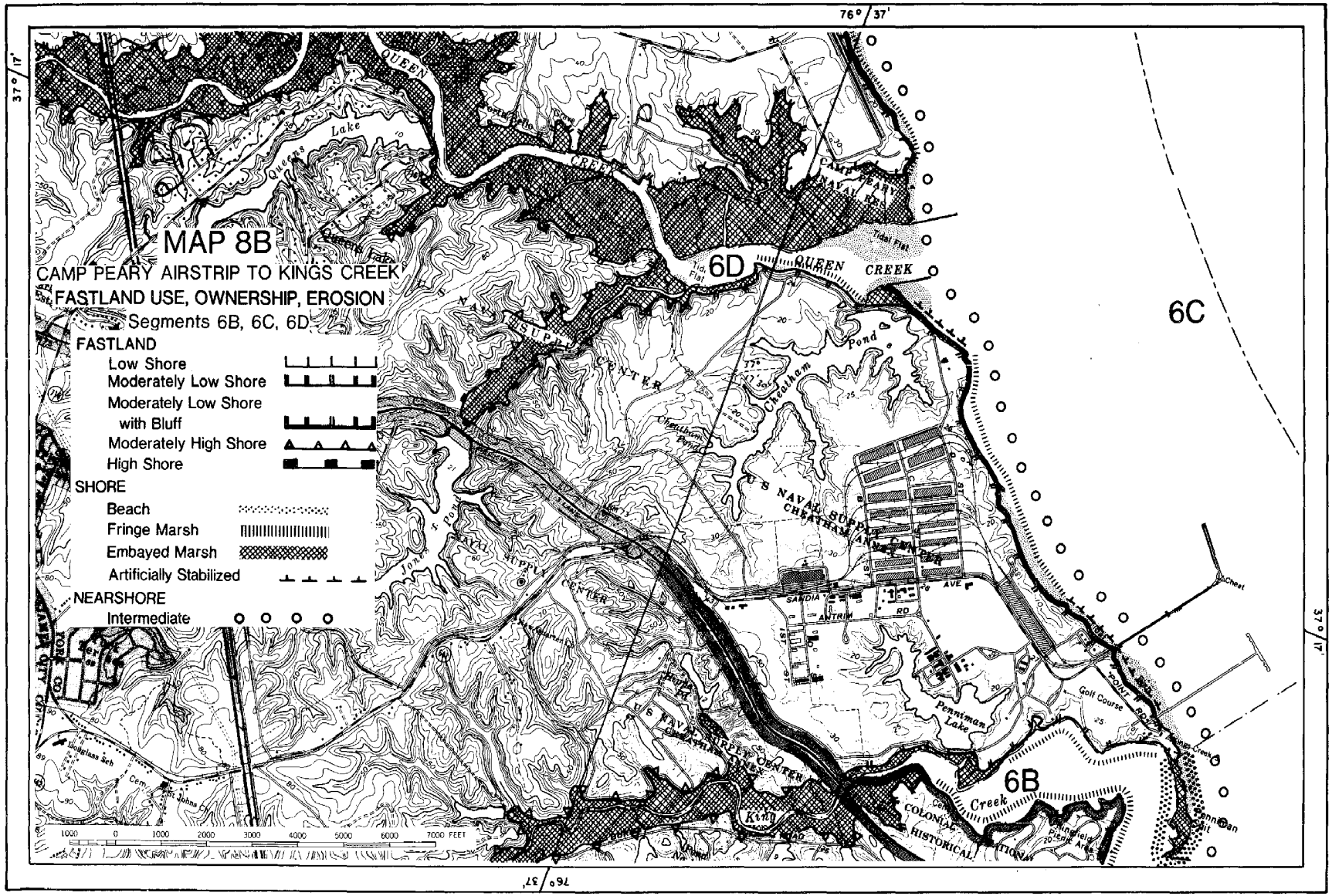

MAP 6C
YORKTOWN TO GOODWIN NECK
TOPOGRAPHY AND CULTURE
Segment 5
USE
Industrial I
Government G
Residential RS
Unmanaged
Wooded W
OWNERSHIP
Private 1
Federal 2
City 5
EROSION
Severe
Slight or No Change
No Symbol
6
5
76° 30'
37° 13'
GLOUCESTER CO
YORK CO
Y O R K
Yorktown
Point of Rocks
U S COAST GUARD RESERVE TRAINING CENTER
U S NAVAL SUPPLY CENTER
West Branch
Wormley Creek
TANK FARM
GOODWIN NECK
Dandy
Battle Trenches
SURRENDER GROUND
Sand and Gravel
Water Tanks
Conveyor
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

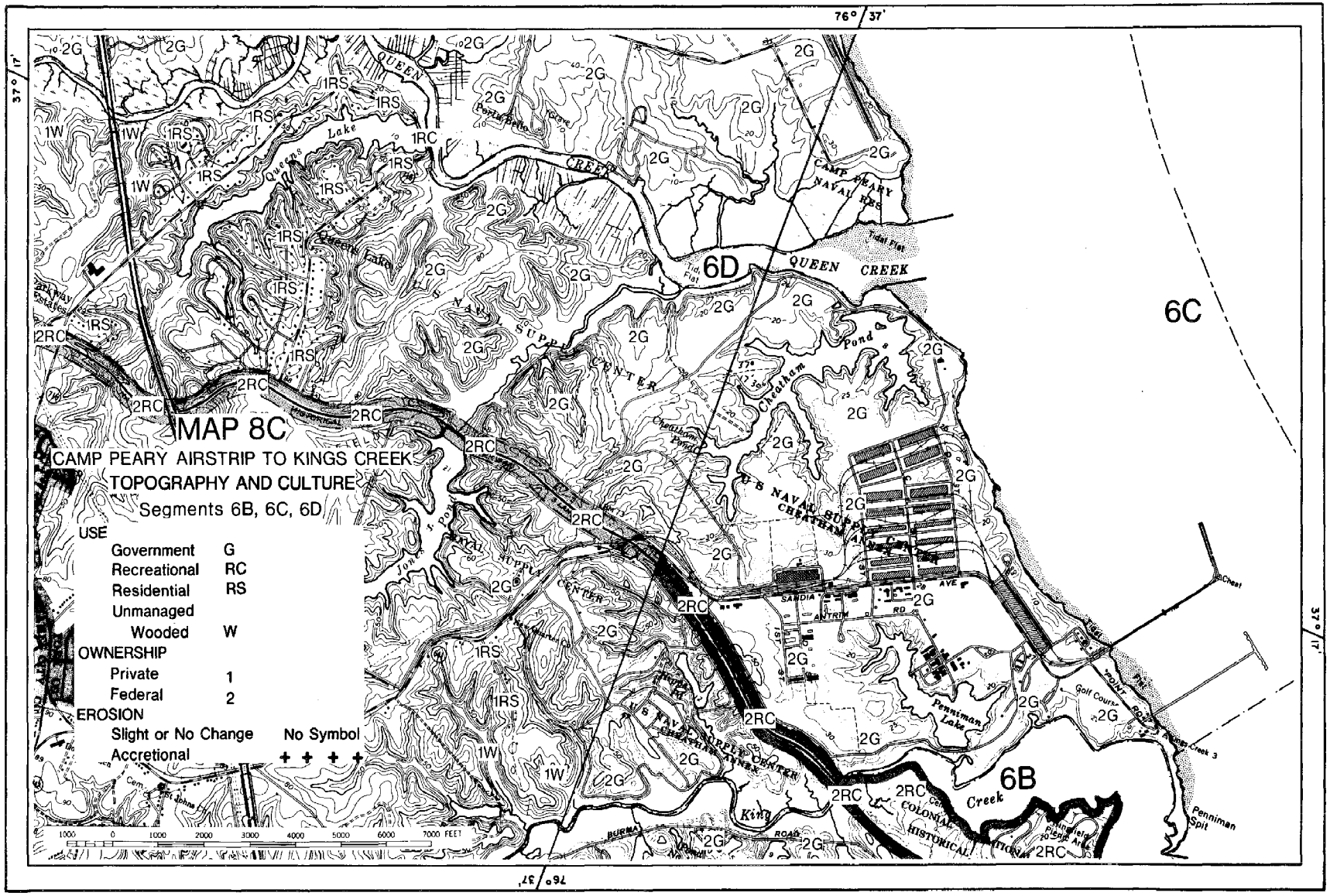

MAP 7A
KINGS CREEK TO YORKTOWN
SHORELANDS TYPES
Segment 6A
= Segment Boundary
= Subsegment Boundary
6A
6B
6C
U S NAVAL WEAPONS STATION
GLOUCESTER CO
YORK CO
Gloucester Point
Sandy Point
Poley Point
Penniman Spit
Stony Pt
York River Cliffs
Felgates Creek
Black Swamp
Great
Lackey
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
76° 35'
37° 15'

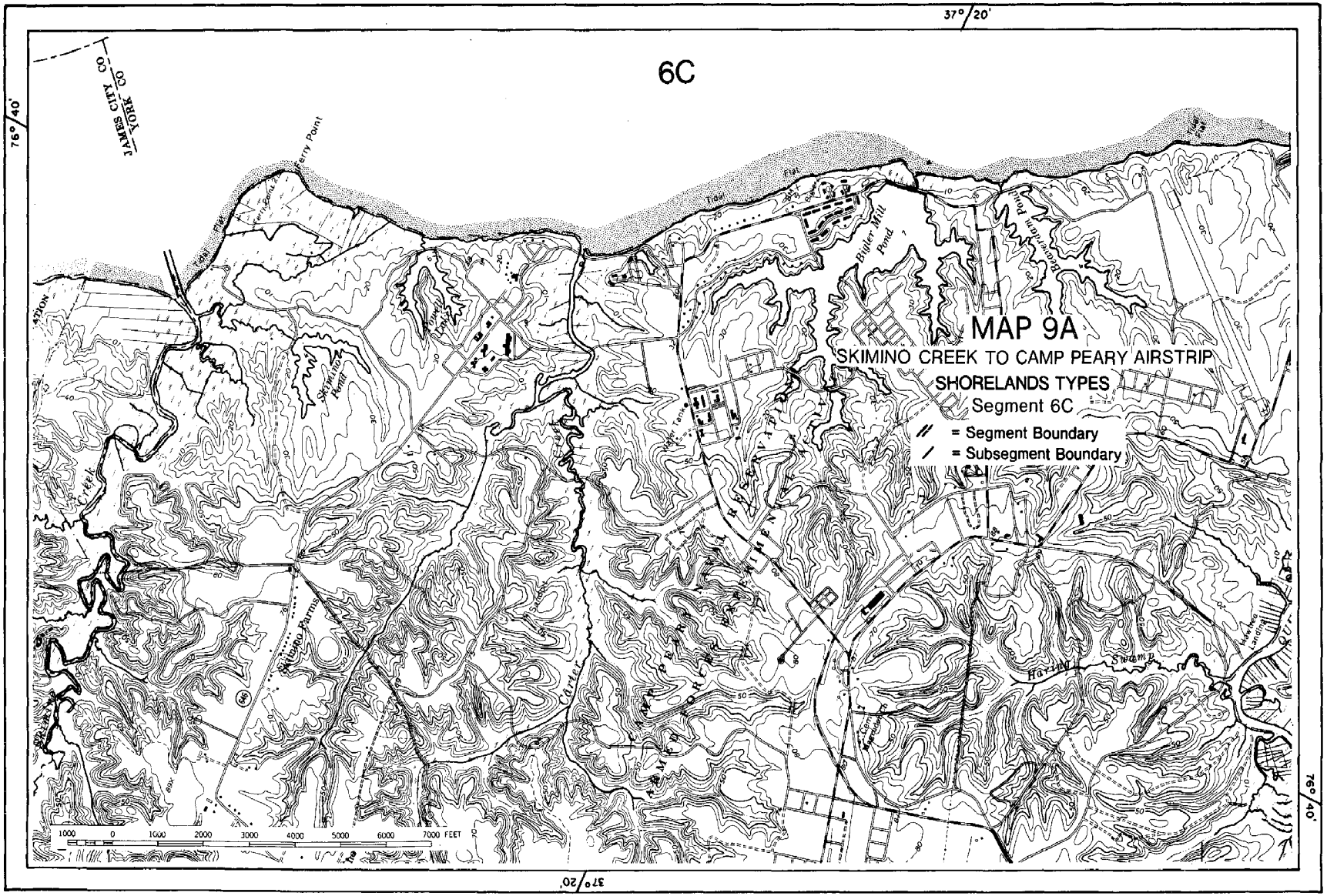
MAP 7B
KINGS CREEK TO YORKTOWN
FASTLAND USE, OWNERSHIP, EROSION
Segment 6A
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore with Bluff
High Shore with Bluff
SHORE
Beach
Fringe Marsh
Embayed Marsh
NEARSHORE
Narrow
Intermediate
Artificially Stabilized
6A
6B
6C
U S NAVAL WEAPONS STATION
GLOUCESTER CO
YORK CO
Gloucester Point
Sandy Point
Felgates
Indian Field Cr
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
76° 35'
37° 15'

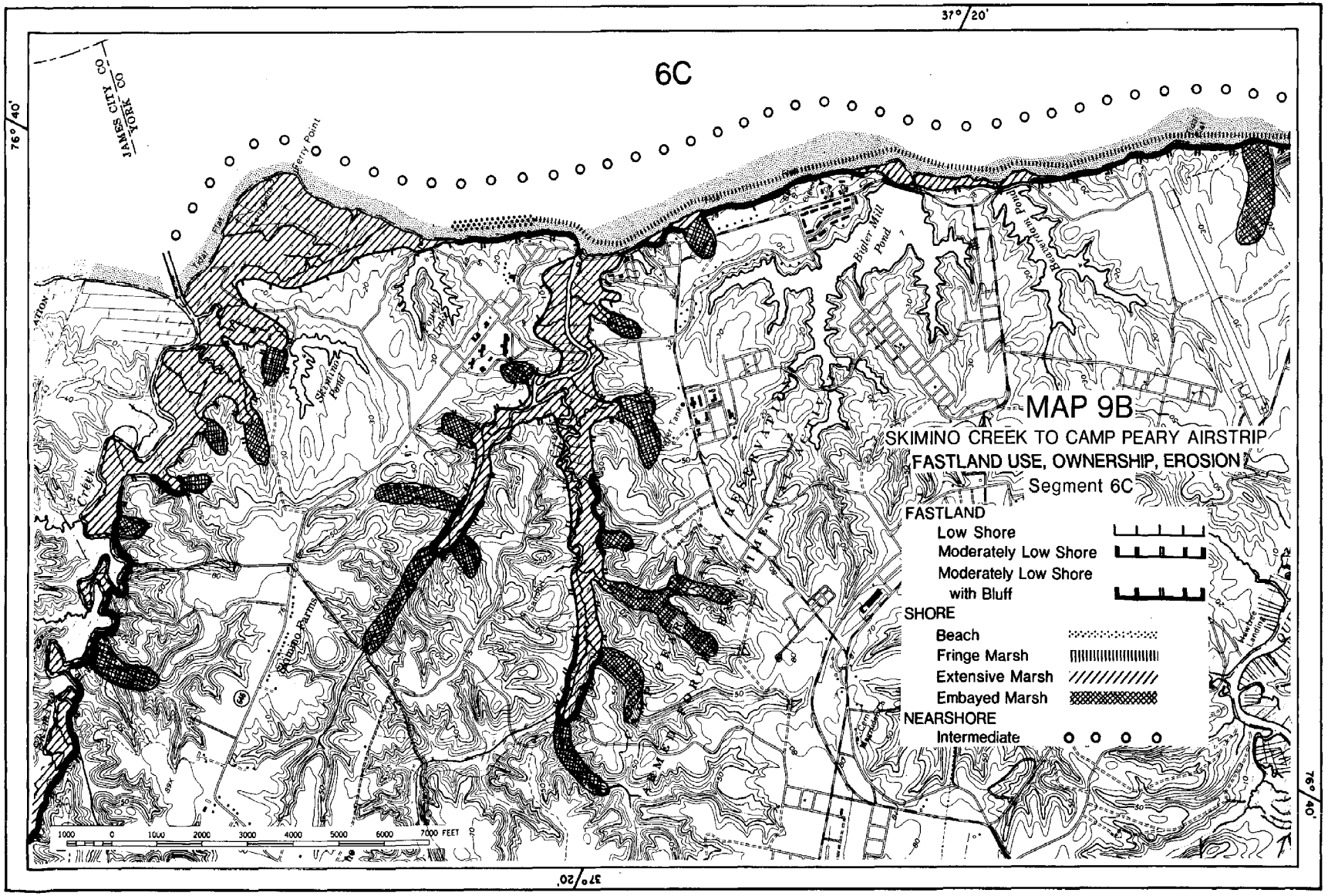

MAP 7C
KINGS CREEK TO YORKTOWN
TOPOGRAPHY AND CULTURE
Segment 6A
USE
Commercial C
Government G
Recreational RC
Unmanaged
Wooded W
OWNERSHIP
Private 1
Federal 2
EROSION
Slight or No Change No Symbol
Accretional + + + +
6A
6B
6C
U S NAVAL WEAPONS STATION
GLOUCESTER CO
YORK CO
Gloucester Point
Sandy Point
Poley Point
Penniman Spit
Stony Pt
York River Cliffs
Indian Field Cr
Felgates Creek
Black Swamp
Great
Lackey
2RC
2G
1C
1W
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
76° 35'
37° 15'


MAP 8A
CAMP PEARY AIRSTRIP TO KINGS CREEK
SHORELANDS TYPES
Segments 6B, 6C, 6D
= Segment Boundary
= Subsegment Boundary
6D
6C
6B
QUEEN CREEK
CAMP PEARY NAVAL RES
Tidal Flat
Cheatham Pond
U S NAVAL SUPPLY CENTER
CHEATHAM ANNEX
SANDIA AVE
ANTRIM RD
Penniman Lake
Golf Course
Penniman Spit
King Creek
COLONIAL HISTORICAL
BURMA ROAD
Cem.
Parkway Estates
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
76° 37'
37° 17'

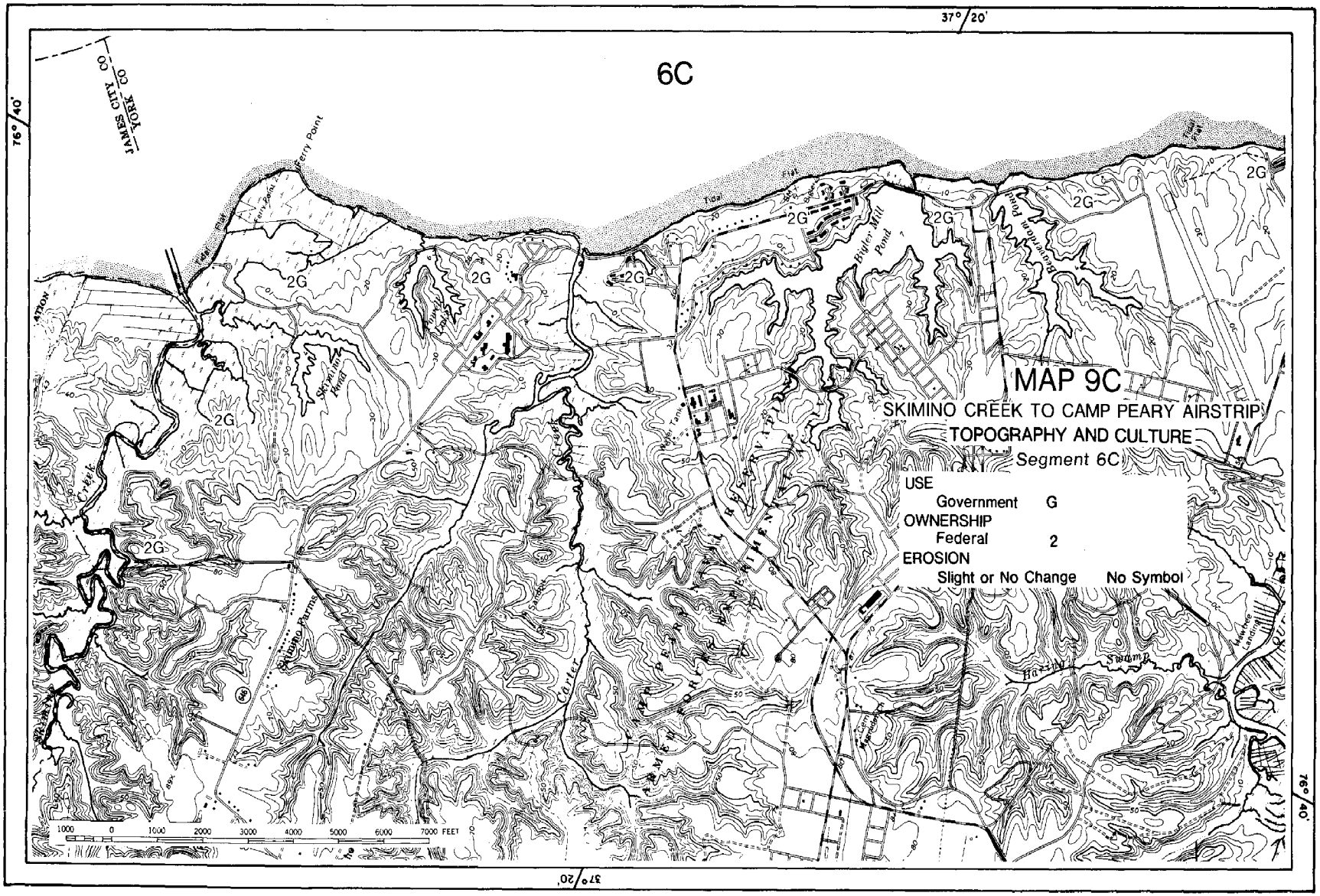

MAP 8B
CAMP PEARY AIRSTRIP TO KINGS CREEK
FASTLAND USE, OWNERSHIP, EROSION
Segments 6B, 6C, 6D
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
High Shore
SHORE
Beach
Fringe Marsh
Embayed Marsh
Artificially Stabilized
NEARSHORE
Intermediate
6B
6C
6D
QUEEN CREEK
Queens Lake
Cheatham Pond
Penniman Lake
Golf Course
Tidal Flat
CAMP PEARY NAVAL RES
U S NAVAL SUPPLY CENTER
CHEATHAM ANNEX
SANDIA AVE
ANTRIM RD
POINT RD
King Creek
COLONIAL HISTORICAL
Cheat
Penniman Spit
76° 37'
37° 17'
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET


MAP 8C
CAMP PEARY AIRSTRIP TO KINGS CREEK
TOPOGRAPHY AND CULTURE
Segments 6B, 6C, 6D
USE
Government G
Recreational RC
Residential RS
Unmanaged
Wooded W
OWNERSHIP
Private 1
Federal 2
EROSION
Slight or No Change No Symbol
Accretional + + + +
6C
6D
6B
QUEEN CREEK
CAMP PEARY NAVAL RES
Queens Lake
Cheatham Pond
Penniman Lake
Penniman Spit
Golf Course
Kings Creek
Creek
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
76° 37'
37° 17'


6C
MAP 9A
SKIMINO CREEK TO CAMP PEARY AIRSTRIP
SHORELANDS TYPES
Segment 6C
= Segment Boundary
= Subsegment Boundary
37°/20'
76°/40'
JAMES CITY CO
YORK CO
Ferry Point
Tidal Flat
Skimino Pond
Skimino Farms
Carter
Bigler Mill Pond
Beaverdam Pond
Haring Swamp
Lawnee Landing
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET



6C
MAP 9B
SKIMINO CREEK TO CAMP PEARY AIRSTRIP
FASTLAND USE, OWNERSHIP, EROSION
Segment 6C
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
NEARSHORE
Intermediate
37°/20'
76°/40'
JAMES CITY CO
YORK CO
Ferry Point
Skimino Pond
Bigler Mill Pond
Beaverdam Pond
Skimino Farms
Creek
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET


6C
MAP 9C
SKIMINO CREEK TO CAMP PEARY AIRSTRIP
TOPOGRAPHY AND CULTURE
Segment 6C
USE
Government G
OWNERSHIP
Federal 2
EROSION
Slight or No Change No Symbol
37°/20'
76°/40'
JAMES CITY CO
YORK CO
Ferry Point
Tidal Flat
Skimino Pond
Bigler Mill Pond
Beaverdam Pond
Skimino Farms
Carter
Hawtree Landing
Swamp
2G
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

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