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Shoreline Situation Report

PRINCE GEORGE 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.
Published With Funds Provided to the Commonwealth by the Office of Coastal Zone Management,
National Oceanic and Atmospheric Administration, Grant No.04-5-158-50001

Chesapeake Research Consortium Report Number 47

Special Report In Applied Marine Science and Ocean Engineering Number 114 of the

VIRGINIA INSTITUTE OF MARINE SCIENCE
Gloucester Point, Virginia 23062

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PRINCE GEORGE COUNTY, VIRGINIA

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CHAPTER 1
Introduction

CHAPTER 1

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 a discussion of those factors which might significantly limit development of the shoreline and, in some instances, a discussion of some of the potential or alternate uses of the shoreline, particularly with respect to recreational use, since such information could aid potential users in the perception of a segment of the shoreline.

The basic advocacy of the authors in the preparation of the report 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 allotted 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 succeed 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 (RANN) program of the National Science Foundation, grants GI 34869 and GI 38973, administered through the Chesapeake Research Consortium (CRC), Inc. Additional funding was provided through provisions of the Coastal Zone Management Act, P.L. 92-583, as administered in the Commonwealth of Virginia under grant number 04-5-158-50001.

Beth Marshall typed the many drafts. Ken Thornberry and Bill Jenkins prepared the photographs. The Offices of Planning in Prince George County and the City of Petersburg contributed information and local knowledge. We also thank the numerous other persons who have assisted us with their comments, criticisms, ideas, and information.

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 unanswered. 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 groups 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) Limitations to shore use and potential or alternate 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.

For each subsegment there are two length measurements, the shore-nearshore interface or shoreline, and the fastland-shore interface. The two interface lengths differ most when the shore zone is embayed or extensive marsh. On the subsegment maps, a dotted line represents the fastland-shore interface when it differs from the shoreline. The fastland-shore interface length is the base for the fastland statistics.

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 1). 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 2). 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 average slope of the land within 400 feet (122 m) of the fastland - shore boundary. The general classification is:

- Low shore, 20 ft. (6 m) or less of relief; with or without cliff
- Moderately low shore, 20-40 ft. (6-12 m) of relief; with or without cliff
- Moderately high shore, 40-60 ft. (12-18 m) of relief; with or without cliff
- High shore, 60 ft. (18 m) or more of relief; with or without cliff.

Two specially classified exceptions are sand dunes and areas of artificial fill.

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 from shore

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

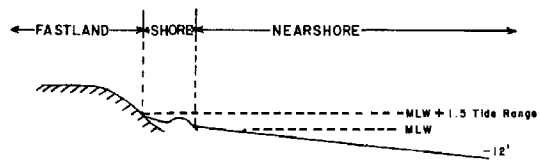


Figure 1

A profile of the three shorelands types.

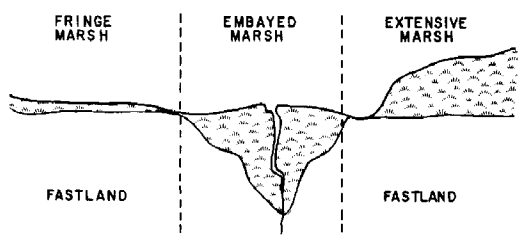


Figure 2

A plan view of the three 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.

Governmental

Includes lands whose usage is specifically controlled, restricted, or regulated by governmental organizations: e.g., Camp Peary, Fort Story. Where applicable, the Governmental use category is modified to indicate the specific character of the use, e.g., residential, direct military, and so forth.

Recreational 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. For simplicity and convenience, managed woodlands are classified as "unmanaged, wooded" areas.

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 water quality sections of this report are based upon data abstracted from Virginia State Water Control Board's publication Water Quality Standards (November, 1974) and Water Quality Inventory (305 (b) Report) (April, 1976).

Additionally, where applicable, Virginia Bureau of Shellfish Sanitation data is used to assign ratings of satisfactory, intermediate, or unsatisfactory. These 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 the shellfish standards are somewhat more stringent than most of the other water quality standards, they are included because of the economic and ecological impacts of shellfish ground closures. Special care should be taken not to endanger the water quality in existing "satisfactory" areas.

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) Limitations to Shore Use and Potential or Alternate Shore Uses

In this section we point out specific factors which may impose significant limits on the type or extent of shoreline development. This may result in a restatement of other factors from elsewhere in the report, e.g., flood hazard or erosion, or this may be a discussion of some other factor pertaining to the particular area.

Also we have placed particular attention on the recreational potential of the shore zone. The possible development of artificial beach, erosion protection, etc., influence the evaluation of an area's potential. Similarly, potential alternate shore uses are occasionally noted.

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. In Shoreline Situation Reports of counties that have had marsh inventories, the marsh number is indicated, thus allowing the user of the Shoreline Situation Report to key back to the formal marsh inventory for additional data. The independent material in this report is provided to indicate the physiographic type of marsh land and to serve as a rough guide to marsh distribution, pending a formal inventory. Additional information on wetlands characteristics may be found in Coastal Wetlands of Virginia: Interim Report No. 3, by G.M. Silberhorn, G.M. Dawes, and T.A. Barnard, Jr., SRAMSOE No. 46, 1974, 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 Enginners 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 judgment based upon considerations such 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 SHORELINE SITUATION OF PRINCE GEORGE COUNTY, VIRGINIA

3.1 THE SHORELANDS OF PRINCE GEORGE COUNTY

Prince George County is located on the south bank of the James River between Upper Chippokes Creek and the Appomattox River. This geographical area also contains the City of Hopewell (Subsegments 1B and 2A) and parts of the City of Petersburg (Subsegment 1A), which is on the Appomattox River. The shorelands reflect a wide diversity of uses, from large agricultural and wooded areas to sections of high intensity industrial and residential use.

There are 111.9 miles of measured fastland and 92.5 miles of shoreline in the Prince George County area. The shorelands physiography ranges from low shore to high shore, with seventy-three percent being classified as either low or moderately low shore (see Table 1). Flooding is not a serious threat to most areas of the shoreline, as elevations average greater than 10 feet. Only in a few isolated areas in the county are structures endangered by flood waters.

Tidal marshes, including fringe, embayed, and extensive marshes, comprise eighty percent of the county's shoreline (a tidal marsh inventory for Prince George is forthcoming). The marsh areas, especially embayed and extensive marshes, should be preserved, as they are important flood and erosion control agents and as they are valuable wildlife habitats. The beaches, which comprise eighteen percent of the shoreline, are poor, thin strips, often with vegetation. Only two percent of the shore is artificially stabilized.

The geographic area of Prince George County, especially along the Appomattox River, has several uses. The majority of the shorelands here are owned by the federal government (Fort Lee Military Reservation and the Federal Reformatory). The shorelands in Petersburg have industry (various mining operations and a Sewage Treatment Plant), commerce (railroad lines), recreation (proposed public park), and agriculture. The City of Hopewell has much industry (chemical plants) and large urban residential areas. In contrast, the shorelands of the remaining county are largely agricultural and wooded. From Jordan Point to the head of Upper Chippokes Creek, ninety-six percent of the fastlands are either wooded or agricultural. The other four percent of the shorelands are divided among commercial, industrial, recreational, and residential use.

According to the Virginia State Water Control Board's Water Quality Inventory, (305 (b) Report) (April, 1976), the Appomattox River in this area sometimes contains very high fecal coliform counts. The James River has water quality degradation from numerous discharges both in the area and further upstream. One area of particular concern is Bailey Creek near Hopewell. Discharges here have created extensive sludge deposits which create a high oxygen demand in the area. Due to these conditions, the creek hosts undesirable species of aquatic life.

In 1974, it was discovered that a toxic pesticide ingredient, KEPONE, was being discharged into the James River from a chemical plant in Hopewell. The entire river was closed to the harvesting of finfish and shellfish in December, 1975. At the present time, the James River is open to the taking of seed oysters.

3.2 SHORE EROSION IN PRINCE GEORGE COUNTY

Shoreline erosion is not a significant problem for most of Prince George County. Due to the limited fetches, wind generated waves are generally not very large along the meandering portion of the river. Historical average erosion rates are slight to moderate, the highest rate being 2.4 feet per year at Flowerdew Hundred. No structures are endangered in the county.

Erosion in Prince George is caused by a number of factors. During periods of abnormally high water, waves can overtop the protecting fringe of marsh or beach. This storm surge, which can be as much as two feet above normal high tide levels, allows wind generated waves to attack the vulnerable fastland. Downhill rain runoff also affects some areas of the shoreline, though this is not a major cause of erosion.

Although parts of Prince George, especially around Hopewell, have substantial lengths of artificial stabilization, they serve more for commercial or cosmetic purposes than for shore protection. These areas include several marinas and much of the shoreline fronting the Hopewell chemical plants. These structures for the most part seem to be effective.

Most areas of erosion are located along the relatively undeveloped eastern two-thirds of the county. Shoreline stabilization is not urgent in these areas, as erosion is not critical. Where stabilization is necessary, an area wide plan of protection is usually desirable, as individual costs are reduced and the chances for aggravated erosion downdrift are lessened. Professional advice on structure design and implementation is imperative for any shore protection device.

Most erosion in Prince George probably can be controlled with natural means such as vegetation. Marsh grasses have proven to be excellent energy buffers along the shore, and upland vegetation with a dense root system is an excellent buffer to rain runoff erosion.

In summary, shoreline erosion is not a critical problem for most of Prince George County and can be controlled with ordinary, well conceived methods. Areas with moderate erosion are usually not developed, so shore stabilization is not urgent. Where protection is necessary, proper design and implementation is most important.

3.3 SHORE USE LIMITATIONS

The geographical area of Prince George County is composed of the County, the City of Hopewell, and part of the City of Petersburg. In general, the development potential of the area is very limited for both the rural and urban sections, though for differing reasons. The high intensity use of the urban areas and the large agricultural holdings of several landowners in the rural areas presently control most of the shorelands.

The Petersburg-Hopewell area along the Appomattox River and parts of the James River (Subsegments 1A, 1B, and part of 2A) are characterized by zones of intensive use. This section includes

the Fort Lee Military Reservation, the Hopewell chemical plants, large urban residential areas, sand and gravel mining operations, and several marinas. Less than ten percent of the area is unused.

There are several possible alternate uses for parts of this section of shoreline. The land adjacent to the I-95 bridge in Petersburg is owned by the city. Proposed plans call for the development of a public recreational park which would include docks for ferry boats, picnic areas, a railroad museum, and tours through various historical homes. Another possible recreational site would be along the headwaters of Cabin Creek in Hopewell. This wooded area could be used for various low intensity activities such as hiking, picnicking, and camping. The site is located near a housing development and not far from the urban residential area of City Point. Such "nature parks" are much needed near areas of high density population buildup.

In contrast with the highly developed shoreline of the cities of Hopewell and Petersburg, the shorelands of the county of Prince George are largely agricultural and unused. However, alternate shore uses are very limited for this area also.

The Jordan Point section, which is near Hopewell and on the major route between Hopewell and Williamsburg, has a marina, an airport, and a country club. The present use precludes alternate development here. Most of the remaining shorelands are contained within several large estates, "Brandon", "Flowerdew Hundred", "Willow Hill", and "Upper Brandon". These estates, which have survived from the 1800's, directly control the use of much of the shorelands. These rural-agricultural sections of the county will probably remain relatively unchanged.

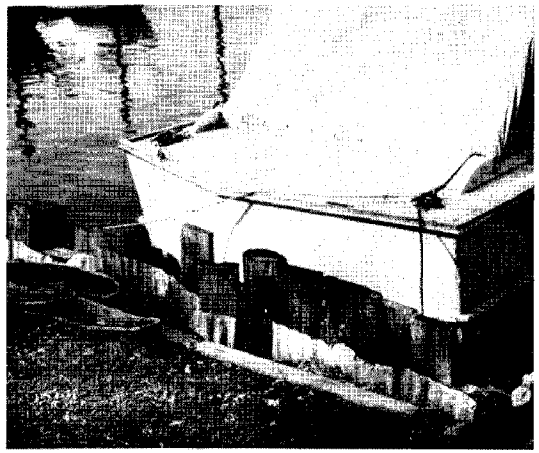


FIGURE 3

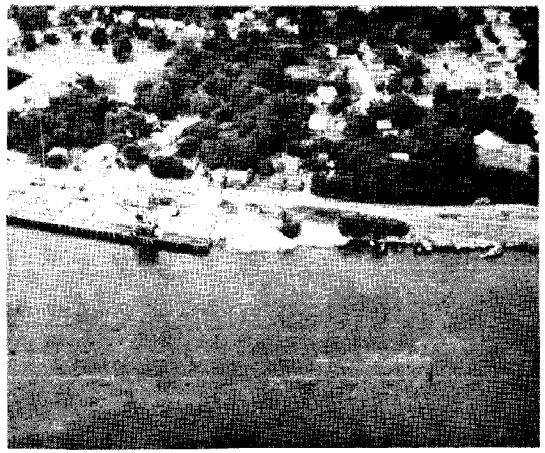


FIGURE 4

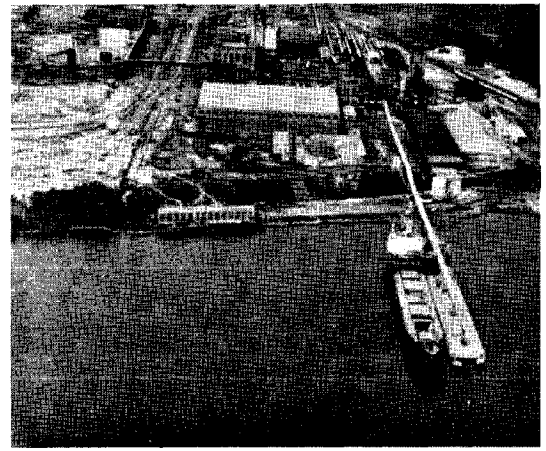


FIGURE 5

FIGURE 6

FIGURE 3: Bulkheading at Hopewell Yacht Club. This structure will probably become ineffective in the future.

FIGURE 4: View of City Point shoreline.

FIGURE 5: Industry along Hopewell's shoreline. The ship is docked at the Allied Chemical Company pier.

FIGURE 6: Jordan Point Marina and bridge. Note the sand-filled barges acting as breakwaters.

FIGURE 7: Barge acting as a breakwater, Jordan Point Marina.

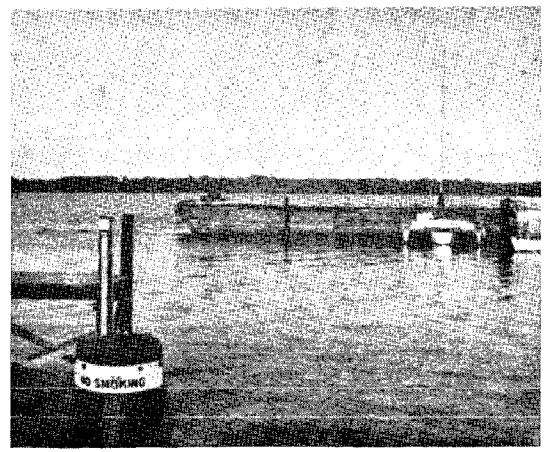


FIGURE 7

FIGURE 8

FIGURE 9

FIGURE 8: Aerial view of Brandon Point. This area has nice sandy beaches of fair width, though often littered with debris.

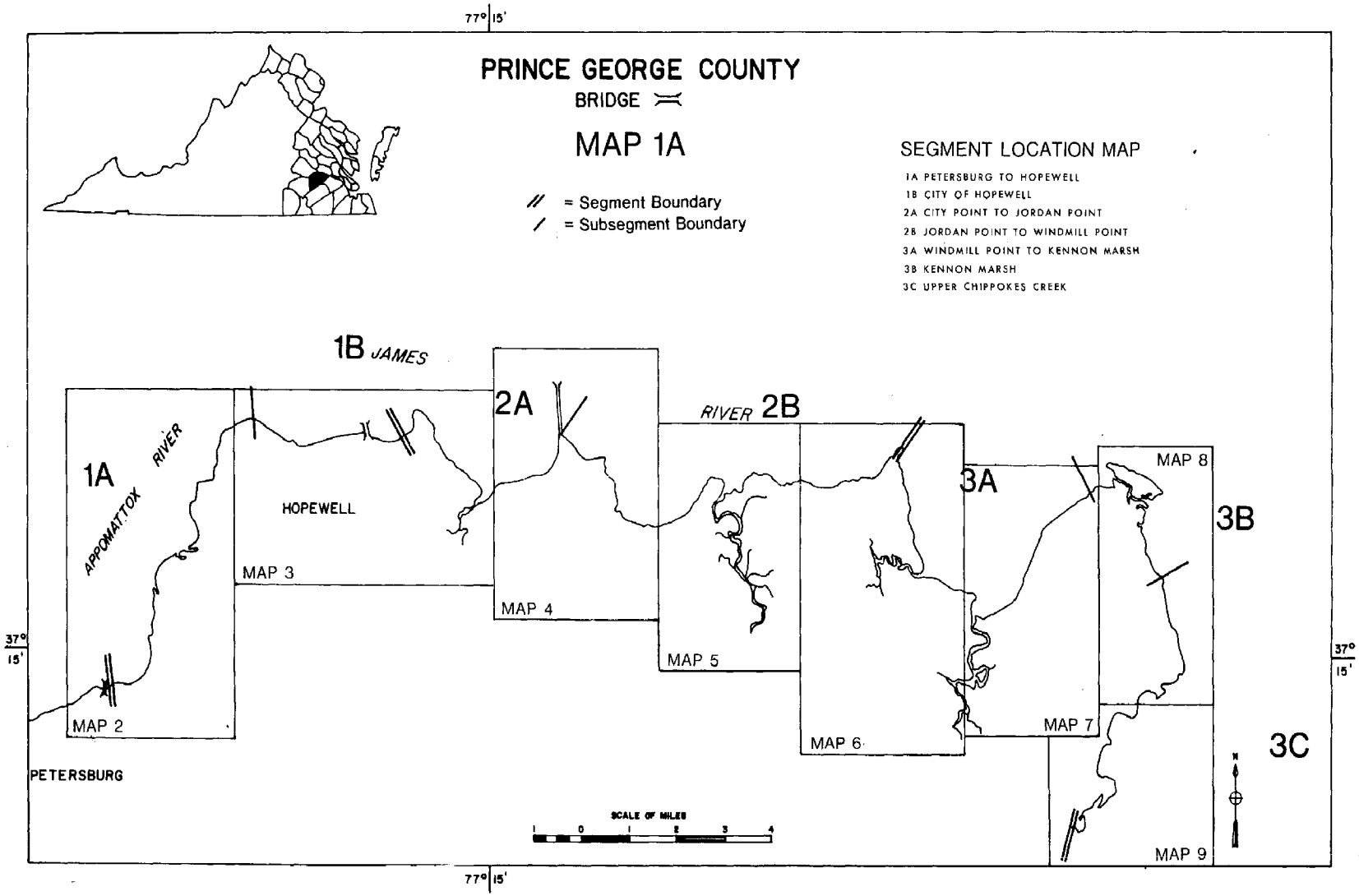
FIGURE 9: Ground view of Brandon Point. Note debris on beach.

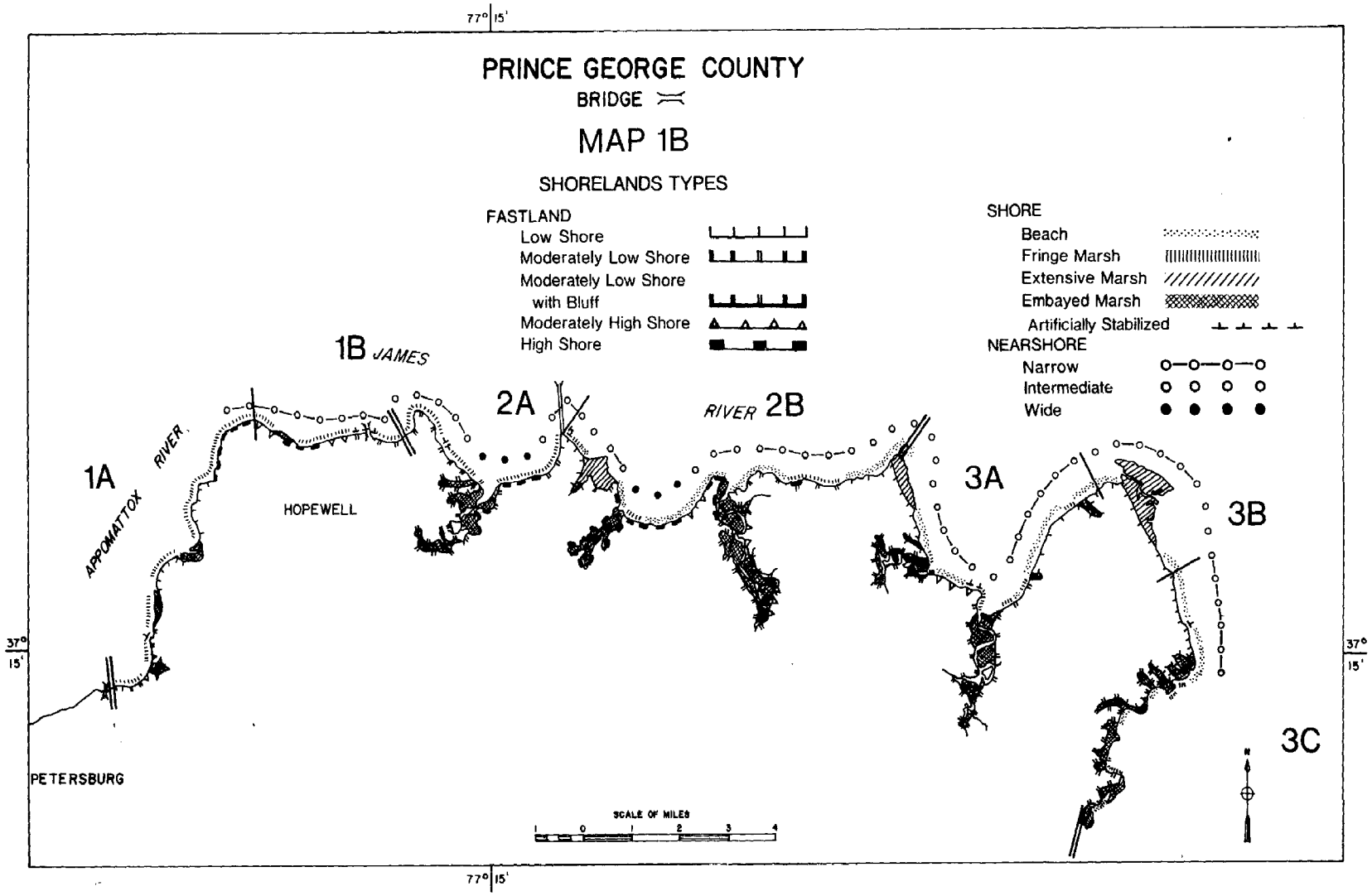
FIGURE 10: Aerial view at Fort Powhatan. The shoreline has elevations of 50 feet in most areas here.

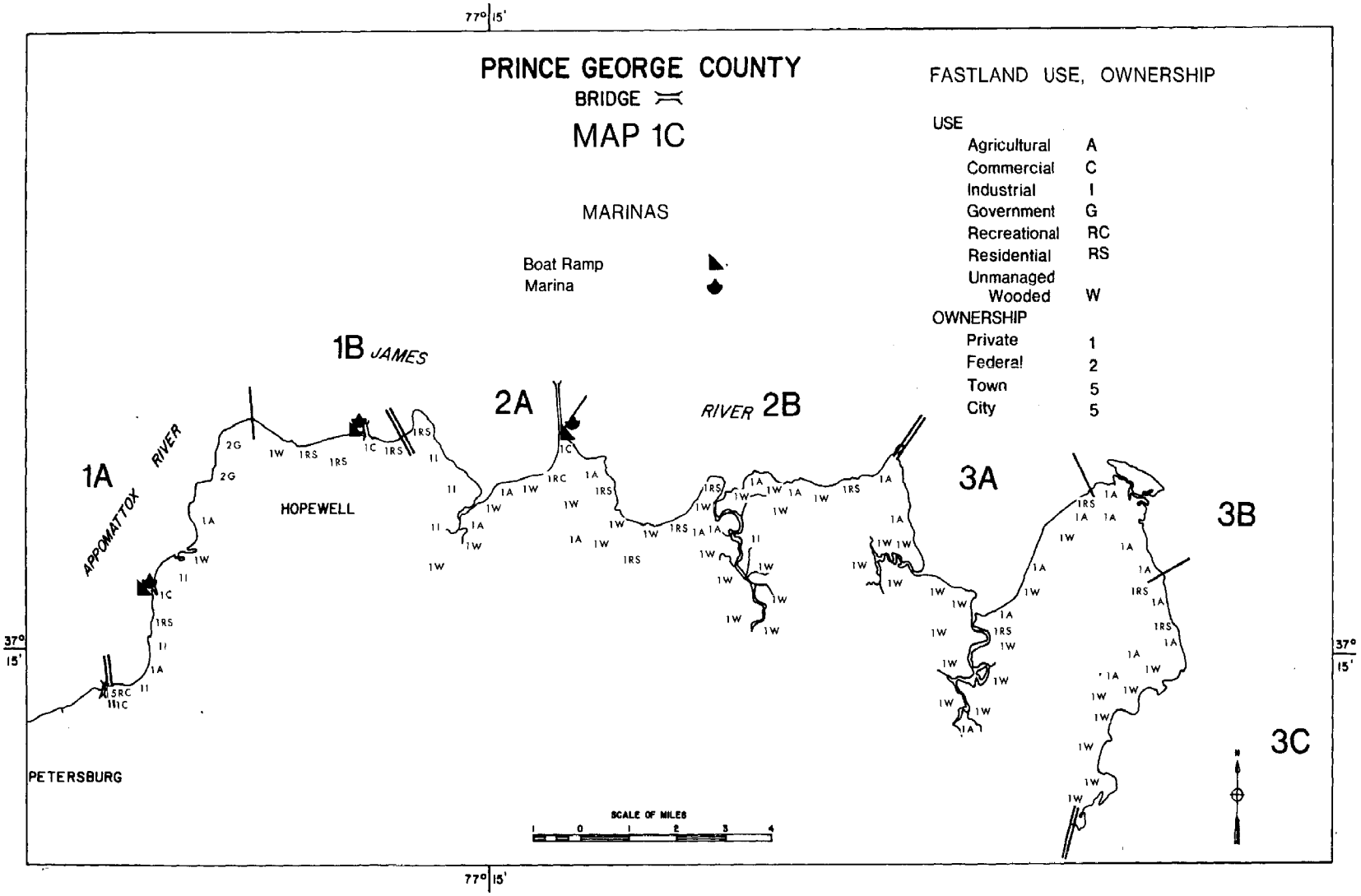
FIGURE 11: View from the bluffs at Fort Powhatan. The groin serves little purpose, and the retaining wall at the cliff base seems ineffective.

FIGURE 10

FIGURE 11


77° 15'
PRINCE GEORGE COUNTY
BRIDGE
MAP 1A
// = Segment Boundary
/ = Subsegment Boundary
SEGMENT LOCATION MAP
1A PETERSBURG TO HOPEWELL
1B CITY OF HOPEWELL
2A CITY POINT TO JORDAN POINT
2B JORDAN POINT TO WINDMILL POINT
3A WINDMILL POINT TO KENNON MARSH
3B KENNON MARSH
3C UPPER CHIPPOKES CREEK
1B JAMES
RIVER 2B
2A
1A
APPOMATTOX RIVER
HOPEWELL
MAP 3
MAP 4
MAP 5
MAP 6
MAP 7
MAP 8
MAP 9
MAP 2
3A
3B
3C
PETERSBURG
37° 15'
SCALE OF MILES
1 0 1 2 3 4


77° 15'
PRINCE GEORGE COUNTY
BRIDGE
MAP 1B
SHORELANDS TYPES
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
High Shore
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
Artificially Stabilized
NEARSHORE
Narrow
Intermediate
Wide
1A
APPOMATTOX RIVER
1B JAMES
2A
RIVER 2B
3A
3B
3C
HOPEWELL
PETERSBURG
37° 15'
SCALE OF MILES
1 0 1 2 3 4


77° 15'
PRINCE GEORGE COUNTY
BRIDGE
MAP 1C
MARINAS
Boat Ramp
Marina
FASTLAND USE, OWNERSHIP
USE
Agricultural A
Commercial C
Industrial I
Government G
Recreational RC
Residential RS
Unmanaged Wooded W
OWNERSHIP
Private 1
Federal 2
Town 5
City 5
1A
APPOMATTOX RIVER
1B JAMES
2A
RIVER 2B
3A
3B
3C
HOPEWELL
PETERSBURG
37° 15'
SCALE OF MILES
1 0 1 2 3 4

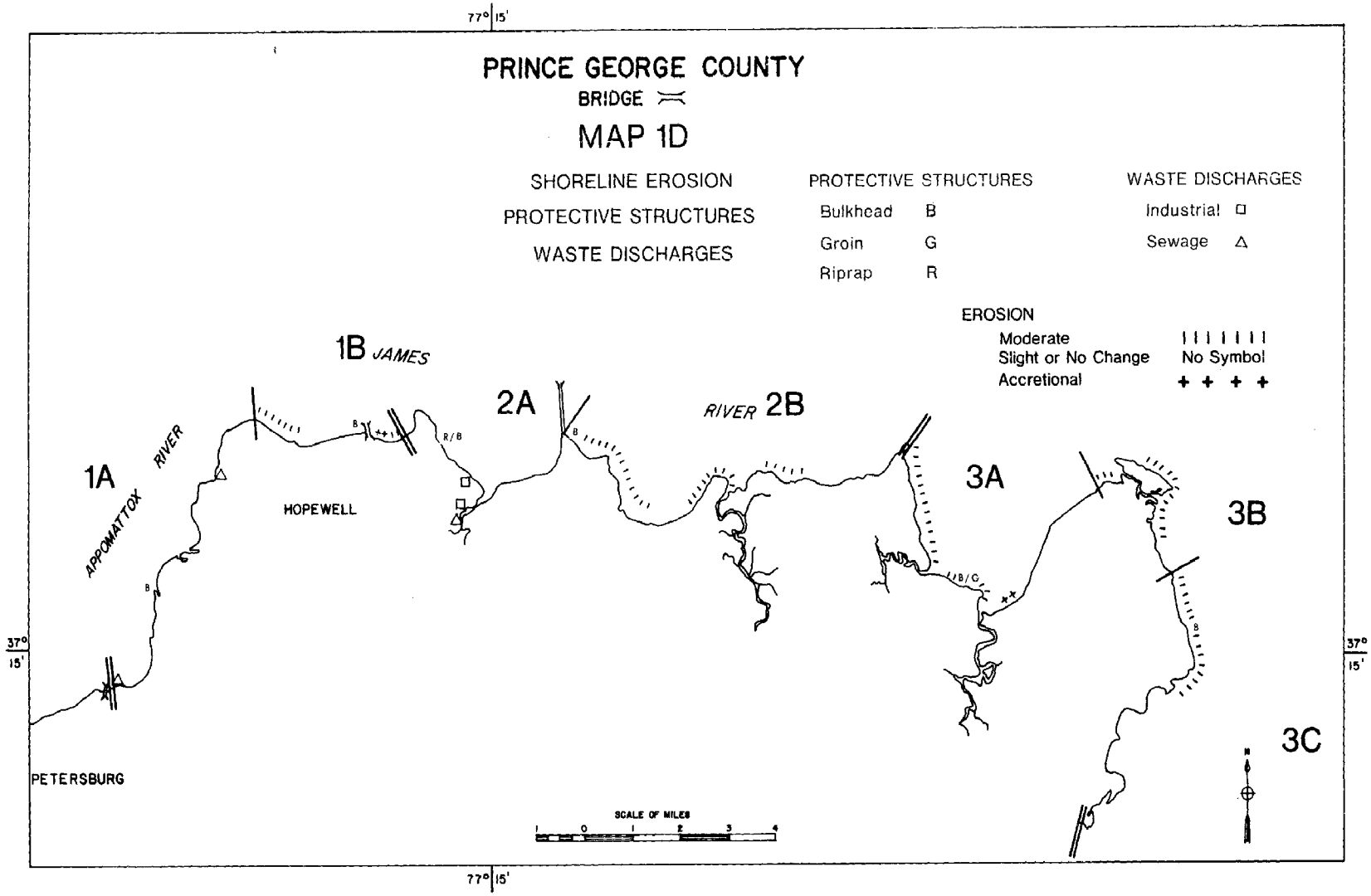

77° 15'
PRINCE GEORGE COUNTY
BRIDGE
MAP 1D
SHORELINE EROSION
PROTECTIVE STRUCTURES
WASTE DISCHARGES
PROTECTIVE STRUCTURES
Bulkhead B
Groin G
Riprap R
WASTE DISCHARGES
Industrial
Sewage
EROSION
Moderate
Slight or No Change No Symbol
Accretional
1B JAMES
2A
RIVER 2B
1A
APPOMATTOX RIVER
HOPEWELL
3A
3B
3C
PETERSBURG
37° 15'
SCALE OF MILES
77° 15'

TABLE 1. PRINCE GEORGE COUNTY SHORELANDS PHYSIOGRAPHY, FASTLAND USE, OWNERSHIP (STATUTE MILES)

Physiographic, use and ownership classification / Subsegment	SHORELANDS PHYSIOGRAPHY													FASTLAND USE								OWNERSHIP				TOTAL MILES	
	FASTLAND					SHORE					NEARSHORE																
	LOW SHORE	MODERATELY LOW SHORE	MODERATELY HIGH SHORE	HIGH SHORE	HIGH SHORE WITH BLUFF	ARTIFICIALLY STABILIZED	BEACH	EMBAYED MARSH	EXTENSIVE MARSH	FRINGE MARSH	NARROW	INTERMEDIATE	WIDE	AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	RECREATIONAL	RESIDENTIAL	UNMANAGED, OPEN	UNMANAGED, WOODED	PRIVATE	FEDERAL	COUNTY	CITY	FASTLAND	SHORELINE
1A	3.4	0.7	1.5	2.2		0.2		0.2		7.1				0.5	0.1	2.6	3.1	0.6			0.9	5.0	2.6		0.2	7.8	7.5
1B		1.6	1.6	1.5		0.6		0.4		3.4					0.4				3.6		0.7	4.7				4.7	4.5
2A	2.3	12.9	0.9	7.5		0.9	0.6	4.1		4.6	0.7	1.2	3.1	1.9			4.9	0.5	3.1	0.2	13.0	23.4		0.2		23.6	10.2
2B	7.2	11.9	2.6	7.5	0.4		7.5	15.7	1.1	2.0	2.4	4.7	2.6	7.4	0.9		1.1	0.3	1.0		18.9	29.6				29.6	26.3
3A	5.1	17.4	1.7	0.7			4.8	17.3	1.4	1.3	4.7	3.2		4.2							20.7	24.9				24.9	24.8
3B	4.1						0.4		4.3		1.3	3.4		4.1								4.1				4.1	4.7
3C	7.2	8.5	0.6	0.9		0.1	3.1	10.4		0.9	2.3			7.2							10.0	17.2				17.2	14.5
TOTAL MILES	29.3	53.0	8.9	20.3	0.4	1.8	16.4	48.1	6.8	19.3	11.4	12.5	5.7	25.3	1.4	2.6	9.1	1.4	7.7	0.2	64.2	108.9	2.6	0.2	0.2	111.9	92.5
% of FASTLAND	26%	47%	8%	18%	0									23%	1%	2%	8%	1%	7%	0	57%	97%	2%	0	0	100%	
% of SHORELINE						2%	18%	52%	7%	21%	12%	14%	6%														100%

CHAPTER 4

4.1 Table of Subsegment Summaries

4.2 Segment and Subsegment Descriptions

4.3 Segment and Subsegment Maps

TABLE 2. SHORELINE SITUATION REPORT SUBSEGMENT SUMMARIES, PRINCE GEORGE COUNTY, VIRGINIA

SUBSEGMENT	SHORELANDS TYPE	SHORELANDS USE	OWNERSHIP	ZONING	FLOOD HAZARD	BEACH QUALITY	SHORE EROSION SITUATION	ALTERNATE SHORE USE
1A PETERSBURG TO HOPEWELL 7.5 miles (7.8 miles of fastland)	FASTLAND: Low shore 44%, moderately low shore 9%, moderately high shore 19%, and high shore 28%. SHORE: Artificially stabilized 3%, fringe marsh 94%, and embayed marsh 3%. RIVER: The Appomattox River is narrow and shallow, with controlling depths of 5 feet in 1971.	FASTLAND: Agricultural 6%, commercial 1%, governmental 34%, industrial 40%, recreational 7%, and unmanaged, wooded 12%. SHORE: Some waterfowl hunting in the marshes, but mostly unused. RIVER: Commercial shipping and pleasure boating.	Private 61%, federal 34%, and city 5%.	Mostly agricultural, some industrial and recreational.	Low. This area is not exposed to direct storm effects.	There are no beaches in this subsegment.	The area appears stable. A marina near Petersburg has approximately 1,000 feet of effective bulkhead.	Low. The area of most growth potential is a parcel of city owned property near the I-95 bridge.
1B CITY OF HOPEWELL 4.5 miles (4.7 miles of fastland)	FASTLAND: Moderately low shore 34%, moderately high shore 34%, and high shore 32%. SHORE: Artificially stabilized 13%, fringe marsh 78%, and embayed marsh 8%. RIVER: The Appomattox River is narrow and shallow, having controlling depths of 5 feet in 1971.	FASTLAND: Commerail 8%, residential 76%, and unmanaged, wooded 16%. SHORE: Some waterfowl hunting in the marshes. RIVER: Commercial shipping and pleasure boating.	Private.	Residential.	Low. The entire subsegment has elevations of 20 feet.	There are no beaches in this subsegment.	Slight or no change to moderate, noncritical. The historical erosion rate from Cabin Creek to Hopewell city limits is 2.0 feet per year. There is approximately 3,000 feet of bulkhead in the subsegment, most of which is effective.	Moderate. Most of the subsegment, being included in the urban area of Hopewell, is already used extensively. The Cabin Creek area is a possible site for future low intensity recreational development.
2A CITY POINT TO JORDAN POINT 10.2 miles (23.6 miles of fastland)	FASTLAND: Low shore 9%, moderately low shore 55%, moderately high shore 4%, and high shore 32%. SHORE: Artificially stabilized 9%, beach 6%, fringe marsh 45%, and embayed marsh 40%. NEARSHORE: Narrow 7%, intermediate 12%, and wide 30%. The remainder of the subsegment is located along Bailey Creek.	FASTLAND: Agricultural 8%, industrial 21%, recreational 2%, residential 13%, unmanaged, open 1%, and unmanaged, wooded 55%. SHORE: Mostly unused. NEARSHORE: Commercial shipping and pleasure boating.	Private and some county.	Agricultural in the county. Hopewell is zoned residential and industrial.	Low, noncritical. The majority of the subsegment has elevations of 10 feet.	Poor. The subsegment has narrow, strip beaches.	Slight or no change. The industrial park between Bailey Creek and City Point has effective bulkheading and rubble riprap.	Low. The extensive residential and industrial use of the land near Hopewell precludes further development there. Any construction near Jordon Point would sacrifice the agricultural lands.
2B JORDAN POINT TO WINDMILL POINT 26.3 miles (29.6 miles of fastland)	FASTLAND: Low shore 24%, moderately low shore 40%, moderately high shore 9%, high shore 26%, and high shore with bluff 1%. SHORE: Beach 28%, fringe marsh 8%, embayed marsh 60%, and extensive marsh 4%. NEARSHORE: Narrow 9%, intermediate 18%, and wide 10%. The remainder of the subsegment is located along the creeks.	FASTLAND: Agricultural 25%, commercial 3%, industrial 4%, recreational 1%, residential 3%, and unmanaged, wooded 64%. SHORE: Mostly unused, except for the marina at Jordan Point. NEARSHORE: Commercial shipping, sport boating and fishing.	Private.	Agricultural, residential, some industrial and business.	Low. The majority of the subsegment has elevations of 20 feet.	Fair. Most beaches are of moderate width with some vegetation.	Slight or no change to moderate, noncritical. Flowerdew Hundred has an historical erosion rate of 2.4 feet per year. Jordan Point Marina has several sand-filled barges which serve as breakwaters, and some effective bulkheading.	Low. Most development will probably continue to center on the well used inland motor routes.
3A WINDMILL POINT TO KENNON MARSH 24.8 miles (24.9 miles of fastland)	FASTLAND: Low shore 20%, moderately low shore 70%, moderately high shore 7%, and high shore 3%. SHORE: Beach 19%, fringe marsh 5%, embayed marsh 70%, and extensive marsh 6%. NEARSHORE: Narrow 19% and intermediate 13%. The remainder of the subsegment is located along the creeks.	FASTLAND: Agricultural 17% and unmanaged, wooded 83%. SHORE: Some waterfowl hunting in the marshes. NEARSHORE: Commercial shipping, sport boating, fishing, and other water related activities.	Private.	Agricultural and some industrial.	Low to moderate, noncritical. Parts of Flowerdew Hundred and Upper Brandon are susceptible to flooding.	Poor. The subsegment has narrow, strip beaches, often vegetated.	Slight or no change to moderate, noncritical. An area near Wards Creek has an effective bulkhead and one groin.	Low. Most of the subsegment is included in three large estates; Flowerdew Hundred, Willow Hill, and Upper Brandon. These are privately owned and would directly control any development there.
3B KENNON MARSH 4.7 miles (4.1 miles of fastland)	FASTLAND; Entirely low shore. SHORE: Beach 9% and extensive marsh 91%. NEARSHORE: Narrow 28% and intermediate 72%.	FASTLAND: Entirely agricultural. SHORE: Some waterfowl hunting in the marsh, but mostly unused. NEARSHORE: Commercial shipping and pleasure boating.	Private.	Agricultural.	Low to moderate, noncritical. Fastland flooding occurs around Brandon Point.	Poor. The few areas of beach are narrow and often vegetated.	Slight or no change to moderate, noncritical. Kennon Marsh has an historical erosion rate of 1.6 feet per year on its eastern side, and an accretion rate of 0.7 feet per year on its western side. There are no shore protective structures.	Low. Two large estates actively control the use of the subsegment.
3C UPPER CHIPPOKES CREEK 14.5 miles (17.2 miles of fastland)	FASTLAND: Low shore 42%, moderately low shore 50%, moderately high shore 3%, and high shore 5%. SHORE: Artificially stabilized $< 1\%$, beach 21%, fringe marsh 6%, and embayed marsh 73%. NEARSHORE: Narrow 16%. Upper Chippokes Creek contains the remaining shoreline.	FASTLAND: Agricultural 42% and unmanaged, wooded 58%. SHORE: Some waterfowl hunting in the marshes. NEARSHORE: Commercial shipping on the river, sport boating and fishing on the creek.	Private.	Agricultural.	Low, noncritical. Most of the fastland has elevations of at least 10 feet and is not subject to flooding.	Poor. The subsegment has narrow, strip beaches.	Slight or no change to moderate, noncritical. Historical erosion rates along the river and in the creek mouth range from 1.1 to 1.4 feet per year. Brandon has approximately 400 feet of effective bulkhead.	Low. The agricultural lands along the river are controlled by a large estate and will probably remain unchanged. An area near the creek headwaters is suitable for low intensity recreational use.

SUBSEGMENT 1A

PETERSBURG TO HOPEWELL

(Maps 2 and 3)

EXTENT: 39,400 feet (7.5 mi.) of shoreline from the I-95 bridge at Petersburg to the Hopewell City limits. The subsegment also includes 41,200 feet (7.8 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 44% (3.4 mi.), moderately low shore 9% (0.7 mi.), moderately high shore 19% (1.5 mi.), and high shore 28% (2.2 mi.).
SHORE: Artificially stabilized 3% (0.2 mi.), fringe marsh 94% (7.1 mi.), and embayed marsh 3% (0.2 mi.).
RIVER: The Appomattox River is too narrow and shallow for classification, having controlling depths of 5 feet in 1971.

SHORELANDS USE
FASTLAND: Agricultural 6% (0.5 mi.), commercial 1% (0.1 mi.), governmental (Fort Lee Military Reservation and the Federal Reformatory) 34% (2.6 mi.), industrial 40% (3.1 mi.), recreational 7% (0.6 mi.), and unmanaged, wooded 12% (0.9 mi.).
SHORE: Some waterfowl hunting in the marshes, but mostly unused.
RIVER: Commercial shipping and pleasure boating.

SHORELINE TREND: The shoreline trends basically NNE - SSW. Fetches are negligible due to the narrowness of the river and the numerous marsh islands.

OWNERSHIP: Private 61%, federal 34%, and city 5%.

ZONING: Mostly agricultural for the federally owned lands. There is some industrial and recreational zoning in Petersburg.

FLOOD HAZARD: Low. This area is not exposed to direct storm effects. Any flooding would be the result of heavy upstream rains.

BEACH QUALITY: There are no beaches in this subsegment.

PRESENT SHORE EROSION SITUATION
EROSION RATE: No data. The area appears stable.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There is approximately 1,000 feet of bulkheading at a marina one mile north of the Petersburg City limits.

OTHER SHORE STRUCTURES: There are several piers and a boat ramp at the Appomattox Small Boat Harbor.

SHORE USE LIMITATIONS: Approximately thirty-four percent of the shorelands in this subsegment are included in the Fort Lee Military Reservation. These lands are federally owned and controlled, which would preclude any development. An additional forty percent of the shorelands are actively mined for sand and gravel. No development seems probable here until the mining operations are complete. The remaining sections of the shorelands are used for agriculture, some industry (Petersburg Sewage Treatment Plant), and recreation. Though construction near the I-95 bridge seems probable, development elsewhere in the subsegment is unlikely.

ALTERNATE SHORE USE: Low. The area with the most growth potential is a parcel of city owned property near the I-95 bridge. The City of Petersburg is considering plans for a public park which would include a boat basin for ferry boat tours, a museum, various historic homes, and other facilities. Elsewhere, there is little alternate use potential.

MAPS: USGS, 7.5 Min.Ser. (Topo.), HOPEWELL, Va. Quadr., 1969;
USGS, 7.5 Min.Ser. (Topo.), CHESTER, Va. Quadr., 1969;
USGS, 7.5 Min.Ser. (Topo.), PETERSBURG, Va. Quadr., 1969,
C&GS, #531, 1:20,000 scale, JAMES RIVER, Jordan Point to Richmond, 1971.

PHOTOS: Aerial-VIMS 12Jul74 PG-1A/107-114.

SUBSEGMENT 1B

CITY OF HOPEWELL

(Map 3)

EXTENT: 24,000 feet (4.5 mi.) of shoreline from the westward extent of Hopewell City limits east to the end of Hopewell's water boundary (3,400 feet southwest of City Point). The subsegment also includes 24,600 feet (4.7 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Moderately low shore 34% (1.6 mi.), moderately high shore 34% (1.6 mi.), and high shore 32% (1.5 mi.).
SHORE: Artificially stabilized 13% (0.6 mi.), fringe marsh 78% (3.4 mi.), and embayed marsh 8% (0.4 mi.).
RIVER: The Appomattox River is too narrow for classification, having controlling depths of 5 feet to Petersburg in 1971.

SHORELANDS USE
FASTLAND: Commercial 8% (0.4 mi.), residential 76% (3.6 mi.), and unmanaged, wooded 16% (0.7 mi.).
SHORE: Private use and some waterfowl hunting in the marshes.
RIVER: Commercial shipping and pleasure boating.

SHORELINE TREND: The shoreline trends basically E - W in this subsegment.

OWNERSHIP: Private.

ZONING: Residential.

FLOOD HAZARD: Low, noncritical. The entire subsegment has elevations of at least 20 feet, with the exception of the mouth of Cabin Creek.

BEACH QUALITY: There are no beaches in this subsegment.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change to moderate, noncritical. The historical erosion rate from Cabin Creek to Hopewell City limits is 2.0 feet per year.

ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There is approximately 3,000 feet of bulkheading in this subsegment, the majority of which is found at the Hopewell Yacht Club. Most of the structure is effective, though several sections are in need of repair.

OTHER SHORE STRUCTURES: The Hopewell Yacht Club facilities include a boat ramp, marine railway, approximately 44 covered slips, and 19 uncovered slips.

SHORE USE LIMITATIONS: All of the shorelands in this subsegment have elevations of over 20 feet, with the majority of lands being over 40 feet. This height reduces the availability of the shorelands for water related development purposes. Much of this subsegment is already used extensively, the eastern portion being included in the urban area of Hopewell. Here, little additional development could occur. The western third of the subsegment is largely wooded, though a residential development is located in the fastland just west of Cabin Creek.

ALTERNATE SHORE USE: Moderate. Some of the wooded lands in the western sector of the subsegment could be developed for low intensity recreational activities such as picnicking, hiking, and camping. One possible location for such a facility would be along the shore of Cabin Creek. Other sites in the subsegment could have some residential development in places.

MAPS: USGS, 7.5 Min.Ser. (Topo.), HOPEWELL, Va. Quadr., 1969.
C&GS, #531, 1:20,000 scale, JAMES RIVER, Jordan Point to Richmond, 1971.

PHOTOS: Aerial-VIMS 12Jul74 PG-1B/91-106.

Ground-VIMS 10Dec75 PG-1B/45- 60.

SUBSEGMENT 2A

CITY POINT TO JORDAN POINT

(Maps 3 and 4)

EXTENT: 54,200 feet (10.2 mi.) of shoreline from the end of Hopewell City water to Jordan Point. The subsegment also includes 124,600 feet (23.6 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 9% (2.3 mi.), moderately low shore 55% (12.9 mi.), moderately high shore 4% (0.9 mi.), and high shore 32% (7.5 mi.).
SHORE: Artificially stabilized 9% (0.9 mi.), beach 6% (0.6 mi.), fringe marsh 45% (4.6 mi.), and embayed marsh 40% (4.1 mi.).
NOTE: The figure for embayed marsh does not include 72,000 feet along Bailey Creek where the water becomes too narrow and shallow to be included in the shoreline measurement.
NEARSHORE: Narrow 7%, intermediate 12%, and wide 30%. The remainder of the shoreline is located along Bailey Creek, which is too narrow and shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 8% (1.9 mi.), industrial 21% (4.9 mi.), recreational 2% (0.5 mi.), residential 13% (3.1 mi.), unmanaged, open 1% (0.2 mi.), and unmanaged, wooded 55% (13.0 mi.).
SHORE: Mostly unused.
NEARSHORE: Commercial barges to the industrial plants at Hopewell and pleasure boating.

SHORELINE TREND: This subsegment trends NW - SE from City Point to Bailey Creek, then SW - NE from Bailey Creek to Jordan Point. The fetch at City Point is NNE - 3.0 nm, ESE - 4.7 nm, and WSW - 1.7 nm.

OWNERSHIP: Private and some county.

ZONING: Agricultural in the county. The City Point area is residential, and the southeastern section of Hopewell is industrial.

FLOOD HAZARD: Low, noncritical. The majority of the subsegment has elevations of at least 10 feet, with the exception of some storage tanks southeast of City Point.

BEACH QUALITY: Poor. This subsegment has narrow, strip beaches.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There is an area of effective riprap and bulkheading at the industrial park between Bailey Creek and City Point.

OTHER SHORE STRUCTURES: There are two large piers in this subsegment.

SHORE USE LIMITATIONS: The Hopewell section of this subsegment (to Bailey Creek) is already extensively used for private residences and industrial plants. Little other development is possible for these areas. The Jordan Point section is a very thin strip of land beside the road. The Jordan Point Country Club just southwest of Jordan Point controls one-half mile of shoreline. No development is probable for either area.

ALTERNATE SHORE USE: Low. No residential or recreational development is very likely near Bailey Creek because of offensive odors caused by contamination of the water. The level lands between Bailey Creek and Jordan Point are used extensively for agriculture. The area is probably best left as it is.

MAPS: USGS, 7.5 Min.Ser. (Topo.), WESTOVER, Va. Quadr., 1965;
USGS, 7.5 Min.Ser. (Topo.), HOPEWELL, Va. Quadr., 1969.
C&GS, #531, 1:20,000 scale, JAMES RIVER, Jordan Point to Richmond, 1971;
C&GS, #530, 1:40,000 scale, JAMES RIVER, Jamestown Island to Jordan Point, 1971.

PHOTOS: Aerial-VIMS 12Jul74 PG-2A/67-90.

Ground-VIMS 10Dec75 PG-2A/61-63.

SUBSEGMENT 2B

JORDAN POINT TO WINDMILL POINT

(Maps 4, 5 and 6)

EXTENT: 139,000 feet (26.3 mi.) of shoreline from Jordan Point to Windmill Point. The subsegment also includes 156,000 feet (29.6 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 24% (7.2 mi.), moderately low shore 40% (11.9 mi.), moderately high shore 9% (2.6 mi.), high shore 26% (7.5 mi.), and high shore with bluff 1% (0.4 mi.).
SHORE: Beach 28% (7.5 mi.), fringe marsh 8% (2.0 mi.), embayed marsh 60% (15.7 mi.), and extensive marsh 4% (1.1 mi.).
NEARSHORE: Narrow 9%, intermediate 18%, and wide 10%. The remainder of the subsegment is located along the creeks.

SHORELANDS USE
FASTLAND: Agricultural 25% (7.4 mi.), commercial 3% (0.9 mi.), industrial 4% (1.1 mi.), recreational 1% (0.3 mi.), residential 3% (1.0 mi.), and unmanaged, wooded 64% (18.9 mi.).
SHORE: Little used except for the marina at Jordan Point. Some waterfowl hunting in the marshes.
NEARSHORE: Sport boating, fishing, and other water related activities. Commercial shipping to Hopewell and Richmond.

SHORELINE TREND: The shoreline trend is basically W - E from Jordan Point to Windmill Point. The fetch at Jordan Point is WSW - 1.7 nm, and at Coggins Point W - 1.9 nm. The fetches at Windmill Point are WNW - 3.5 nm and SSE - 2.2 nm.

OWNERSHIP: Private.

ZONING: Jordan Point is zoned for business. The rest of the subsegment is zoned for agricultural, residential, and some industrial use.

FLOOD HAZARD: Low, noncritical. The majority of the shorelands have elevations of at least 20 feet.

BEACH QUALITY: Fair. Most beaches are of moderate width with some vegetation.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change to moderate, noncritical. The area experiencing most change is Flowerdew Hundred, which has an average erosion rate of 2.4 feet per year.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There is a small area of effective bulkheading at Jordan Point Marina. Several sand filled barges off Jordan Point serve as effective breakwaters.

OTHER SHORE STRUCTURES: There are several piers located in the subsegment. Structures at Jordan Point include a marine railway, concrete boat ramp, and numerous covered slips.

SHORE USE LIMITATIONS: Sixty-four percent of the shoreline in this subsegment is embayed or extensive marsh. These areas are protected by the Virginia Wetlands Act of 1972, which strictly controls any planned alteration of tidal marsh areas. Development behind marshes is possible, though access to the water would be limited and difficult. Several areas along the shoreline, mainly around Jordan Point, have already been developed. The marina and airport at Jordan Point would prohibit other building in that area. The Beechwood Manor subdivision does have room for expansion if necessary. The rest of the subsegment is characterized by high or moderately high elevations near the shoreline. The inland plains are generally used for agriculture. The Flowerdew Hundred area is one of several large parcels of land owned by individuals in the county. Development in these sections would depend directly upon the wishes of these landowners. For the present time, these lands are largely used for agriculture.

ALTERNATE SHORE USE: Low. This subsegment is largely rural - agricultural in nature. Development will probably continue to center on the well used inland motor routes through the county. Isolated residential development is possible in areas along the shore. It is expected, however, that the shorelands will remain primarily in their present rural state for the near future.

MAPS: USGS, 7.5 Min.Ser. (Topo.), WESTOVER, Va. Quadr., 1965;
USGS, 7.5 Min.Ser. (Topo.), CHARLES CITY, Va. Quadr., 1965.
C&GS, #530, 1:40,000 scale, JAMES RIVER, Jamestown Island to Jordan Point, 1971.

PHOTOS: Aerial-VIMS 12Jul74 PG-2B/38-66.

Ground-VIMS 10Dec75 PG-2B/32-44; 64-72.

SUBSEGMENT 3A

WINDMILL POINT TO KENNON MARSH

(Maps 6 and 7)

EXTENT: 130,800 feet (24.8 mi.) of shoreline from Windmill Point to Kennon Marsh, including Wards Creek and Flowerdew Hundred Creek. The subsegment also includes 131,800 feet (24.9 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 20% (5.1 mi.), moderately low shore 70% (17.4 mi.), moderately high shore 7% (1.7 mi.), and high shore 3% (0.7 mi.).
SHORE: Beach 19% (4.8 mi.), fringe marsh 5% (1.3 mi.), embayed marsh 70% (17.3 mi.), and extensive marsh 6% (1.4 mi.).
NEARSHORE: Narrow 19% and intermediate 13%. The remainder of the subsegment is located along the creeks.

SHORELANDS USE
FASTLAND: Agricultural 17% (4.2 mi.) and unmanaged, wooded 83% (20.7 mi.).
SHORE: Some waterfowl hunting in the marshes.
NEARSHORE: Sport boating, fishing and other water related activities. Commercial shipping to Hopewell and Richmond.

SHORELINE TREND: The shoreline trends first NW - SE, then SW - NE. Fetches at the mouth of Wards Creek are NE - 3.6 nm and NW - 1.5 nm.

OWNERSHIP: Private.

ZONING: Agricultural and some industrial.

FLOOD HAZARD: Low to moderate, noncritical. Areas subject to flooding include parts of Flowerdew Hundred and land near Upper Brandon. Most other areas have elevations greater than 10 feet and are not susceptible to flooding.

BEACH QUALITY: Poor. There are only narrow, strip beaches in this subsegment, often vegetated.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change to moderate, noncritical. There is both erosion and accretion occurring, neither causing substantial changes in the shoreline.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There is an area of effective bulkheading and one groin located north of Wards Creek.

OTHER SHORE STRUCTURES: There are several piers in the subsegment.

SHORE USE LIMITATIONS: Most of the lands in this subsegment are the property of three large estates: Flowerdew Hundred, Willow Hill, and Upper Brandon. Alternate uses of the areas would depend upon the wishes of the owners. The rural wooded - agricultural usage of this subsegment, with the concurrent lack of access would further hinder any development along the shoreline.

ALTERNATE SHORE USE: Low. Development along most of the shorelands would depend directly upon the wishes of the several landowners in this subsegment. It is expected that the shorelands here will remain in much their present state.

MAPS: USGS, 7.5 Min.Ser. (Topo.), CHARLES CITY, Va. Quadr., 1965;
USGS, 7.5 Min.Ser. (Topo.), SAVEDGE, Va. Quadr., 1966.
C&GS, #530, 1:40,000 scale, JAMES RIVER, Jamestown Island to Jordan Point, 1971.

PHOTOS: Aerial-VIMS 12Jul74 PG-3A/16-37.

Ground-VIMS 10Dec75 PG-3A/11-31.

SUBSEGMENT 3B

KENNON MARSH

(Maps 7 and 8)

EXTENT: 24,600 feet (4.7 mi.) of shoreline from Kennon Marsh to Brandon Point. This subsegment also includes 21,600 feet (4.1 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Entirely low shore.
SHORE: Beach 9% (0.4 mi.) and extensive marsh 91% (4.3 mi.).
NEARSHORE: Narrow 28% and intermediate 72%.

SHORELANDS USE
FASTLAND: Entirely agricultural.
SHORE: Some waterfowl hunting in the marsh, but mainly unused.
NEARSHORE: Commercial and pleasure boating.

SHORELINE TREND: The shoreline trends basically NW - SE. The fetch at Kennon Marsh is SE - 3.6 nm and SW - 3.3 nm.

OWNERSHIP: Private.

ZONING: Agricultural.

FLOOD HAZARD: Low to moderate, noncritical. Fastland flooding occurs around Brandon Point where elevations are 5 feet or less. The remainder of the subsegment has elevations of at least 10 feet and is not subject to flooding.

BEACH QUALITY: Poor. The few areas of beach are narrow and often vegetated.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change to moderate, noncritical. There is an average erosion rate of 1.6 feet per year on the eastern side of Kennon Marsh, and an accretion rate of 0.7 feet per year on the western side.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: None.

OTHER SHORE STRUCTURES: None.

SHORE USE LIMITATIONS: The extensive marsh area comprising Kennon Marsh would limit development

behind in the fastland. The marsh should be preserved. This subsegment is actively used for agricultural purposes, being part of two large estates. Any development would be at the sacrifice of the agriculture.

ALTERNATE SHORE USE: Low. Two large estates actively control the use of this subsegment. No change in the present agricultural use is forseen for the near future.

MAPS: USGS, 7.5 Min.Ser. (Topo.), CHARLES CITY, Va. Quadr., 1965;
USGS, 7.5 Min.Ser. (Topo.), BRANDON, Va. Quadr., 1965.
C&GS, #530, 1:40,000 scale, JAMES RIVER, Jamestown Island to Jordan Point, 1971.

PHOTOS: Aerial-VIMS 12Jul74 PG-3B/5-15.

Ground-VIMS 10Dec75 PG-3B/1-10.

SUBSEGMENT 3C

UPPER CHIPPOKES CREEK

(Maps 8 and 9)

EXTENT: 76,800 feet (14.5 mi.) of shoreline from Brandon Point to the headwaters of Upper Chippokes Creek. The fastland extent is 91,000 feet (17.2 mi.).

SHORELANDS TYPE
FASTLAND: Low shore 42% (7.2 mi.), moderately low shore 50% (8.5 mi.), moderately high shore 3% (0.6 mi.), and high shore 5% (0.9 mi.).
SHORE: Artificially stabilized less than 1%, beach 21% (3.1 mi.), fringe marsh 6% (0.9 mi.), and embayed marsh 73% (10.4 mi.).
NEARSHORE: Narrow 16%. The remainder of the subsegment is located along Upper Chippokes Creek, which has controlling depths of 2 to 5 feet.

SHORELANDS USE
FASTLAND: Agricultural 42% (7.2 mi.) and unmanaged, wooded 58% (10.0 mi.).
SHORE: Some waterfowl hunting in the marshes, but mostly unused.
RIVER: Commercial shipping and pleasure boating.
CREEK: Sport fishing and other water related activities.

SHORELINE TREND: The shoreline trend is basically NE - SW in this subsegment. The fetch at Chippokes Point is SE - 5.6 nm.

OWNERSHIP: Private.

ZONING: Agricultural.

FLOOD HAZARD: Low, noncritical. The majority of the subsegment has elevations of at least 10 feet. Only the marsh areas are subject to flooding.

BEACH QUALITY: Poor. This subsegment has narrow, strip beaches.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change to moderate, noncritical. While the areas near the creek head appear stable, erosion elsewhere ranges from 1.1 to 1.4 feet per year.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There is approximately 400 feet of effective bulkheading at Brandon.

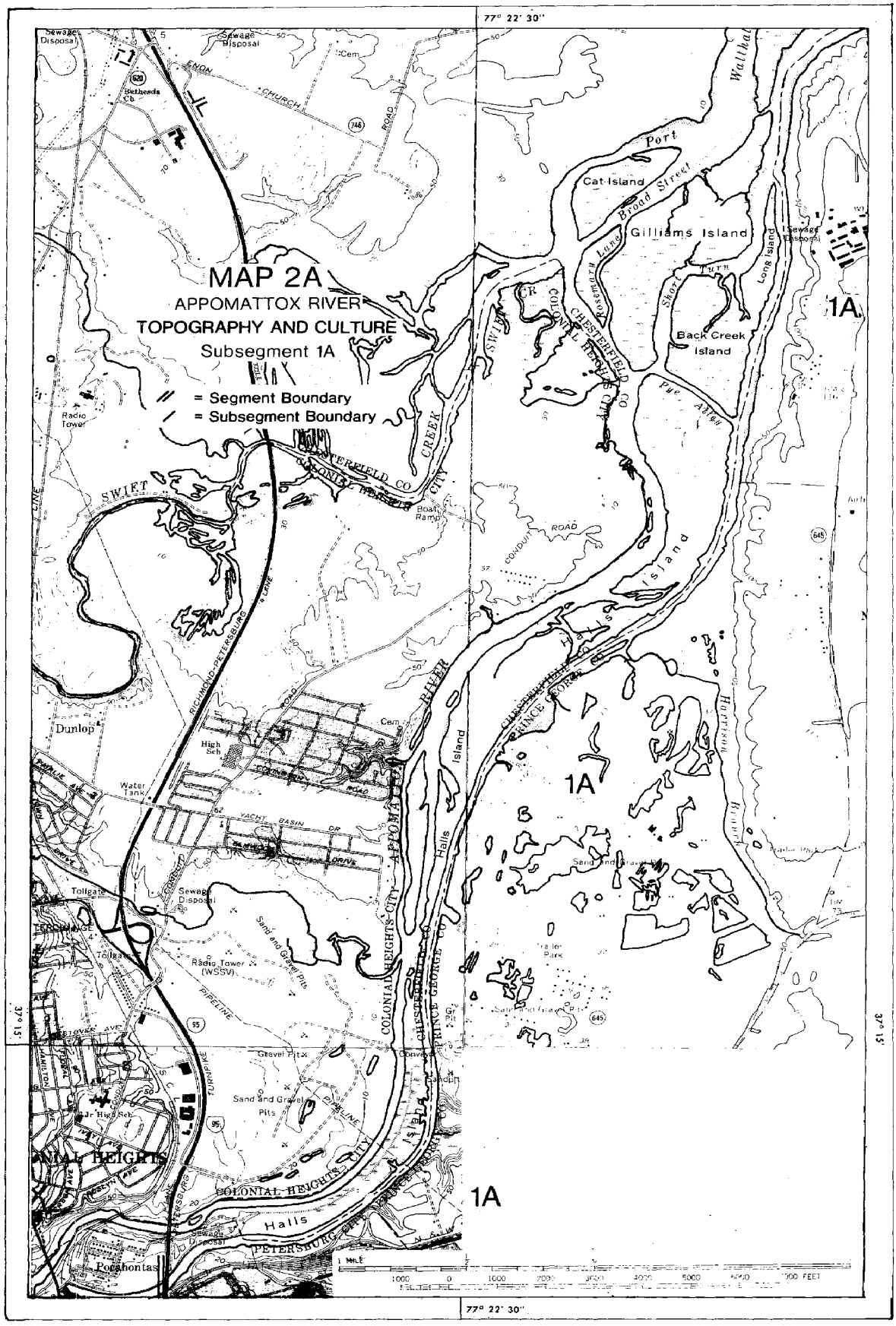
OTHER SHORE STRUCTURES: There is a pier at Brandon and a boat landing near the head waters of Upper Chippokes Creek.

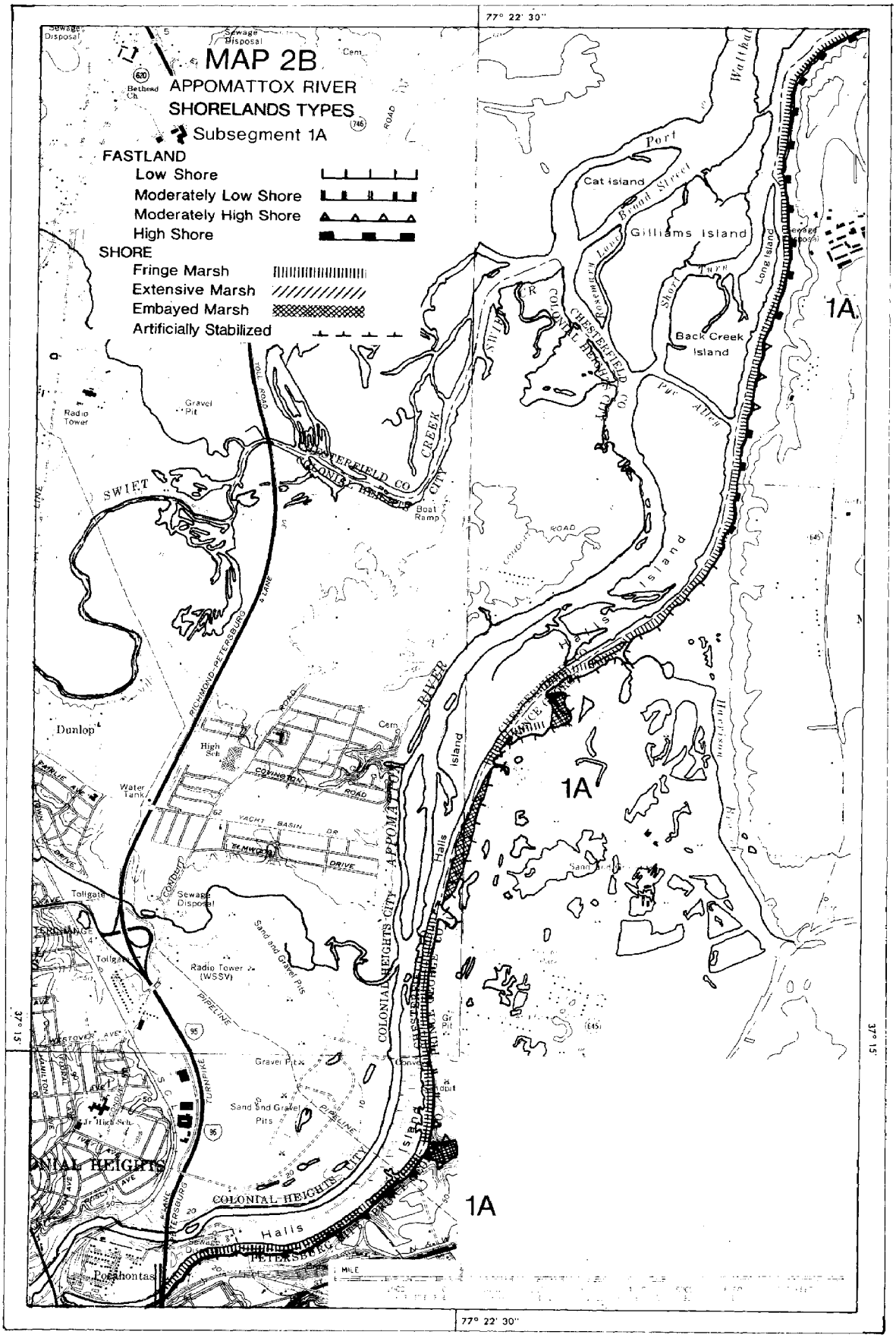
SHORE USE LIMITATIONS: The fastlands of this subsegment are divided between agricultural and wooded lands. Generally, the agricultural areas are located from the mouth of Upper Chippokes Creek north to Brandon. The shorelands of the creek are entirely unmanaged, wooded. As in the preceeding subsegment, the agricultural lands are part of a large estate, "Brandon", and their use is therefore controlled by the estate. The wooded lands along Upper Chippokes Creek are fronted by large areas of embayed marsh (seventy-three percent of the shoreline is embayed marsh). The shorelands along the creek have very limited access, there being only dirt roads to the area.

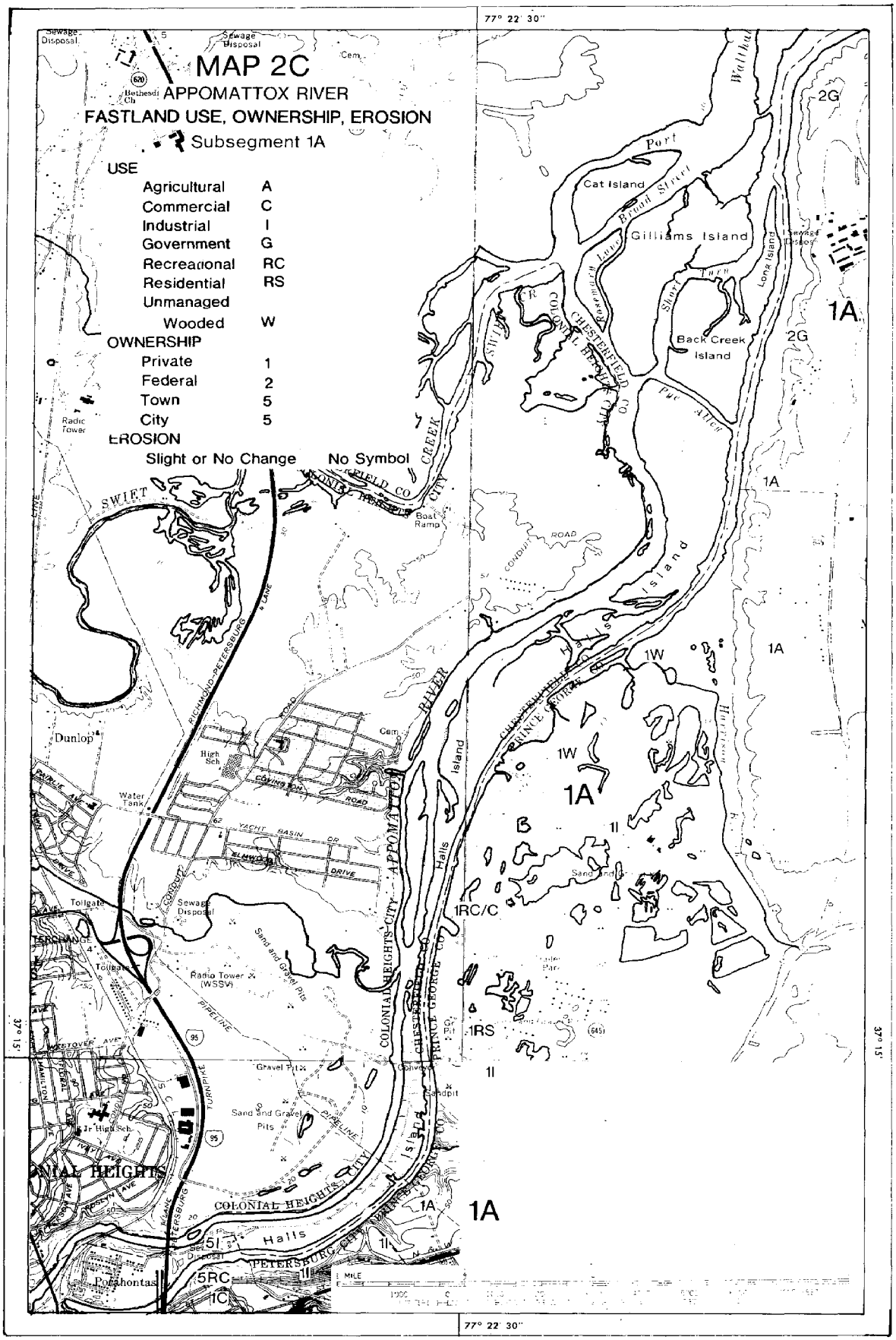
ALTERNATE SHORE USE: Low. Little change in the present shore use seems probable. The agricultural lands are controlled by a large estate and will most likely remain unchanged. The lack of access to the creek shorelands, plus the presence of embayed marsh along the shoreline, make development unlikely here. A low intensity recreational facility near the headwaters of Upper Chippokes Creek is a possibility. This area is near a paved road, and the wooded nature of the land plus the embayed marsh areas would be ideal for nature walks, picnicking, and other such recreational uses.

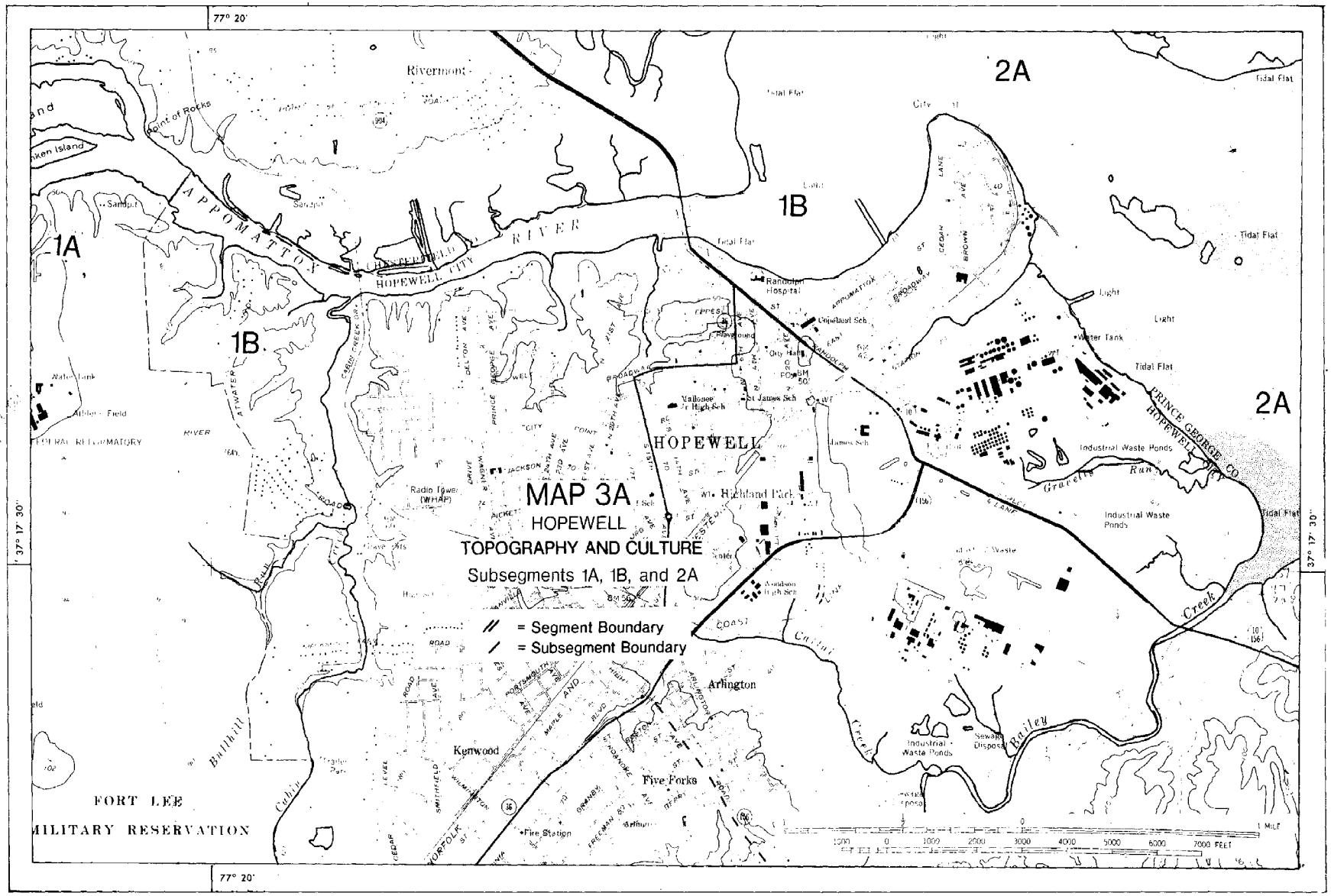
MAPS: USGS, 7.5 Min.Ser. (Topo.), BRANDON, Va. Quadr., 1965;
USGS, 7.5 Min.Ser. (Topo.), CLAREMONT, Va. Quadr., 1966;
USGS, 7.5 Min.Ser. (Topo.), SAVEDGE, Va. Quadr., 1966.
C&GS, #530, 1:40,000 scale, JAMES RIVER, Jamestown Island to Jordan Point, 1971.

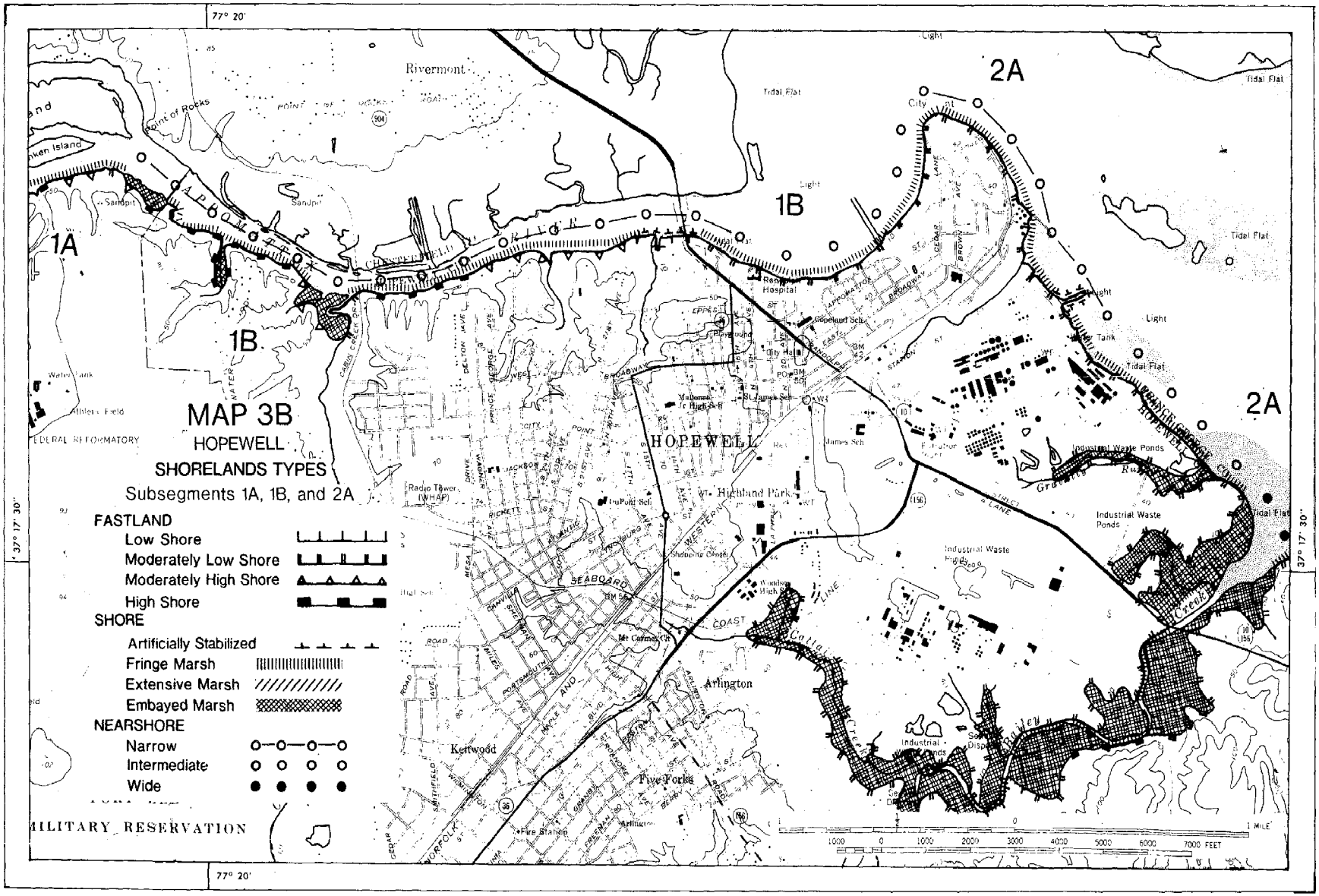
PHOTOS: Aerial-VIMS 12Jul74 PG-3C/1-4;
PG-3B/5-8.
Ground-VIMS 10Dec75 PG-3B/1-10.

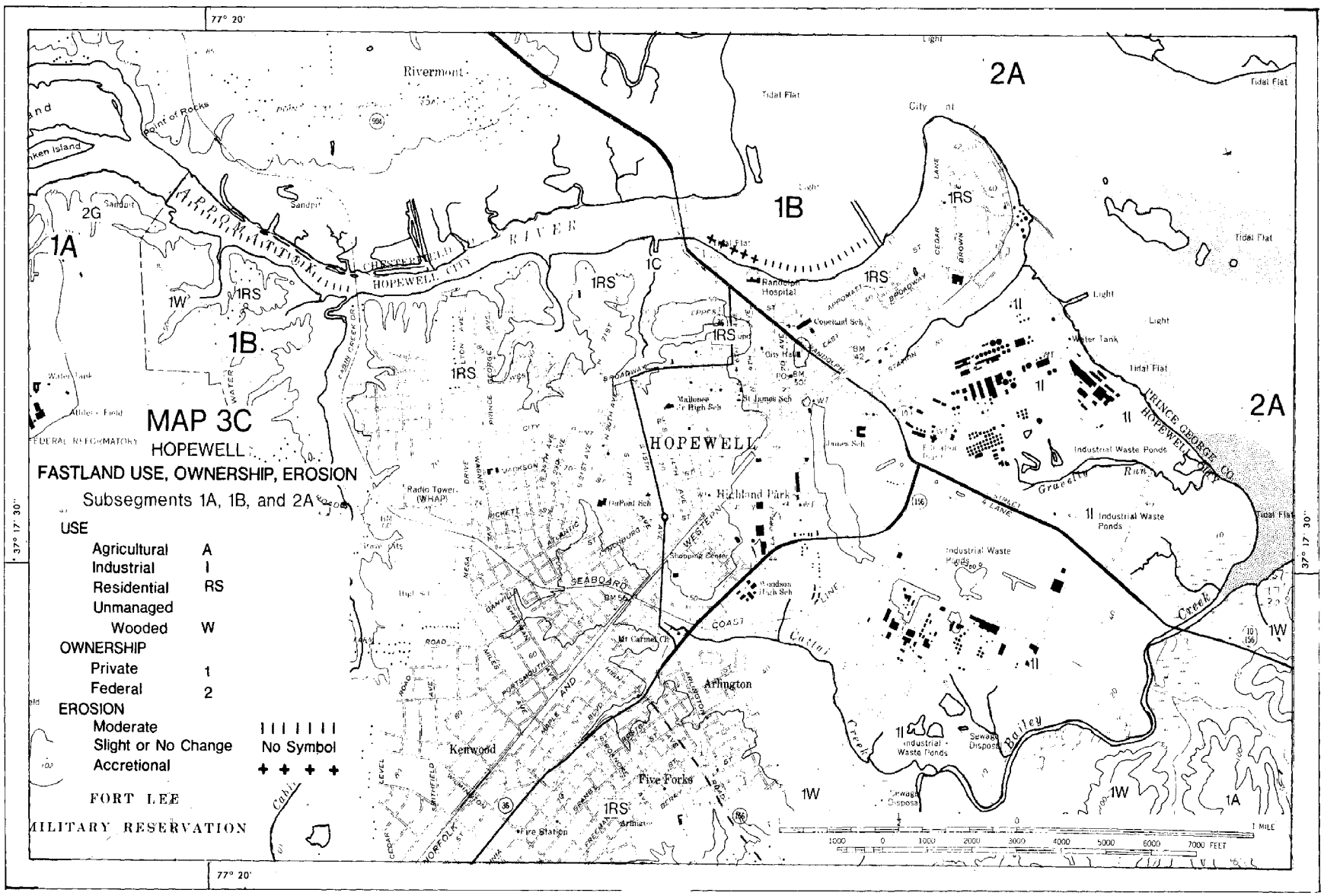

MAP 2A
APPOMATTOX RIVER
TOPOGRAPHY AND CULTURE
Subsegment 1A
= Segment Boundary
= Subsegment Boundary
77° 22' 30"
37° 15'
1A
Cat Island
Gilliams Island
Back Creek Island
Long Island
Port Walthall
Broad Street
Short Turn
Pye Alley
Halls Island
Harrison Branch
Sewage Disposal
Radio Tower
Dunlop
High Sch
Water Tank
Tollgate
Radio Tower (WSSV)
Sand and Gravel Pits
Gravel Pit
Jr High Sch
Porphontas
Boat Ramp
Trailer Park
Sand and Gravel Pits
SWIFT CREEK
APPOMATTOX RIVER
COLONIAL HEIGHTS CITY
CHESTERFIELD CO
PRINCE GEORGE CO
PETERSBURG CITY
RICHMOND-PETERSBURG LANE
YACHT BASIN DR
PIPELINE
TURNPIKE
CONDUIT ROAD
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

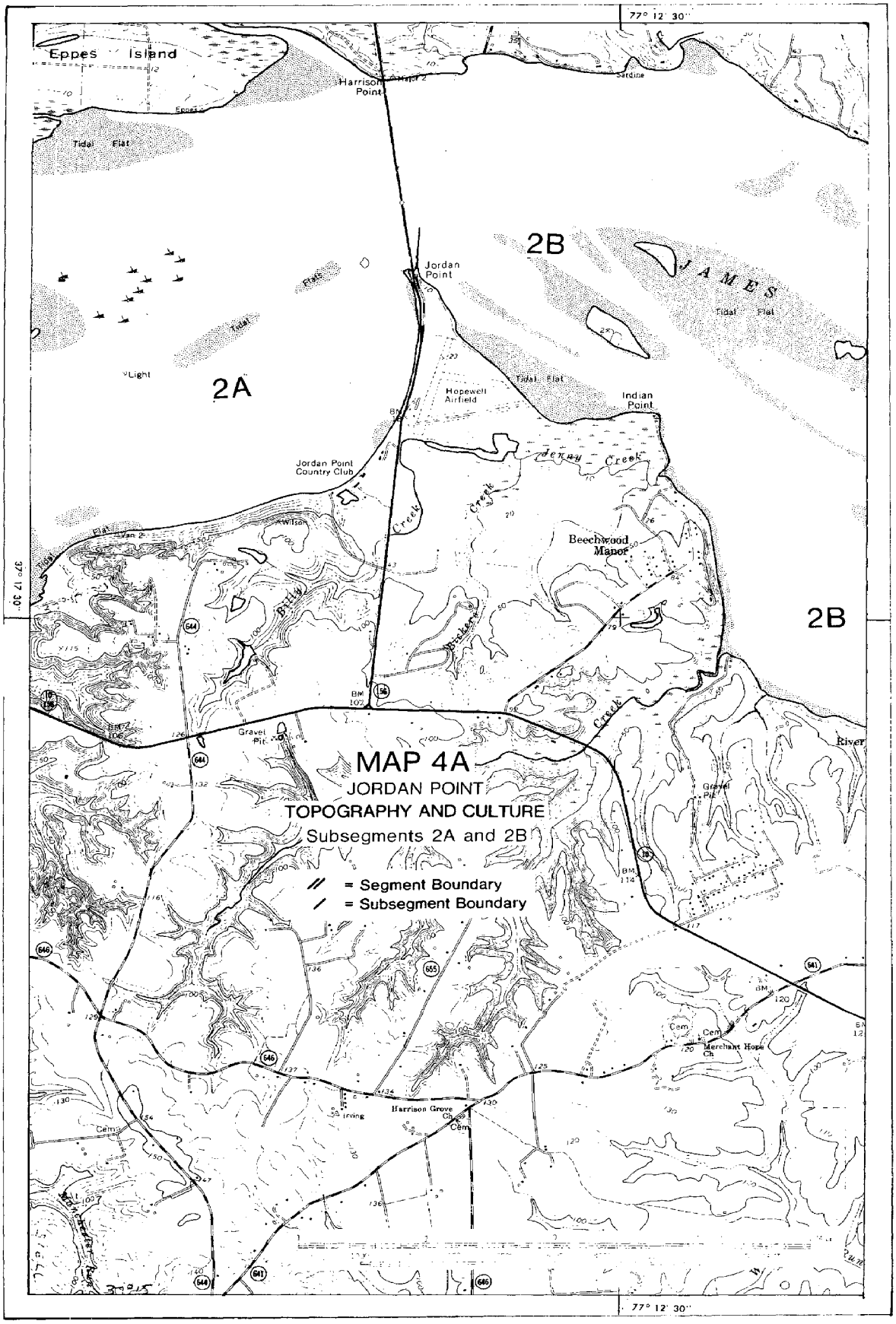

MAP 2B
APPOMATTOX RIVER
SHORELANDS TYPES
Subsegment 1A
FASTLAND
Low Shore
Moderately Low Shore
Moderately High Shore
High Shore
SHORE
Fringe Marsh
Extensive Marsh
Embayed Marsh
Artificially Stabilized
77° 22' 30"
37° 15'
1A
Cat Island
Gilliams Island
Back Creek Island
Long Island
Port Walthall
Broad Street
Short Turn
Pye Alley
Halls Island
Harrison Beach
Sewage Disposal
Radio Tower
Gravel Pit
Boat Ramp
SWIFT CREEK
CHESTERFIELD CO
COLONIAL HEIGHTS CITY
APPOMATTOX RIVER
RICHMOND-PETERSBURG 4 LANE
Dunlop
High Sch
Water Tank
COVINGTON ROAD
YACHT BASIN DR
ELMWOOD DRIVE
Tollgate
Sewage Disposal
Radio Tower (WSSV)
Sand and Gravel Pits
PIPELINE
Gravel Pit
Sand and Gravel Pits
Jr High Sch
COLONIAL HEIGHTS
Halls Island
PETERSBURG
Pocahontas
MILE

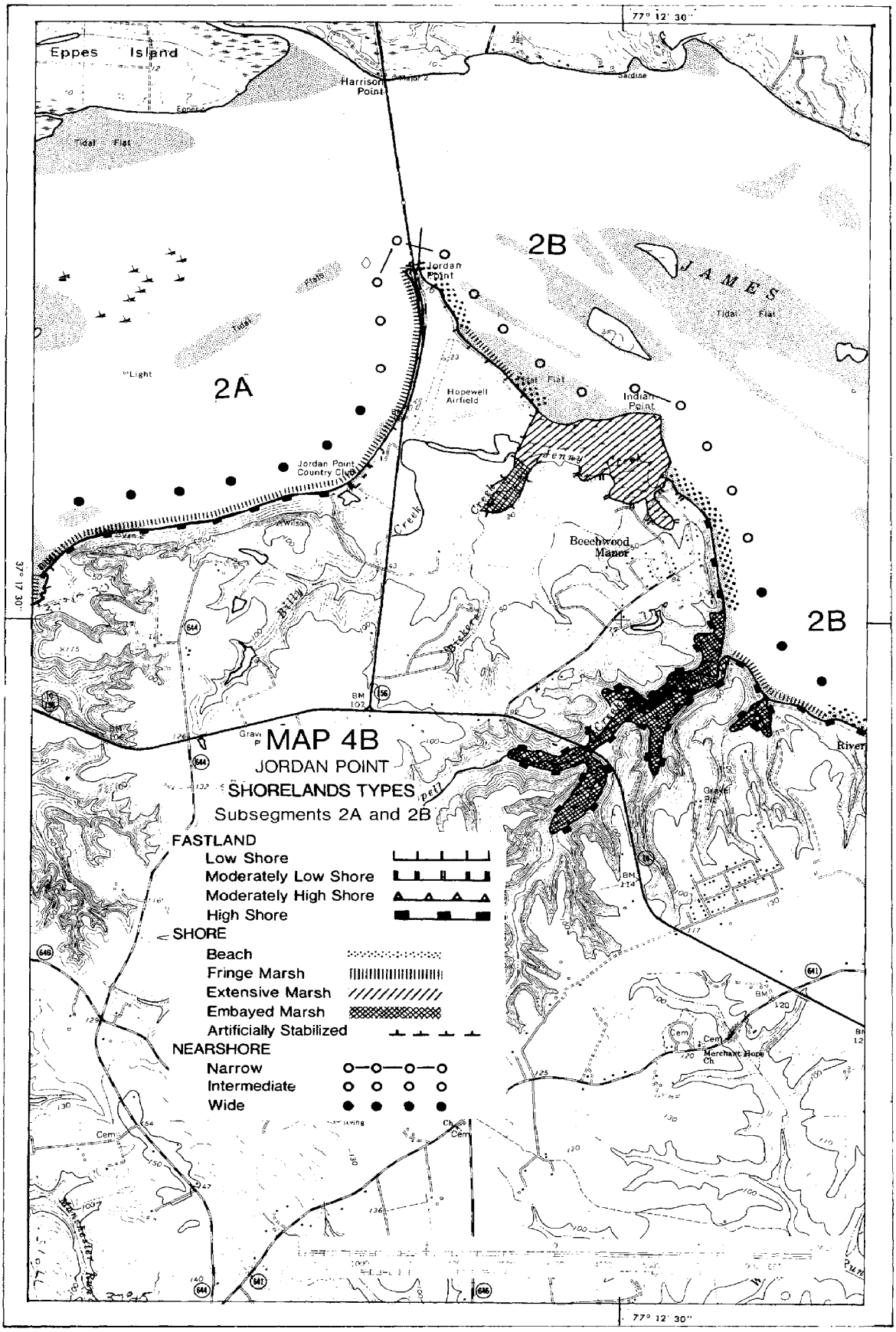

MAP 2C
APPOMATTOX RIVER
FASTLAND USE, OWNERSHIP, EROSION
Subsegment 1A
USE
Agricultural A
Commercial C
Industrial I
Government G
Recreational RC
Residential RS
Unmanaged
Wooded W
OWNERSHIP
Private 1
Federal 2
Town 5
City 5
EROSION
Slight or No Change No Symbol
77° 22' 30"
37° 15'
Cat Island
Gilliams Island
Back Creek Island
Long Island
Halls Island
Dunlop
Porahontas
Sewage Disposal
Radio Tower (WSSV)
Sand and Gravel Pits
Gravel Pit
Sandpit
Water Tank
High Sch
Boat Ramp
Tollgate
Jr High Sch
Cem
SWIFT CREEK
APPOMATTOX RIVER
COLONIAL HEIGHTS CITY
PETERSBURG CITY
PRINCE GEORGE CO
CHESTERFIELD CO
RICHMOND-PETERSBURG
COVINGTON ROAD
YACHT BASIN DR
ELMWOOD DRIVE
PIPELINE
TURNPIKE
Port Walthall
Broad Street
Short Turn
Pye Alley
Harrison
1A
2G
1W
1I
1RC/C
1RS
5I
5RC
1C
MILE

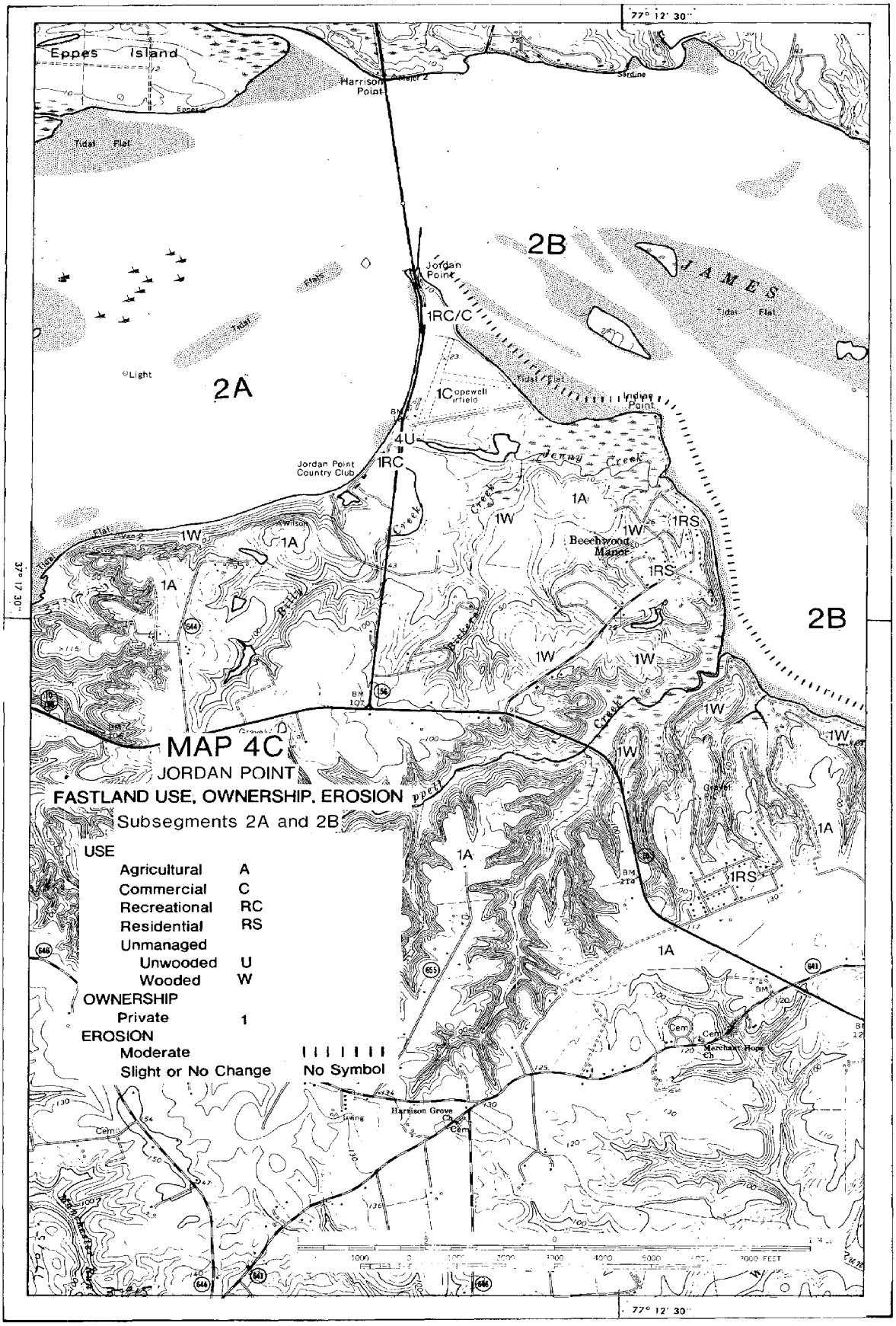

MAP 3A
HOPEWELL
TOPOGRAPHY AND CULTURE
Subsegments 1A, 1B, and 2A
= Segment Boundary
= Subsegment Boundary
1A
1B
2A
77° 20'
37° 17' 30"
Rivermont
Point of Rocks
APPOMATTOX RIVER
CHESTERFIELD
HOPEWELL CITY
HOPEWELL
Highland Park
Arlington
Kenwood
Five Forks
FORT LEE
MILITARY RESERVATION
PRINCE GEORGE CO
HOPEWELL CITY
Industrial Waste Ponds
Gravelly Run
Bailey Creek
Cabin Creek
Tidal Flat
Light
Water Tank
Radio Tower (WHAP)
Fire Station
Sewage Disposal
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

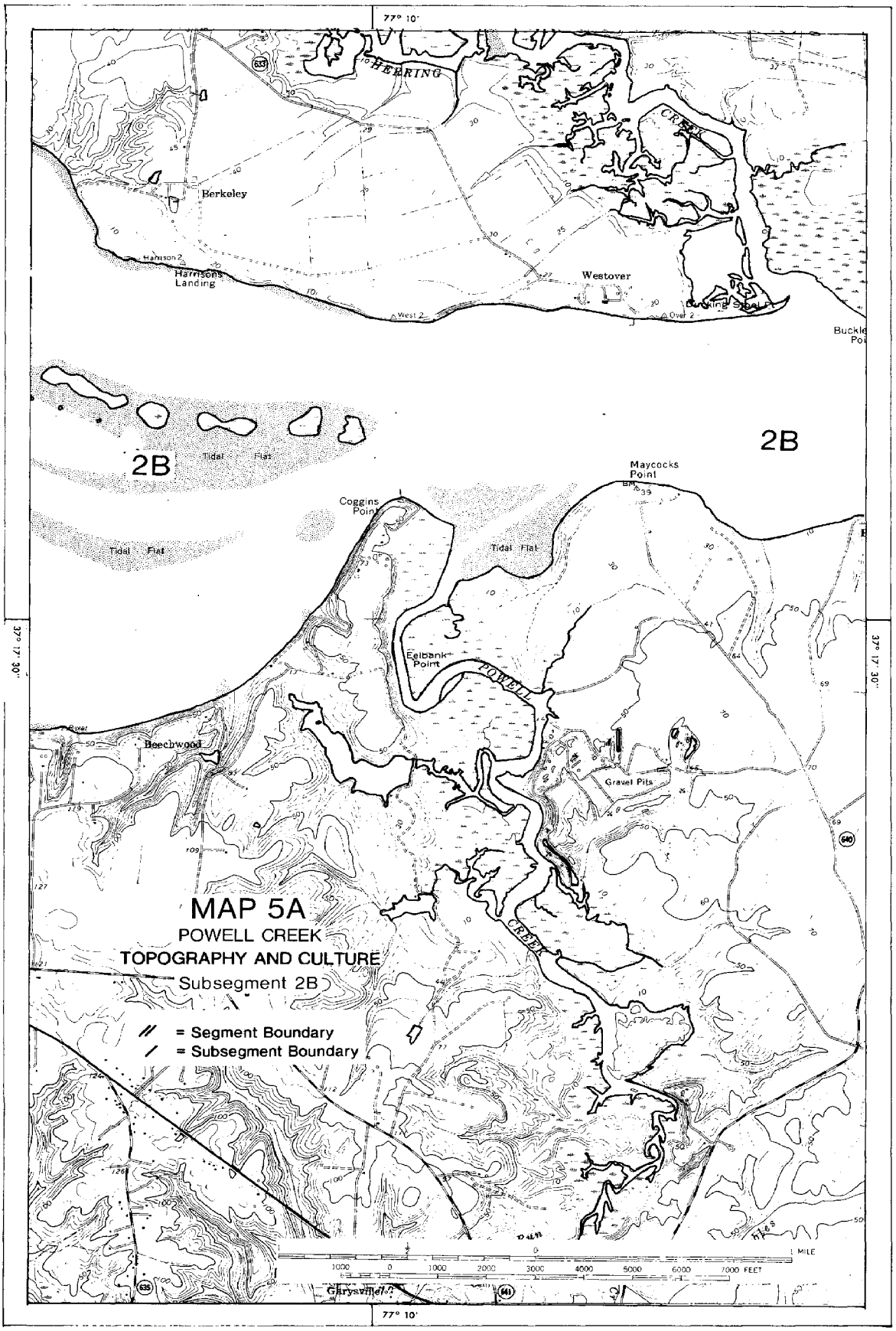

MAP 3B
HOPEWELL
SHORELANDS TYPES
Subsegments 1A, 1B, and 2A
FASTLAND
Low Shore
Moderately Low Shore
Moderately High Shore
High Shore
SHORE
Artificially Stabilized
Fringe Marsh
Extensive Marsh
Embayed Marsh
NEARSHORE
Narrow
Intermediate
Wide
1A
1B
2A
HOPEWELL
Rivermont
Arlington
Keitwood
Five Forks
Highland Park
Industrial Waste Ponds
Tidal Flat
Light
77° 20'
37° 17' 30"
1 MILE
7000 FEET

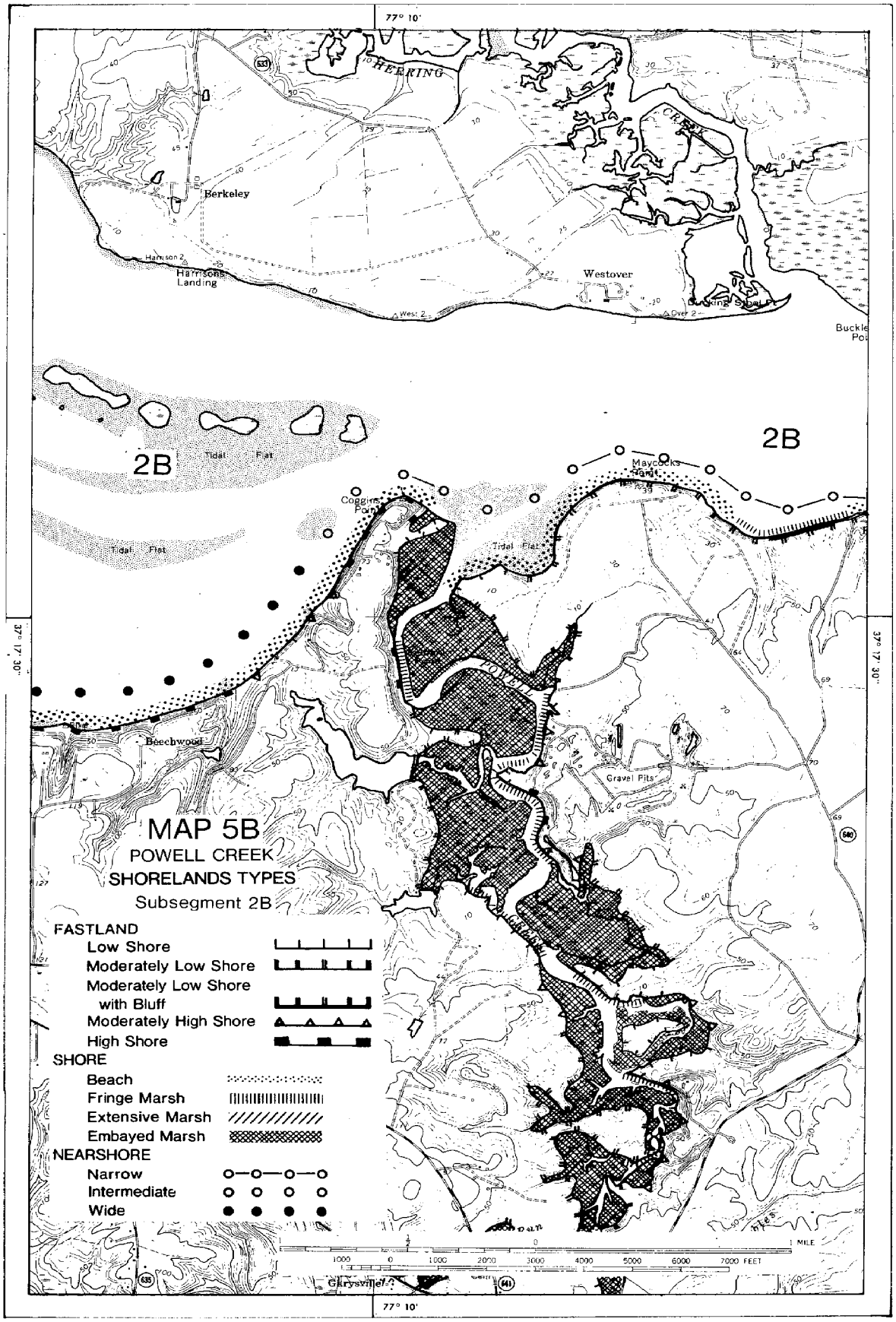

MAP 3C
HOPEWELL
FASTLAND USE, OWNERSHIP, EROSION
Subsegments 1A, 1B, and 2A
USE
Agricultural A
Industrial I
Residential RS
Unmanaged
Wooded W
OWNERSHIP
Private 1
Federal 2
EROSION
Moderate
Slight or No Change No Symbol
Accretional
FORT LEE
MILITARY RESERVATION
77° 20'
37° 17' 30"
1A
1B
2A
2G
1W
1RS
1C
1I
Rivermont
Point of Rocks
Sandpit
APPOMATTOX RIVER
CHESTERFIELD
HOPEWELL CITY
HOPEWELL
Highland Park
Arlington
Kenwood
Five Forks
Randolph Hospital
Industrial Waste Ponds
Sewage Disposal
Gravelly Run
Bailey Creek
Cattail Creek
PRINCE GEORGE CO.
Tidal Flat
Light
Water Tank
Radio Tower (WHAP)
Mt Carmel Ch
Fire Station
SEABOARD
COAST LINE
1 MILE
7000 FEET

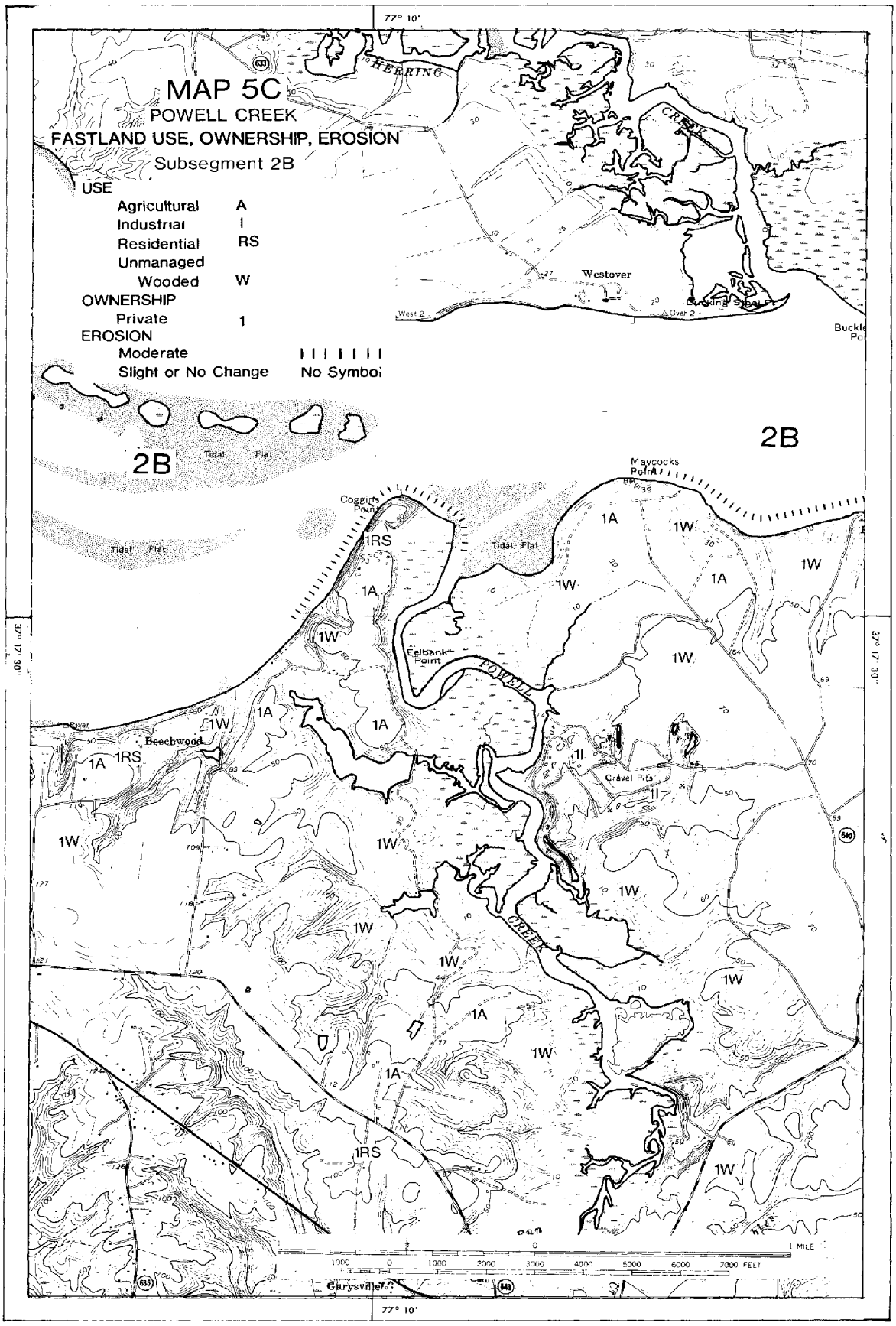

77° 12' 30"
Eppes Island
Harrison Point
Tidal Flat
2B
JAMES
Jordan Point
Tidal Flat
Light
2A
Hopewell Airfield
Indian Point
Jordan Point Country Club
Jenny Creek
Beechwood Manor
2B
37° 17' 30"
Gravel Pit
River
MAP 4A
JORDAN POINT
TOPOGRAPHY AND CULTURE
Subsegments 2A and 2B
= Segment Boundary
= Subsegment Boundary
Merchant Hope Ch
Harrison Grove Ch
Cem
77° 12' 30"

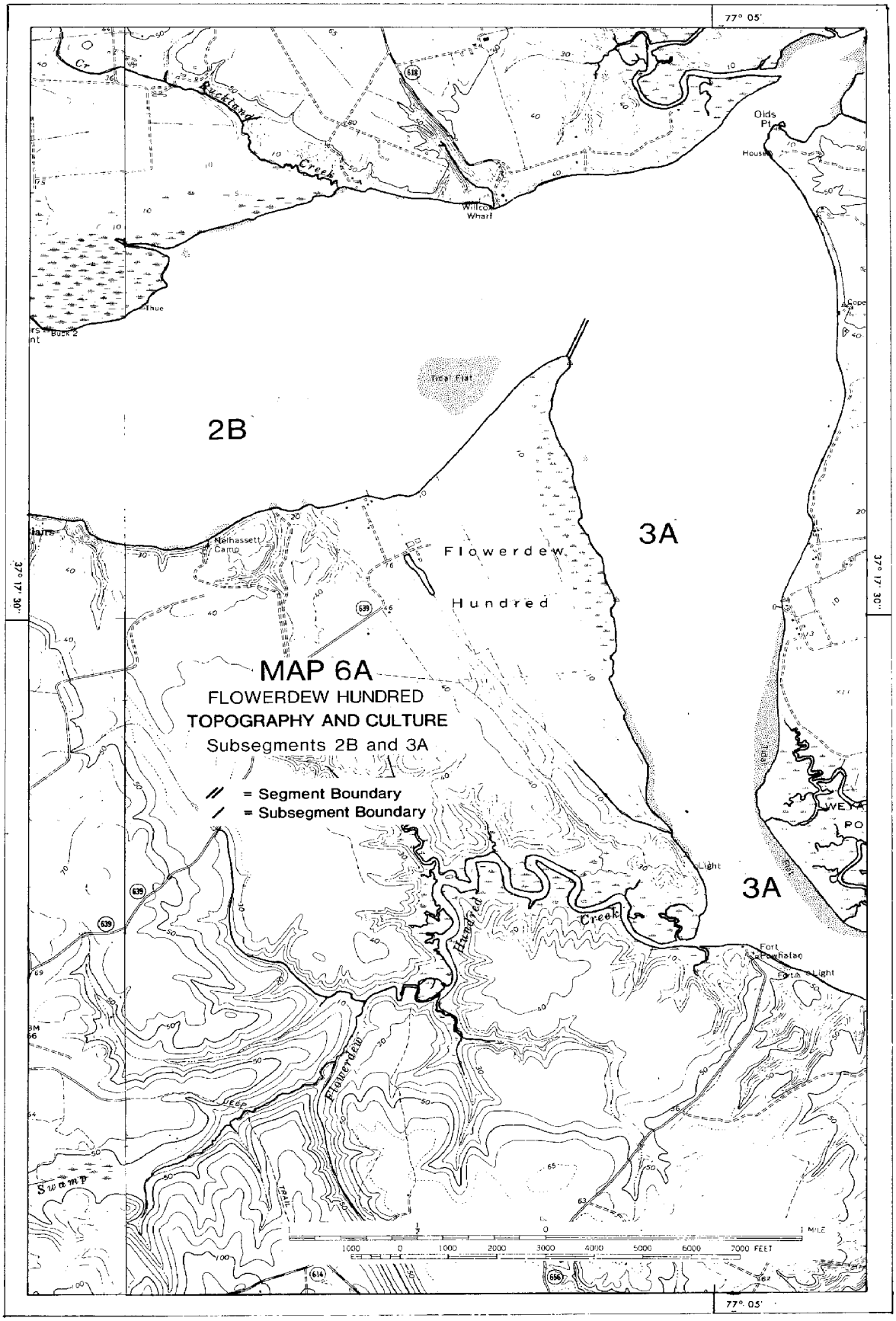

MAP 4B
JORDAN POINT
SHORELANDS TYPES
Subsegments 2A and 2B
FASTLAND
Low Shore
Moderately Low Shore
Moderately High Shore
High Shore
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
Artificially Stabilized
NEARSHORE
Narrow
Intermediate
Wide
2A
2B
2B
Eppes Island
Harrison Point
Jordan Point
Hopewell Airfield
Indian Point
Jordan Point Country Club
Beechwood Manor
JAMES
Tidal Flat
77° 12' 30"
37° 17' 30"

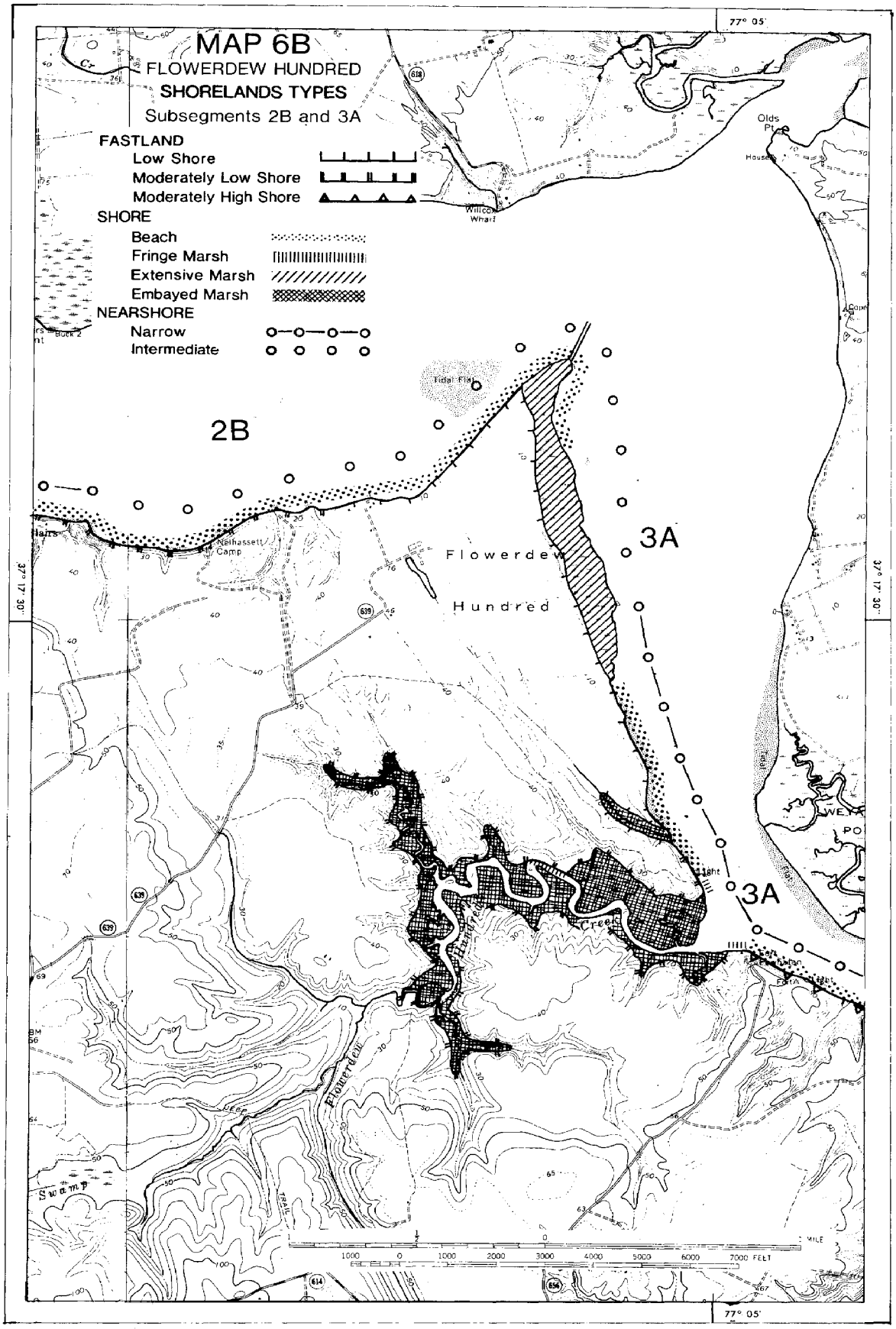

MAP 4C
JORDAN POINT
FASTLAND USE, OWNERSHIP, EROSION
Subsegments 2A and 2B
USE
Agricultural A
Commercial C
Recreational RC
Residential RS
Unmanaged
Unwooded U
Wooded W
OWNERSHIP
Private 1
EROSION
Moderate
Slight or No Change No Symbol
77° 12' 30"
37° 17' 30"
Eppes Island
Harrison Point
Tidal Flat
Jordan Point
JAMES
2A
2B
1RC/C
1C
4U
1RC
Jordan Point Country Club
Indian Point
Jenny Creek
Beechwood Manor
1W
1A
1RS
Harrison Grove
Merchant Hope Ch
Cem
Light
Sardine
Major 2
Wilson
Gravel
Tidal Flat
Creek
Billy
Butkers
Cem
7000 FEET

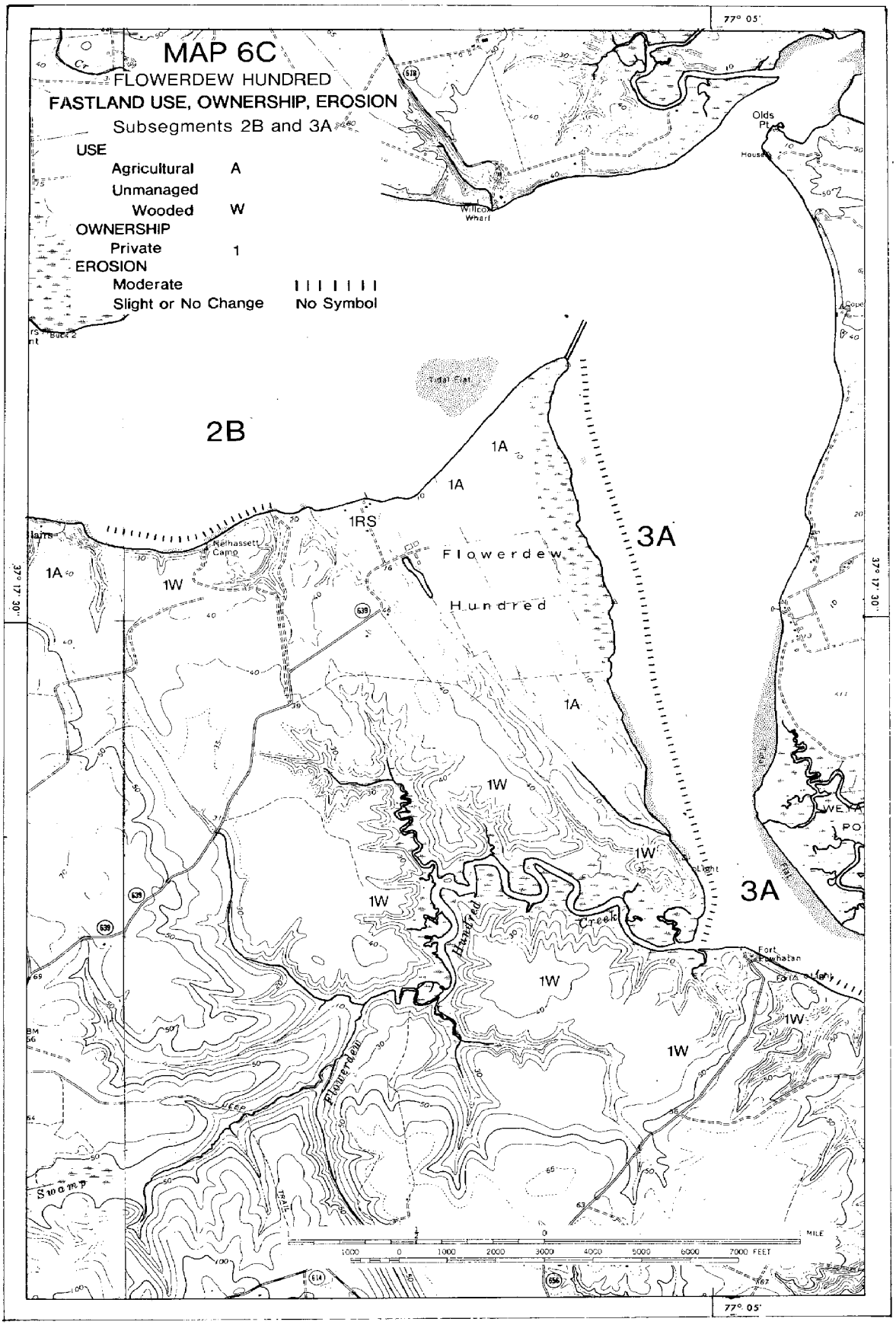

77° 10'
HERRING
CREEK
Berkeley
Harrison 2
Harrisons Landing
West 2
Westover
Over 2
Buckle Poi
2B
Tidal Flat
2B
Maycocks Point
Coggins Point
Tidal Flat
Tidal Flat
37° 17' 30"
Eelbank Point
POWELL
Beechwood
Gravel Pits
CREEK
MAP 5A
POWELL CREEK
TOPOGRAPHY AND CULTURE
Subsegment 2B
= Segment Boundary
= Subsegment Boundary
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
Garysville
77° 10'

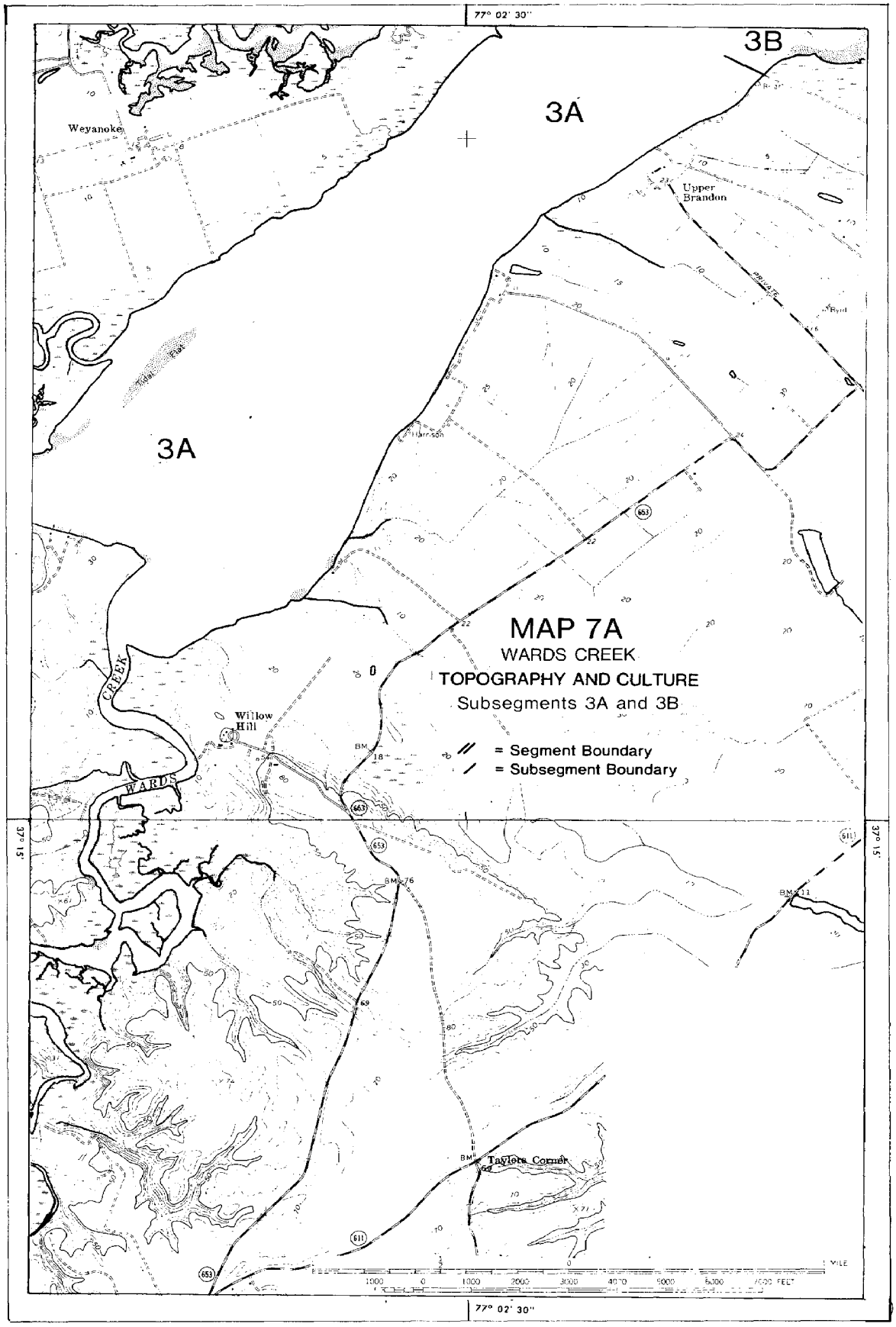

77° 10'
HERRING
CREEK
Berkeley
Harrison 2
Harrisons Landing
Westover
West 2
Over 2
Buckle Poi
2B
Tidal Flat
Tidal Flat
Coggins Point
Maycocks Point
Tidal Flat
POWELL
Beechwood
Gravel Pits
37° 17' 30"
MAP 5B
POWELL CREEK
SHORELANDS TYPES
Subsegment 2B
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
High Shore
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
NEARSHORE
Narrow
Intermediate
Wide
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
Garysville
77° 10'


MAP 5C
POWELL CREEK
FASTLAND USE, OWNERSHIP, EROSION
Subsegment 2B
USE
Agricultural A
Industrial I
Residential RS
Unmanaged
Wooded W
OWNERSHIP
Private 1
EROSION
Moderate
Slight or No Change No Symbol
2B
Tidal Flat
Coggins Point
Maycocks Point
Eelbank Point
POWELL CREEK
Beechwood
Gravel Pits
Westover
Garrysville
1RS
1A
1W
1I
77° 10'
37° 17' 30"
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

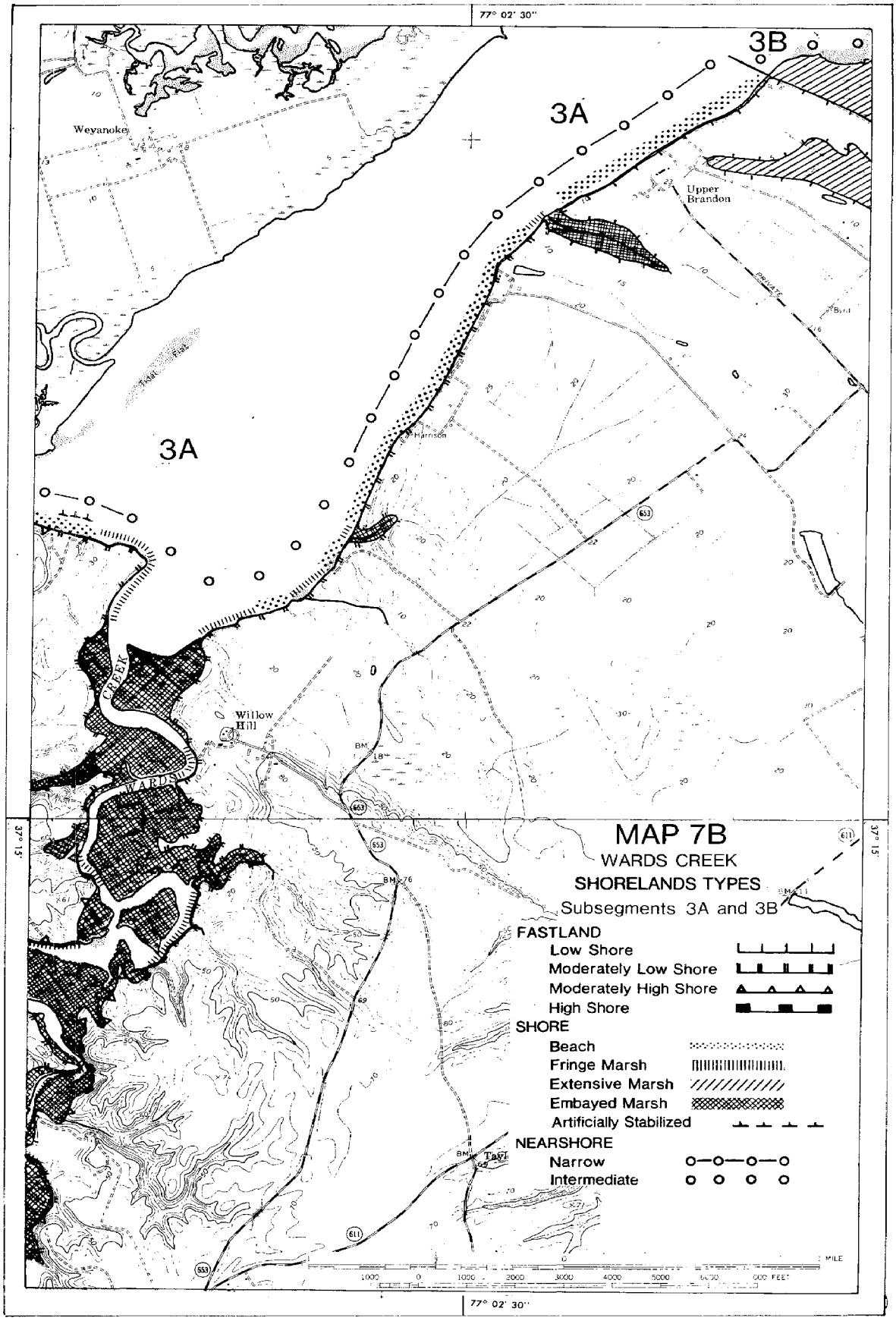

MAP 6A
FLOWERDEW HUNDRED
TOPOGRAPHY AND CULTURE
Subsegments 2B and 3A
= Segment Boundary
= Subsegment Boundary
2B
3A
3A
Flowerdew
Hundred
Tidal Flat
Nelhassett Camp
Willcox Wharf
Olds Pt
Thue
Buck 2
Fort Powhatan
Light
Flowerdew
Hundred
Creek
Swamp
Buckland
Creek
77° 05'
37° 17' 30"
1 MILE
7000 FEET

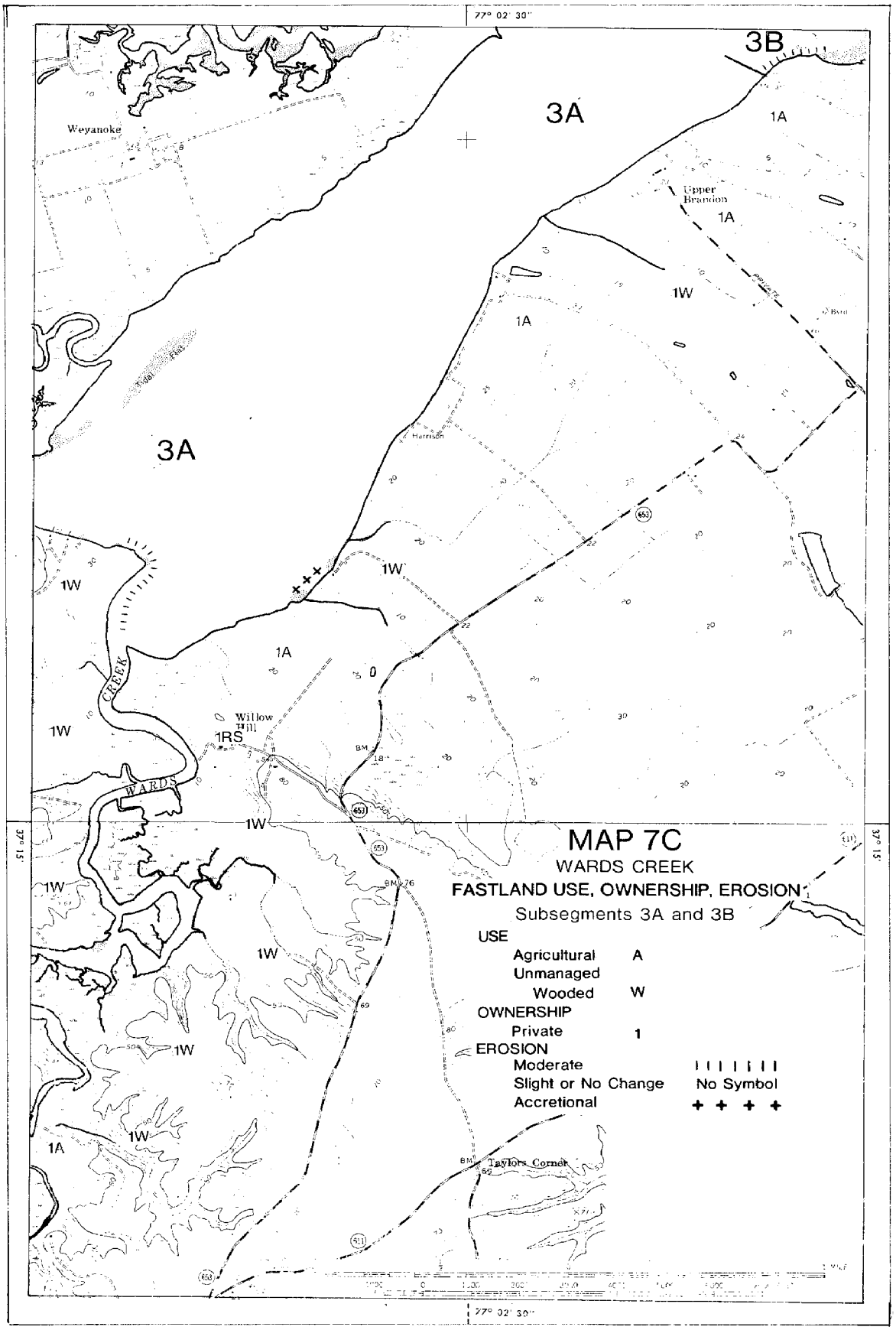

MAP 6B
FLOWERDEW HUNDRED
SHORELANDS TYPES
Subsegments 2B and 3A
FASTLAND
Low Shore
Moderately Low Shore
Moderately High Shore
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
NEARSHORE
Narrow
Intermediate
2B
3A
3A
Flowerdew
Hundred
Tidal Flat
Nelhassett Camp
Olds Pt
Willcox Wharf
Flowerdew
Creek
Swamp
77° 05'
37° 17' 30"
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 MILE

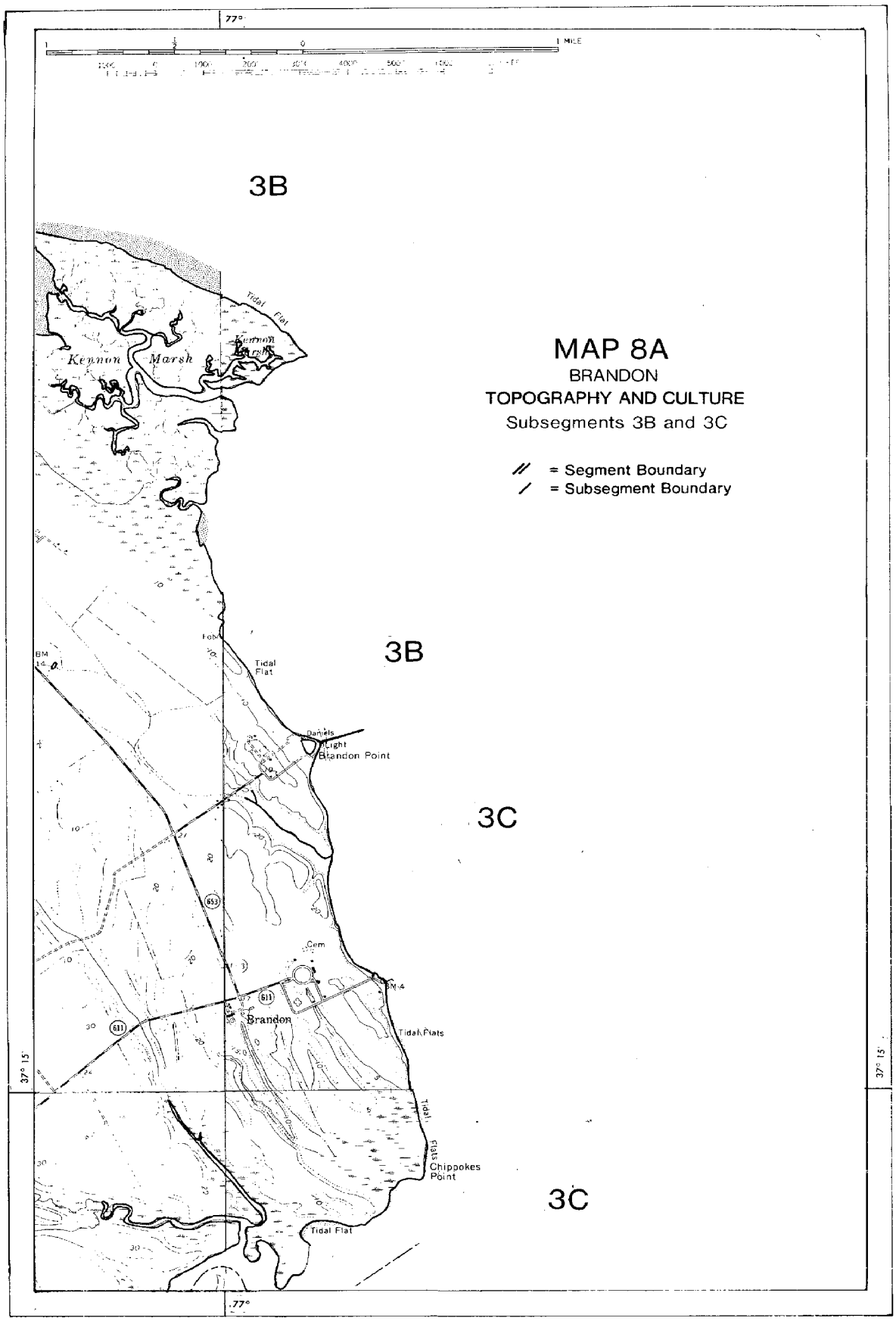

MAP 6C
FLOWERDEW HUNDRED
FASTLAND USE, OWNERSHIP, EROSION
Subsegments 2B and 3A
USE
Agricultural A
Unmanaged
Wooded W
OWNERSHIP
Private 1
EROSION
Moderate
Slight or No Change No Symbol
77° 05'
37° 17' 30"
2B
3A
1A
1RS
1W
Flowerdew
Hundred
Nelhassett Camp
Olds Pt
Willcox Wharf
Tidal Flat
Fort Powhatan
Creek
Swamp
MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET



MAP 7A
WARDS CREEK
TOPOGRAPHY AND CULTURE
Subsegments 3A and 3B

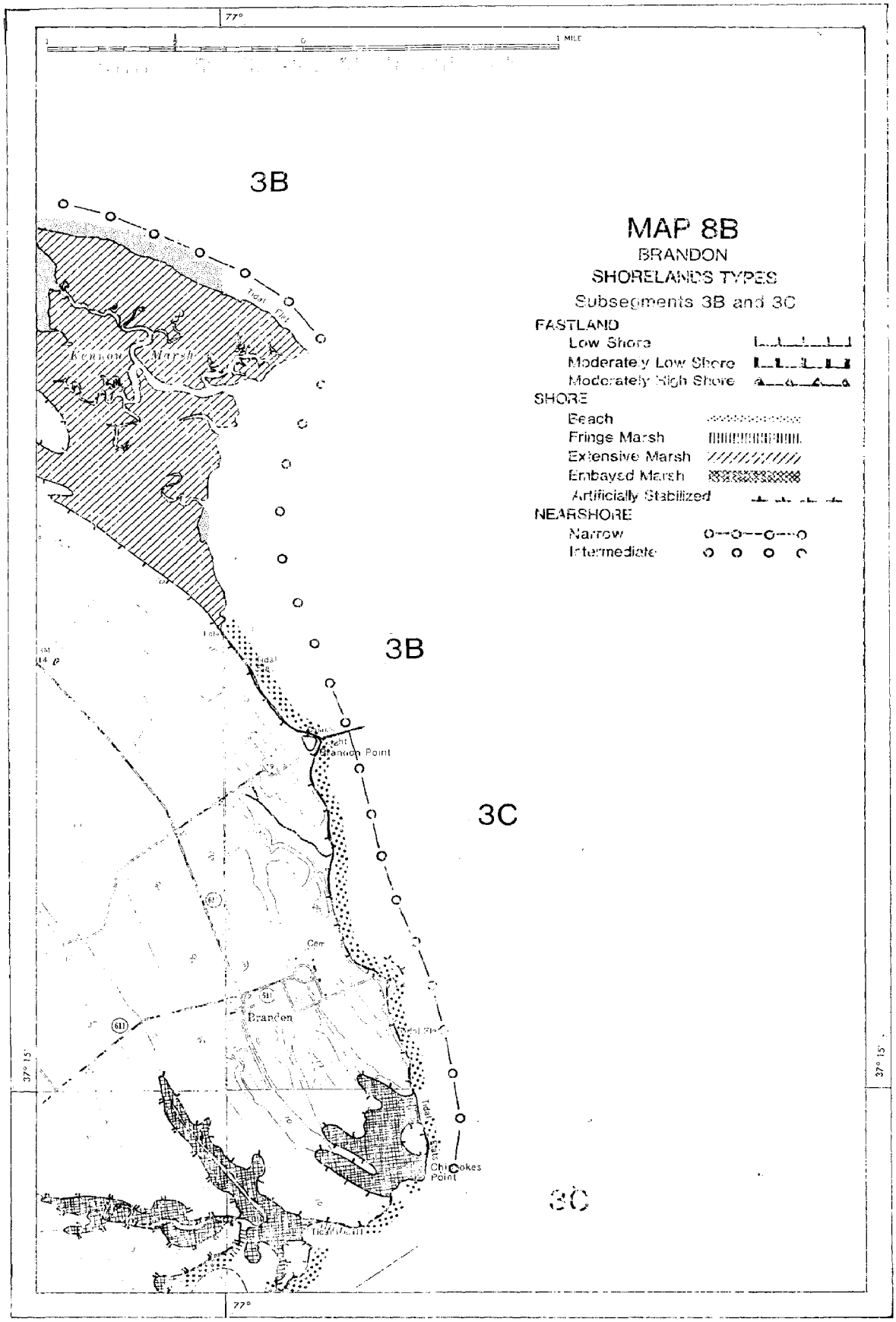

77° 02' 30"
3B
3A
3A
Weyanoke
Upper Brandon
Harrison
Willow Hill
WARDS CREEK
37° 15'
MAP 7B
WARDS CREEK
SHORELANDS TYPES
Subsegments 3A and 3B
FASTLAND
Low Shore
Moderately Low Shore
Moderately High Shore
High Shore
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
Artificially Stabilized
NEARSHORE
Narrow
Intermediate
MILE
FEET
77° 02' 30"

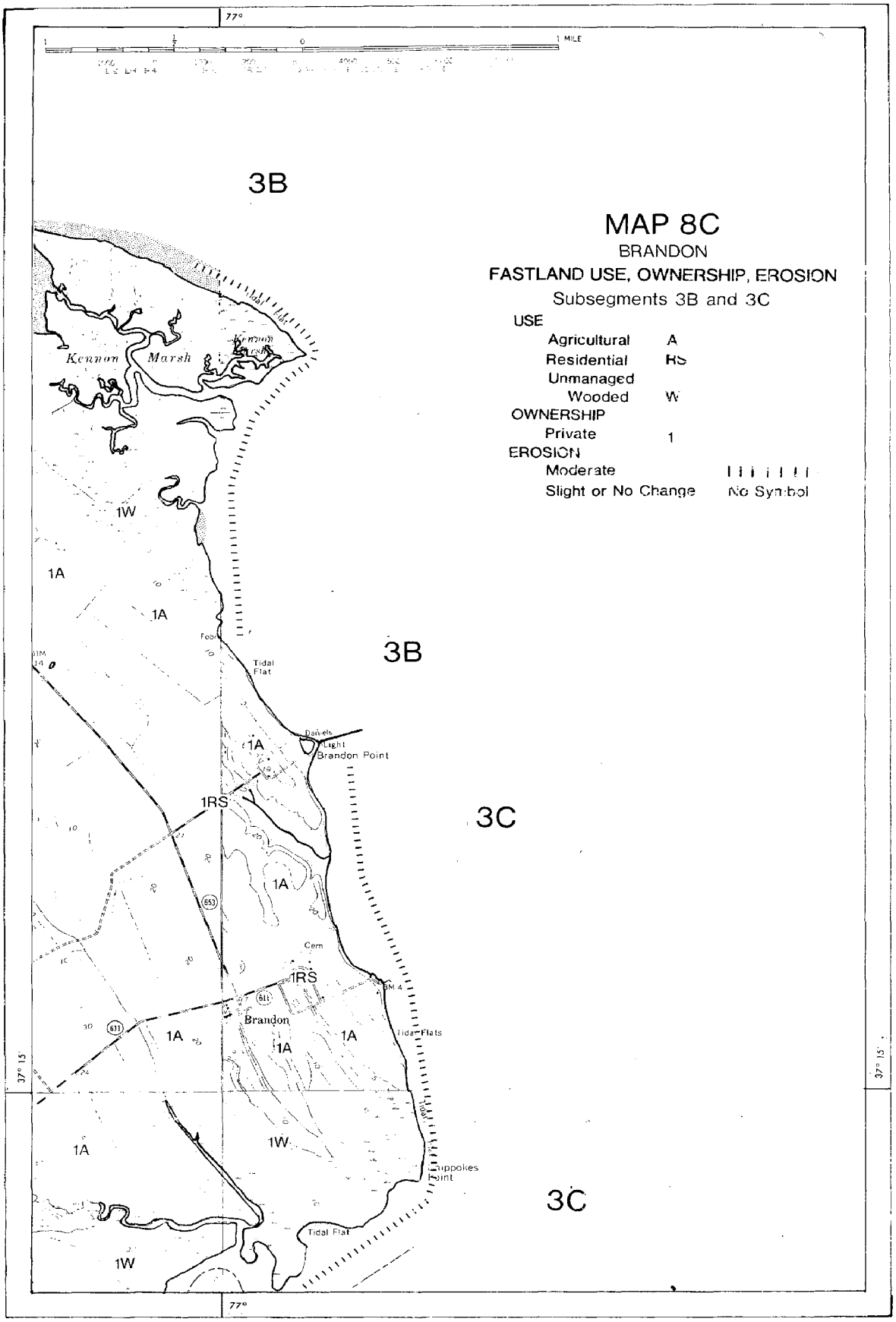

77° 02' 30"
3B
3A
1A
Weyanoke
Upper Brandon
1A
1W
1A
3A
Harrison
1W
1W
1A
CREEK
Willow Hill
1RS
1W
WARDS
1W
37° 15'
37° 15'
1W
1W
1W
1W
1A
1W
Taylors Corner
77° 02' 30"
MAP 7C
WARDS CREEK
FASTLAND USE, OWNERSHIP, EROSION
Subsegments 3A and 3B
USE
Agricultural A
Unmanaged
Wooded W
OWNERSHIP
Private 1
EROSION
Moderate
Slight or No Change No Symbol
Accretional + + + +



MAP 8A
BRANDON
TOPOGRAPHY AND CULTURE
Subsegments 3B and 3C

// = Segment Boundary
/ = Subsegment Boundary


MAP 8B
BRANDON
SHORELANDS TYPES
Subsegments 3B and 3C
EASTLAND
Low Shore
Moderately Low Shore
Moderately High Shore
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
Artificially Stabilized
NEARSHORE
Narrow
Intermediate
3B
3B
3C
3C
Brandon Point
Brandon
Chickokes Point
77°
37° 15'
1 MILE



MAP 8C

BRANDON

FASTLAND USE, OWNERSHIP, EROSION

Subsegments 3B and 3C

USE

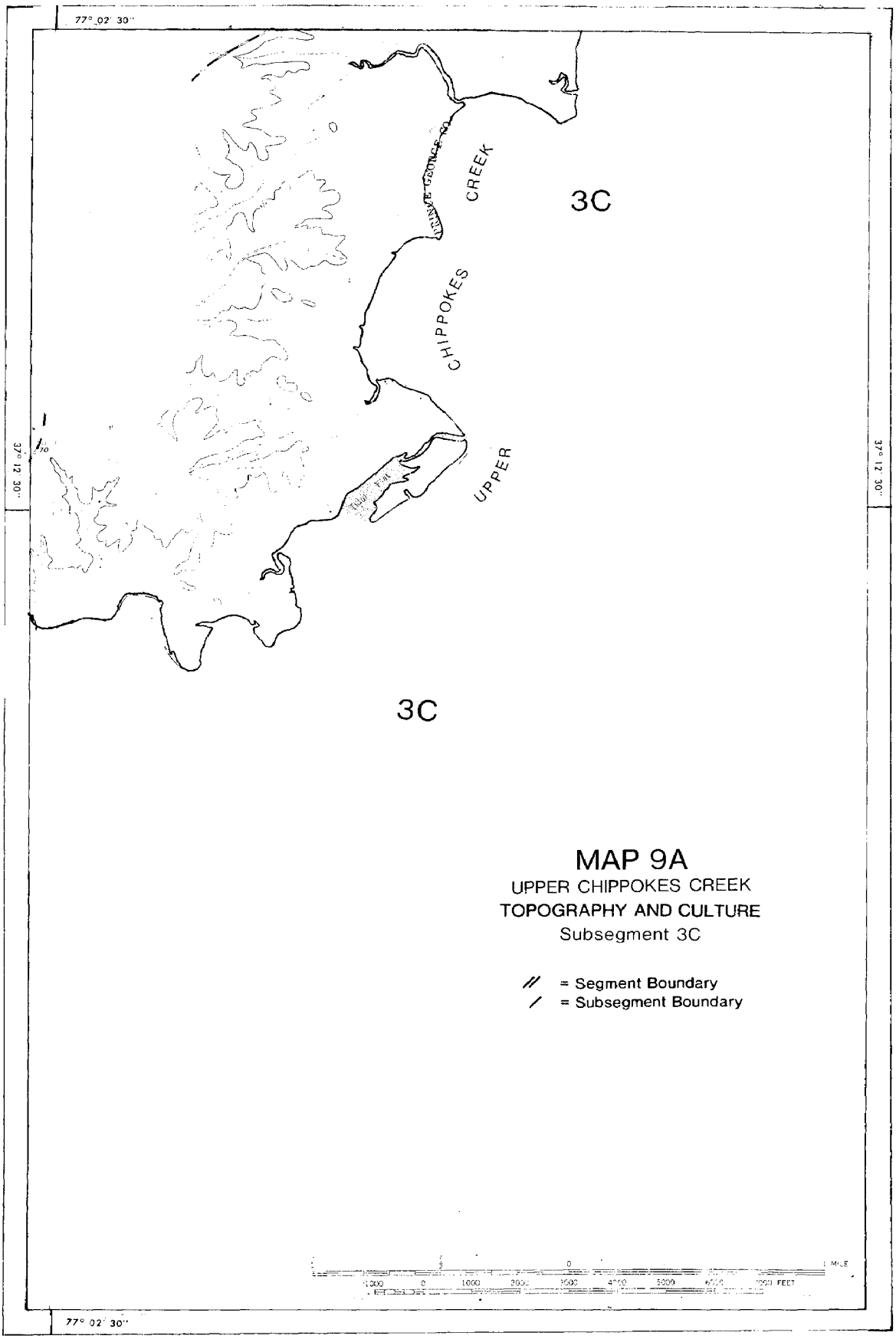
Agricultural	A
Residential	RS
Unmanaged Wooded	W

OWNERSHIP

Private	1

EROSION

Moderate	
Slight or No Change	No Symbol



MAP 9A

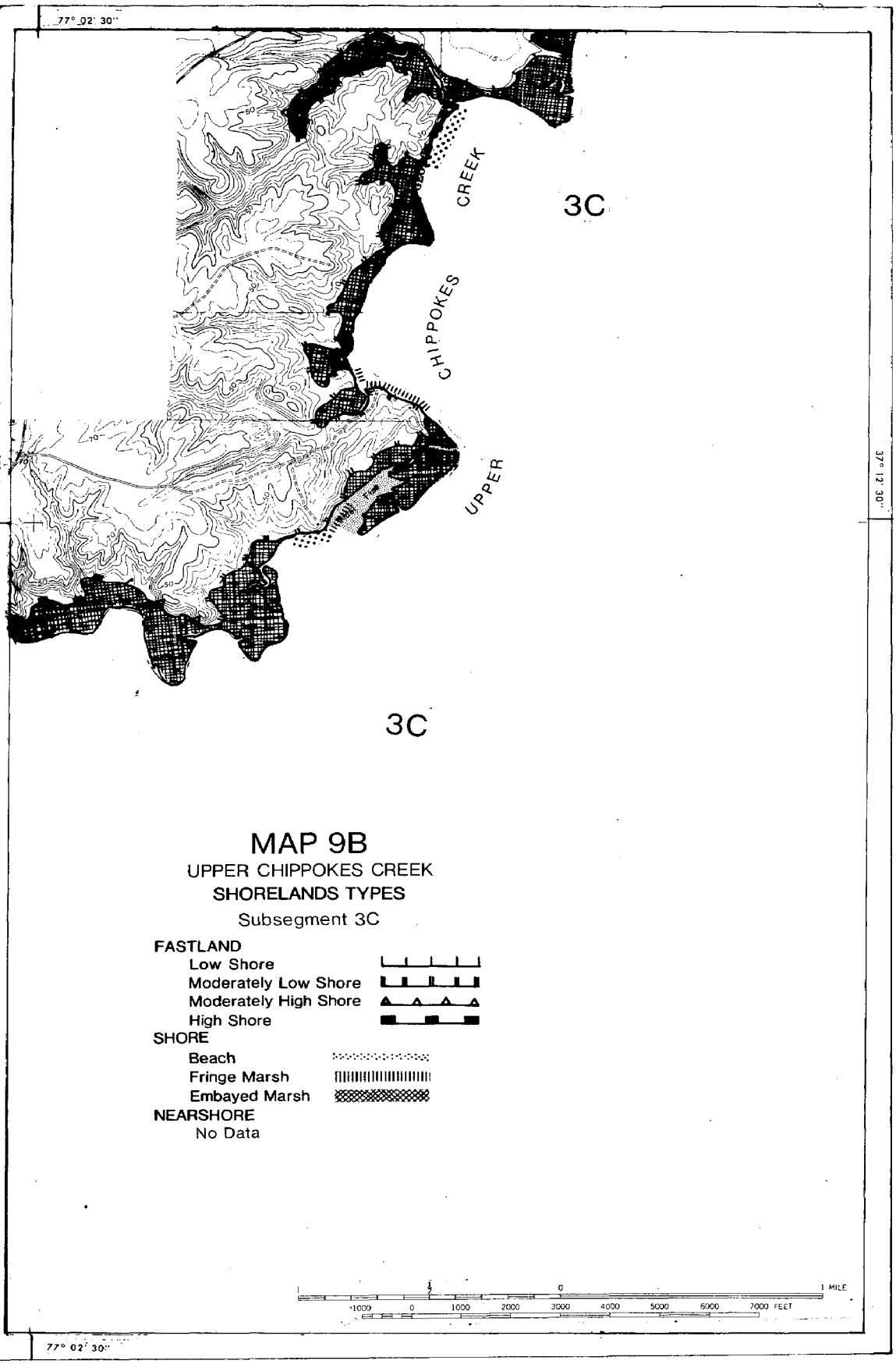
UPPER CHIPPOKES CREEK

TOPOGRAPHY AND CULTURE

Subsegment 3C

// = Segment Boundary

/ = Subsegment Boundary



MAP 9B

UPPER CHIPPOKES CREEK

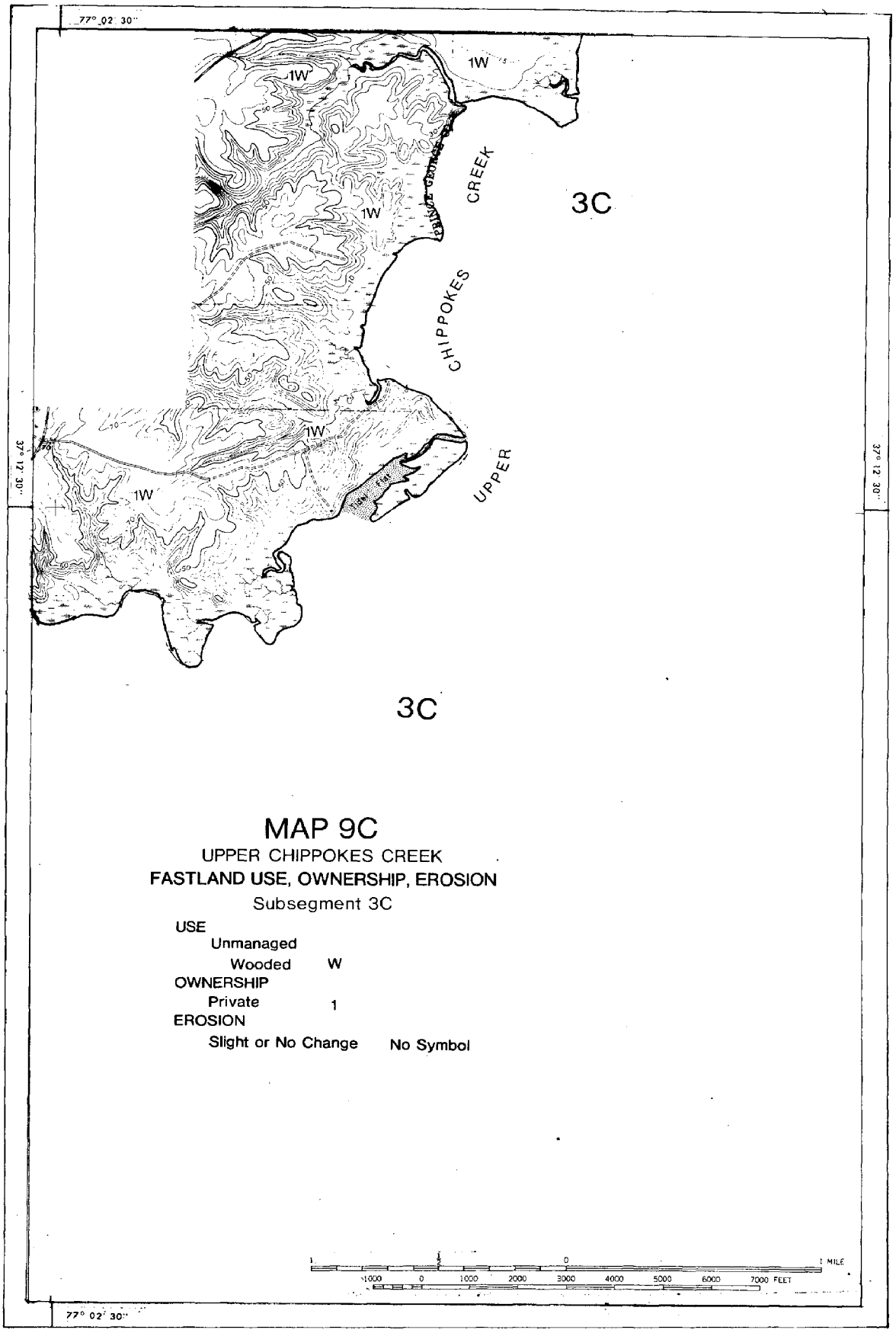
SHORELANDS TYPES

Subsegment 3C

FASTLAND
- Low Shore
- Moderately Low Shore
- Moderately High Shore
- High Shore

SHORE
- Beach
- Fringe Marsh
- Embayed Marsh

NEARSHORE
- No Data



MAP 9C

UPPER CHIPPOKES CREEK

FASTLAND USE, OWNERSHIP, EROSION

Subsegment 3C

USE

Unmanaged

Wooded W

OWNERSHIP

Private 1

EROSION

Slight or No Change **No Symbol**

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