INTERIM REPORT OF THE

COASTAL EROSION ABATEMENT COMMISSION

TO

THE GOVERNOR

AND

THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 23

COMMONWEALTH OF VIRGINIA
DIVISION OF PURCHASES AND SUPPLY
RICHMOND
1979

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Interim Report of the

Coastal Erosion Abatement Commission

To

The Governor and the General Assembly of Virginia

Richmond, Virginia

January, 1979

To: Honorable John N. Dalton, Governor of Virginia

and

The General Assembly of Virginia

I. INTRODUCTION

Pursuant to Senate Joint Resolution 22, the 1978 General Assembly created the Coastal Erosion Abatement Commission to study the effects of erosion on beaches, islands and inlets of the Commonwealth and to make such recommendations as deemed necessary to prevent the further destruction of those resources (see Appendix A). The resolution called for a legislative membership composed of three members from the Senate and four members from the House of Delegates. The bill also provided for the addition of not more than six citizen members. Staff assistance was provided by Susan T. Gill of the Division of Legislative Services.

The Commission relied upon several executive branch agencies for assistance during the course of its work and would like to express its appreciation to Dr. Robert Byrne and Carl H. Hobbs, III from the Virginia Institute of Marine Science, Joseph B. Willson, Jr., of the Soil and Water Conservation Commission, and D. W. Budlong and Lynn C. Goodwin from the Office of the Secretary of Commerce and Resources.

The Commission would also like to express its appreciation to the many concerned citizens and local officials who offered informative assistance during the Commission's site visits to Virginia Beach, Norfolk, Northern Neck, Colonial Beach, and the Eastern Shore. A short abstract and summary of the findings resulting from those site visits follows immediately. A more detailed discussion of the site visits, conclusions and interim recommendations of the Commission is outlined in full later in the report.

Summary of Findings

Site visits, public testimony and technical assistance confirmed that nearly 50% of all the easily accessible public beaches in Virginia have experienced severe erosion. A rough breakdown of the public beach and the estimated mileage affected by the severe erosion is listed below by city:

TABLE 1

CITY	TOTAL MILEAGE	SEVERELY ERODED
Virginia Beach	7.3	3.5
Norfolk	7.4	2.5
Hampton	.5	.5
Yorktown	.3	0.0
Colonial Beach	2.5	2.0
Cape Charles	.5	.5
Gloucester	.1	0.0
	18.6	9.0

Two hundred and forty-three miles of shoreline within the entire Chesapeake Bay System are experiencing erosion rates of greater than two feet per year (See Appendix B). The consistent frequency and severity of both tropical and non-tropical storms over the past twenty years have been a major cause of this erosion process. As the chart in Appendix C indicates, many of the non-tropical storms occurring over the past twenty years in Tidewater have had similar or greater destructive power than hurricanes striking in the same year. The frequency and severity of storms in the Bay System are increasing (Hayden, 1975).

The Commission found the public to be poorly informed regarding the proper methods of erosion control and the risks of development in the beachfront area. The soaring costs of structural controls were often found to prohibit both precautionary and necessary measures to stabilize areas experiencing severe erosion. The Commission also found the limited advisory services and sources of funding to be far insufficient to meet increasing demands from both public and private concerns.

II. GENERAL FINDINGS

A. The Causes, Effects, and Management of Shoreline Erosion in Virginia: A Brief Synopsis.

Causes and Effects. The Commonwealth, having a tidal shoreline exceeding 5,000 miles in length, is graced with a wide diversity of shore types which include the low-lying barrier islands of the Eastern Shore, the ocean front headland - barrier spit of southeastern Virginia, and the shores of Chesapeake Bay and other estuaries which range from high bluffs to tidal marshes.

All of these shore types are affected by the natural process of erosion. Problems and issues arise from that natural process when it compromises man's use of the shorefront and when it affects the marine biological resources. Problems also arise when man's activities on the shoreline cause erosion which adversely affects adjacent shoreline areas. Thus, he becomes an agent as well as a victim of erosion.

Erosion of coastal areas in Virginia is caused by a combination of the following:

1. A relative rise in sea level caused by melting of polar ice masses and/or gradual settling of the land.

2. Storm systems which generate high waves and elevated water levels (storm surge) such that the erosive power is unleashed on the fastland rather than a buffering beach.

Whereas the slow sea level rise may be considered as a pervasive but passive influence in erosion, wave action is the active erosional force (See Appendix C). An analogy with a sawmill is fitting: wave action represents the cutting teeth and the sea level rise (whether long-term or storm surge) represents the belt advancing the saw blade.

The natural response of the coastline to these forces is one of landward retreat. This landward retreat ultimately poses dangers to the more or less fixed line of human development with obvious consequences.

During the period from 1960 to 1970, the population of the United States increased by about 12 percent, while the population of beach subdivisions increase by some 42 percent. Such a trend is likely to continue, at least in the near future, as incomes and leisure time increase.

The effects of shoreline erosion constitute significant problems affecting private and public shorelands resources. The principal effects of shoreline erosion are:

1. Loss of shorelands property and the improvements thereon;

2. Loss to the locality of taxable lands;

3. Introduction of the erosion products (sediment) into the estuarine system thereby contributing to the shoaling of navigable waters;

4. Supply of sand to beaches fringing the Chesapeake Bay and tributary estuaries or, in the case of ocean front beaches, a supply to adjacent beaches.

While the first three effects listed can be viewed as detrimental, the fourth effect is a significant benefit since beaches constitute the best mechanism for wave energy dissipation and they are one of the principal aesthetic elements in recreational utilization of the shorelands.

The lower Chesapeake Bay shoreline and that of its tributary estuaries, the James, York, Piankatank, Rappahannock, and Potomac Rivers, is highly dissected by entrances to creeks so that there is a high degree of variability in shoreline response within and between adjacent segments. Although individual segments of the shoreline have experienced erosion rates exceeding 7 feet per year, one or two feet per year is more common. For the 2,365 miles of Bay system shoreline measured, the average erosion rate was 0.7 foot per year. The Chesapeake Bay has one of the nation's highest rates of erosion for tidewater areas.

Studies by the Virginia Institute of Marine Science indicate that about 330 miles of Virginia tidal shoreline have erosion rates which exceed two feet per year and about 600 miles of shoreline where the erosion rate exceeds one foot per year.

During the last century, more than 28,000 acres of fastland have been lost, 21,000 acres of which were within the Virginia Chesapeake Bay System (see Table 2).

TABLE 2.

Area Losses Due to Erosion Circa.

Atlantic Coast	
SE Virginia	27 miles - 40 acres
Atlantic Coast	
Eastern Shore	84 - 7,228 acres
Virginia Chesapeake Bay	
and Tributaries	2,365 miles - 21,079 acres
Total	2,476 miles - 28,347 acres

Those figures resulted from a study completed by Byrne and Anderson (1977) in which the earliest reliable maps (1850s) were compared with a series of 1940-1960 maps and charts for 2,365 miles of the Bay system. Byrne (1973) made a similar study of the barrier islands and the Corps of Engineers (1970) studied the coastline between Cape Henry and the Virginia–North Carolina border.

The ocean coastline segments show characteristically different erosion responses as compared to the Bay system. The barrier islands are, for the most part, sand starved islands segmented by tidal inlets. The net littoral drift is directed to the south. The northernmost series of islands, Wallops, Assawoman, Metomkin, and Cedar Islands, have retreated in a fashion where the new shoreline parallels the older but with greater erosion rates on Metomkin and Cedar Islands. The central section of islands, Parramore, Hog, and Cobb, are flanked by deep inlets which strongly influence their gross behavior. Over recent times these islands exhibit accretion on the northern ends due to local trapping of sand which bypasses the adjacent inlet. The retreat of the sourthern portions of the islands is dramatic, up to 50 feet per year on Hog Island. The southern section of island ending with Smith Island have retreated in a nearly parallel fashion, Smith Island at about 25 feet per year. Meanwhile, Fishermans Island, which is at the toe of the peninsula, has accreted with a four-fold increase in area during the century studied.

The ocean coastline of Virginia south of Cape Henry is characterized by zones of alternating shoreline advancement and recession. If the total shoreline length between Cape Henry and North Carolina border (27.4 miles) is averaged over the long term, the annual recession rate is about 0.7 feet. This gross average masks a highly dynamic shoreline wherein some locations experienced erosion rates as high as 20 feet per year for several decades which then may have been followed by a period of accretion.

Management of the Erosion Problem. In order to achieve an approximation of the level of impact of erosion on the residential utilization of the shorelands, the distribution of housing density along the shoreline (within 200 feet) was evaluated using the 1968 topographic map series. A housing density of 26-30 residences per mile was considered as "developed." So considered, the total mileage of that density or greater is, including cities, about 170 miles. If the combined condition of being "developed," and an historical erosion rate greater than 2 feet per year is taken as representing a critical erosion situation then 12 miles of shoreline would be so designated within the Virginia Chesapeake Bay and its tributary estuaries. Inclusion of the ocean shoreline would increase the estimate to about 20 miles.

In many areas along the shoreline the erosion rate is so high that occupation of the shoreland fringe must be viewed as hazardous. Many of these areas are subject to the joint hazard of tidal flooding and high erosion rates.

Management of the impacts of erosion may involve either one or a combination of two broad strategies.

1. Institutional controls such as construction set-back lines or other zoning mechanisms which attempt to prevent victimization of property improvement from erosion;

2. Physical controls which attempt to inhibit the physical process of the fastland retreat.

Institutional controls include the following categories:

1. Ownership restrictions – such as public acquisitions, easements, etc.;

2. Regulating actions – such as permitting, zoning and setback lines, etc.;

3. Relocation – this measure may be included in each of the others;

4. Financial incentives – such as taxation, low interest loans, grants, etc.;

5. Insurance programs.

Physical controls include the following categories: (1) Groin fields; (2) Bulkheading or revetments; (3) Riprap revetments; (4) Perched beach; (5) Jetties at inlet entrances; (6) Contouring of the fastland; and (7) Marsh vegetation to create a buffer zone.

Although the awareness of the severity of shoreline erosion and its ramifications have increased dramatically in recent years, there is at present no active set of management strategies at the State level to reduce its impact. However, Article 2.2 of Title 21 of the Code of Virginia (Shore Erosion Control) clearly enunciates present policy as follows:

> § 21-11.16. Declaration of policy. - The shores of the Commonwealth of Virginia are a most valuable resource that should be protected from erosion which reduces the tax base, decreases recreational opportunities, decreases the amount to open space and agricultural lands, damages or destroys roads and produces sediment that damages marine resources, fills navigational channels, degrades water quality and, in general, adversely affects the environmental quality; therefore, the General Assembly hereby recognizes shore erosion as a problem which directly or indirectly affects all of the citizens of this State and declares it the policy of the State to bring to bear the State's resources in effectuating effective practical solutions thereto. (1972, c.855)

Section 21-11.18 of the same article invests the Soil and Water Conservation Commission with the duty and responsibility to effect the coordination of shore erosion control programs of all State agencies and institutions and to secure the cooperation and assistance of the United States and any of its agencies to protect waterfront property from destructive erosion.

Although there are not at present comprehensive management strategies to mitigate the impacts of shoreline erosion, there are limited technical advisory services available to assist the owners of tidal shoreline property in the selection of methods to control erosion. In addition, there has been a dedicated effort by the Commonwealth to provide a technical assessment of the erosion problem, part of the results of which are discussed in earlier sections of this report.

Technical advisory services are offered through the Marine Advisory Service of the Virginia Institute of Marine Science (Commonwealth of Virginia) at Gloucester Point, and the Soil Conservation Service (U.S.D.A.) at Warsaw. Each of these agencies devotes one person per year effort in an attempt to satisfy the growing demand for advice and education in shoreline erosion. While most of the Service rendered is focused on the problems of the individual landowner their clients also include localities. During 1978 the two agencies provided advice on shoreline erosion problems for approximately 350 cases wherein the problem involved shoreline lengths of 75 to 9,000 feet.

An expanded advisory service, available to private property owners and localities, should be the forefront of State level actions to alleviate the impacts of erosion. In addition to consultation on specific problems, this program should include public education regarding the nature of the erosion problem. Such activity could, for example, save large private landowner expenditure for structural controls simply by judicious location of the new residences.

At the present time, most of the attempts to control shoreline erosion are the individual actions of property owners. In some cases the property owners have simply relocated their homes. However, the more general strategy utilized is to install shorefront structures and reduce or stop erosion. The techniques are as varied as dumping old refrigerators and other debris against the shoreline to properly engineered protection works. The problem with individual attempts at erosion control is that with a particular segment of shoreline the staggered application in time, or distance, may result in loss of efficiency in control. In some cases the action may lead to adverse impacts on adjacent property owners. In most cases a concerted community action within an impacted shoreline reach could enhance the effectiveness as well as reduce cost to the individual property owner.

At the present time the Commonwealth does not have established guidelines or minimum construction standards for shoreline protection works. Guidelines or standards are needed since some property owners are victimized by applications of poor design and/or construction techniques which result in repeated expenditures by the landowner.

While there are very limited State, federal and private attempts to cope with the impacts of

shoreline erosion the need for a Commonwealth program to protect its citizens from victimization by tidal shoreline erosion is clear.

B. Site Visits and Public Testimony.

Since its first meeting on May 26, 1978, the Commission has been instructed by staff regarding the primary causes, effects and methods of control currently being used to combat shoreline erosion in Virginia. The members have also conducted site visits to Virginia Beach, Norfolk, Northern Neck, Eastern Shore, and Colonial Beach, as requested by the localities, to view first hand the severe riverine and coastal erosion problems which exist throughout the eastern part of the State. Public hearings or meetings with local officials have been held following the site visits in Virginia Beach, Warsaw, Kiptopeake and Colonial Beach to receive further imput regarding the local problems and varying methods used for attempted control. A synopsis of the information received and the findings which resulted from each site visit follows:

1. Virginia Beach-Norfolk

Commission members and the public were instructed by staff from the Virginia Institute of Marine Science and others regarding the techniques of erosion control in the Bay and their side effects; the causes of shoreline erosion; the Commonwealth's existing policies and programs; the effect of wave action on dunes and beaches; and documentation of wave action, their effect on dunes and beaches; and the distribution and magnitude of shoreline erosion within the Chesapeake Bay and its tributaries, with concentration on the Willoughby Spit, Ocean View and Virginia Beach areas.

Testimony from the public hearing and site visits confirmed severe erosion problems which have resulted from development too close to the water's edge, on top of or in front of a dune; improper advice/construction of structural controls used; and lack of funding sources for erosion control efforts.

Testimony and site vists also demonstrated the natural protection and beach nourishment offered by dunes, the need for their proper reinforcement and protection, and the proper exercise of control techniques and construction of structural devices.

An obvious need for a more informed public was demonstrated regarding the risks of development close to the water's edge and the proper methods of control. The rising costs of the various structural methods of control and the limited advisory services presently available clearly articulated the need for funding sources and increased advisory services relating to erosion control. Both are extremely limited at present.

2. Northern Neck

The Shoreline Committee of the Virginia Association of Soil and Water Conservation Districts invited the Commission and staff to observe riverine erosion problems and control methods utilized in the Northern Neck. The Commission was shown control methods such as vegetative plantings, riprap, rock revetments, jetties and bulkheads and advised of the costs of each method.

The Commission was also advised of the need for vegetative research concerning shoreline erosion and of the proposed vegetative project by the Shoreline Committee. The project's purpose is to investigate and collect data for determining when vegetative measures may be used for erosion control. The project's scope of investigation deals with the lack of information between known areas where vegetative plantings will succeed and where exposures require structural measures.

The public hearing and site visits confirmed that the application and maintenance of proper controls protect eroding banks and beaches. The Commission also noted the Committee's recommendation for the need of vegetative research for shoreline erosion control and for the need of funding the Committee's vegetative research project.

3. Colonial Beach

Colonial Beach officials contacted Senator Fitzpatrick and requested the Commission to visit their area to investigate the severe erosion (in some areas, 50 feet or more) being experienced by the

declining resort town of 2,600. The site visit was conducted to the most severely affected areas of the town, on the Potomac side of the peninsula, just north of the Southern tip of the peninsula. Town officials pointed out the loss of 75 feet of beach, now a ragged bluff, ineffectively reinforced by concrete or gabions. Approximately $10,000 of the town's highway money has been redirected to try to reinforce the bluff along which a prominent road is in danger of collapsing. An Army Corps of Engineers' study has been completed which suggests restoring the Central town beach and the Castlewood Park beach at the southernmost tip of the peninsula at a cost of $250,000, with $125,000 non-federal. The Corp's project would only build up the beach on the two far ends. The need for funding was obvious; town officials have sought help from other State and federal sources to no avail. A minimum of $50,000 was estimated necessary to effectively stabilize the bank along the public road, Irving Avenue.

The Commission concluded its site visits reviewing problems relating to erosion as a public and private concern along the Bay side of the Eastern Shore. The Commission found uncoordinated control attempts often resulting in the destruction of private waterfront property where inappropriate control techniques were utilized on a particular beach.

The site of the Chesapeake Bay Bridge Tunnel was found to be a source of public conern where erosion is affecting the road at the north end of the embankment fill. If the erosion is continues with its present rate and force, part of the riprapped embankment supporting the foundation of the bridge will come under direct wave attack, subjecting the Eastern Shore end of the bridge to collapse. Although this property is presently the responsibility of the federal government, it will soon be transferred to the Chesapeake Bay Bridge Tunnel Authority.

Testimony from the public hearing following the site visits articulated a need for additional technical advisory assistance on the Shore, the use of local expertise regarding control methods, a state policy on accretion and erosion, and funding assistance for erosion control efforts.

C. The Status of Public Beaches in Virginia

The condition of the public beaches in Virginia deserves the particular attention of the Commission since they offer the only fully accessible areas for shoreside recreation and bathing. Excluding State and federal parks, there are less than twenty miles of fully accessible, free public beaches along the entire tidal shoreline of Virginia. Most of the public beach frontage supports a strong tourist industry which is important to the Commonwealth. Since most of the public beach area is located along highly developed shorelands, the beaches themselves must also function as a buffer against erosional forces. The purpose of this section is to highlight the condition and requirements of the public beaches.

1. Virginia Beach

The principal public beach is located on the oceanfront between Rudee Inlet and 89th, the boundary with Fort Story at Cape Henry. A beach nourishment program has been used since 1953 to maintain a protective beach in front of the boardwalk between the vicinity of Rudee Inlet and 49th. Since the net littoral drift is to the north, the program, in effect, nourishes the entire beach to Cape Henry. Between 1964 and 1977, in excess of 3.3 million cubic yards of sand was placed on the beach at a total program cost of about 6.2 million dollars.

In addition to the ongoing federal project noted above, the Corps of Engineers is initiating the Phase I stage of Advanced Engineering and Design studies of additional beach erosion control and hurricane protection between Rudee Inlet and 89th Street. This plan will cost $37,000,000 (Phase I). Protection would include installation of a new sheetpile wall somewhat seaward of the existing bulkhead between Rudee Inlet and 57th Street. Between 57th and 89th Streets, the existing dunes would be raised and strengthened. For the entire 6-mile reach, the beach elevation would be raised to 10 feet above mean sea level by placement of sand. Navigation studies of Rudee Inlet will also be included.

Aside from cost burden of the nourishment program, a major problem is locating and getting access to sand sources for the continual demand. In the past materials have been dredged from within Rudee Inlet and from a stockpile at Fort Story emplaced as a result of widening the Thimble

Shoals Channel. Lynnhaven Inlet maintenance dredging has recently served as a source as has pump-bypassing at Rudee Inlet. Approximately 120,000 cubic yards will be supplied from Fort Story stockpile in 1979. Since the stockpile will soon be diminished, alternate sites are being evaluated. In particular, areas near the mouth of Lynnhaven Inlet are being investigated.

2. Norfolk

The public beach at Norfolk, 7.3 miles in length, fronts the Chesapeake Bay between a point a few hundred feet west of the entrance to Little Creek and the tip of Willoughby Spit. This shoreline section is exposed to wave attack from both the mouth of Chesapeake Bay and from the extensive fetch within Chesapeake Bay. The net littoral drift is from east to the west. Two independent published studies (Fletcher and McRee, 1977; Das, 1974) have concluded that the jettied entrance to Little Creek constitutes a blockage to sand passage from the shoreline to the east. Recent preliminary studies by the Commission and VIMS indicate that a coast-parallel trench excavated in 1953 along the beach at the Naval Amphibious Base would also interrupt the natural littoral drift.

In some areas of East Ocean View and Willoughby Spit, the erosion situation has become critical. The northeast storm of April, 1978, inflicted severe damage to homes and businesses in East Ocean View and homes were also damaged near the tip of Willoughby Spit. Within the one-mile section west of the Little Creek (East Ocean View), erosion rates range up to 9 feet per year. The April, 1978, storm left the beach in a depleted condition with total or severe damages to many of the erosion protection structures. If a nearly comparable storm strikes in 1979, the damage costs will be much more severe.

In addition to an extensive series of groins installed by the City of the 1930's, various private landowners have installed bulkheads and revetments in an effort to control erosion. While the groin field has been partially successful, additional treatment will be necessary to provide protection against severe northeast storms. In 1978 the Virginia General Assembly appropriated $90,000 to the City of Norfolk for use on the public beach, in addition to the City of Norfolk's appropriation of $88,000. These funds are being used for some emergency sand replenishment and for an evaluation of the feasibility of a pump-bypass system to transfer sand from the east side of Little Creek entrance to the Ocean View/Willoughby Spit beaches.

In 1977 the Norfolk Corps of Engineers initiated a five-year Plan of Study for hurricane protection and beach erosion control of East Ocean View/Willoughby Spit. The study will examine various alternative approaches to meet the objective and the costs and benefits of these strategies. If the benefits justify the costs, the District can recommend authorization of the selected approach. While the outcome of the study cannot be predicted, there is a strong likelihood that a beach fill and nourishment program would be the selected strategy. This would enhance the recreational value of the beach as well as provide erosion control. It is likely that about 2 million cubic yards of sand would be needed to supply the initial fill and surcharge.

3. Hampton

The principal public beach in the City of Hampton is Buckroe Beach located on the Chesapeake Bay facing the mouth of the Bay. This section of Hampton is hammerhead-shaped with spits at the north and the south, totaling a length of approximately 7 miles. The public beach area, about 3,800 feet in length, is positioned about two miles north of Fort Monroe. The shoreline along these two miles is hardened or stabilized with groins. Thus the shoreline to the south supplies very little sand. The three-mile shoreline reach to the north is the principal natural source of sand, a relatively weak source.

During 1966-1967, a beachfront recreational area was constructed behind a steel sheetpile bulkhead. In addition, six 200-foot groins were installed with a spacing of 600 feet. Although plans initially called for placement of sand fill within the groins, the sand was not placed due to budget limitations. During the period 1967 to 1975, the sand volumes within the groins became so seriously depleted that little dry sand was available and unimpeded wave attack was undermining the bulkhead at several locations. In the 1975-1977 period, sandbag sills were installed and 31,000 cubic yards of sand were placed in the system. The total cost of the project was about $52,000. This nourishment action has helped provide a viable recreational beach and toe protection for the bulkhead. Additional nourishment is needed.

The public beaches at Virginia Beach, Norfolk, and Hampton rely upon beach nourishment to maintain erosion control and a recreational capability. In all cases, locating suitable and economical marine sand sources which can be extracted at acceptable environmental risk is a serious problem. A comprehensive survey of extractable sand resources between Cape Henry to Newport News Point is needed to access the location, extent and character of sand bodies suitable for beach nourishment and other upland fill or industrial uses. The survey should include evaluation of the biological impact of extraction operations. If favorable sites can be found, then perhaps they could become locations dedicated for sand supply.

In addition to the public beaches at Virginia Beach, Norfolk, and Hampton there are smaller public beaches at Cape Charles City, Yorktown, Gloucester Point and Colonial Beach.

4. Cape Charles City

The town beach at Cape Charles City, about 3,000 feet in length, is located on the north side of the entrance to Cape Charles harbor. The harbor entrance jetty acts to trap sand, forming the basis of the beach. At present the beach area is narrow and low. As such, it offers little protection to the bulkhead which acts as a retaining wall for the road foundation which fringes the shoreline. The groins are in poor condition and the bulkhead needs repair. In 1977-1978, the USDA submitted a RC & D project for a program to replace the groins (18) and repair the bulkhead. In addition, some vegetative controls were planned to inhibit the action of the wind from blowing sand off the beach onto the roadway. The RC & D projects were dropped due to budget constraints. A funding level of $85,000 is needed to complete the work.

5. Yorktown

The Yorktown public beach, 1,500 feet in length, is on the south side of the York River just east of the Coleman Bridge. The beach has a high visitation rate. While the shoreline has been relatively stable, the area is highly susceptible to overwash during storms. In 1977-1978 the county undertook a beachfront improvement plan which included toilet facilities, paved parking, landscaped promenade and a backshore riprap revetment to protect these improvements from storm conditions. The cost of the project was $450,000.

6. Gloucester Point

The public beach at Gloucester Point, about 500 feet in length, is located directly across the York River from the Yorktown beach. Visitations to this beach have increased dramatically in response to the county's expenditures for increased parking and grounds keeping. In addition, a new public boat ramp with enlarged trailer parking capability is being completed by the Commission of Game and Inland Fisheries. The beach itself is relatively stable, although low in elevation.

7. Colonial Beach

Colonial Beach, in Westmoreland County, is located on the Potomac River. The town occupies a low penisula between the Potomac River and Monroe Creek with a frontage on the river of about 2.5 miles. At one time Colonial Beach was the most popular summer tourist area on the Potomac. In recent times, tourism has seriously declined. A significant contributing factor is the high erosion of the shoreline. The river frontage has been seriously eroded due to the exposure to wave action from the east and the northwest.

Approximately two miles of the shoreline are open to the public. Two public beach areas, which are connected by a shoreline drive (Irving Avenue), exist within the two-mile reach. The central town beach, about 600 feet in length, is on the north while Castlewood Park, with a beachfront of 1,000 feet, is at the extreme southern tip of the spit. Irving Avenue, the principal connecting road between the two areas, is also the access to the large marina complexes at the mouth of Monroe Bay.

Three shore erosion problems exist. The central public beach is suffering from sand depletion. The southerly net movement of sand is bypassing the Castlewood Park spit and shoaling the entrance to Monroe Creek. These two aspects of the problem are under study by the Corps of Engineers. Their preliminary studies propose beach fill and a modest breakwater at the central beach, and beach fill and a terminal groin at Castlewood Park to intercept the sand tending to shoal

the entrance to Monroe Bay. Estimated total first costs are about $250,000 with nonfederal cost at about $125,000. The third problem, one of extreme urgency, is the protection of those segments of Irving Avenue not protected and undergoing severe erosion. About 550 feet of public roadway is in immediate danger of being washed out. Estimated costs of gabion revetment to protect this zone is about $50,000.

III. SPECIFIC FINDINGS, CONCLUSIONS, AND INTERIM RECOMMENDATIONS

A. In recent years the Virginia Institute of Marine Science has initiated, with the assistance of the National Sea Grant Program and the Coastal Plains Regional Commission, the development of low-cost erosion control techniques. These efforts have shown some limited success. An expanded effort in research and development could yield considerable dividends to the citizens of the Commonwealth.

The use of vegetative controls of shoreline erosion is worthy of particular attention. The Commission recognizes the need for evaluating vegetative methods to stabilize and control eroding shorelines as pointed out in the Northern Neck tour. The evaluation should include a system for classifying shorelines which may use vegetative practices and an investigation into selecting superior strains of vegetation for use in stabilization of the selected shorelines.

B. The public beaches at Virginia Beach, Norfolk, Hampton, Colonial Beach, and Cape Charles all require sand nourishment to maintain erosion protection. In all cases, long-term and economical sand sources are required. There is little doubt that sufficient and appropriate sand bodies exist within the marine bottoms between Hampton Roads and the Bay mouth. However, detailed surveys which include coring into the bottom will be required to delineate the locations and extent of favorable sand bodies. These evaluations should include an assessment of the impact of extraction operations on the marine biota. When suitable sand resources are located, these sites should be designated as permissible for long-term extraction.

The proposed surveys would take about three years to complete. The Virginia Institute of Marine Science has recently acquired the bottom coring equipment necessary.

C. Cape Charles and Colonial Beach have demonstrated a critical need for emergency appropriations to stabilize their respective areas. The Commission therefore proposes the endorsement of an emergency appropriation consisting of $85,000 for the reinforcement of the bulkhead and placement of 18 new protective groins in Cape Charles and $50,000 for the reinforcement of Irving Avenue in Colonial Beach.

D. Recognizing the need to provide additional technical and consultative assistance to owners of waterfront property to control erosion on tidal riverbanks, bays and coastal areas, the Coastal Erosion Abatement Commission recommends that a Shoreline Erosion Advisory Service be established under the auspices of the Soil and Water Conservation Commission effective July 1, 1979. The Soil and Water Conservation Commission is now authorized

> "...to make the necessary coordination of shore erosion control programs of all State agencies and institutions and to secure the cooperation and assistance of the United States and any of its agencies to protect waterfront property from destructive erosion; to evaluate the effectiveness and practicability of current programs; and to explore all facets of the problems and alternative solutions to determine if other practical and economical methods and practices may be devised to control shore erosion." (§ 21-11.18)

The field staff would take advantage of the on-going shoreline erosion research and demonstration projects of the Virginia Institute of Marine Science.

APPENDIX A

SENATE JOINT RESOLUTION NO. 22

WHEREAS, the beaches, islands and inlets of the Commonwealth lying along or near the Atlantic Ocean and Chesapeake Bay are major assets to the economy of the entire State; and

WHEREAS, the aesthetic beauty of Virginia's beaches, islands and inlets is unparalleled anywhere; and

WHEREAS, these areas are a source of great enjoyment and recreational activity for all Virginians; and

WHEREAS, due to a variety of social and environmental factors, these areas are subject to a constant state of erosion and destruction; and

WHEREAS, the beaches, islands and inlets of this Commonwealth constitute a great natural resource which is in extreme danger and needs preservation and protection; now, therefore, be it

RESOLVED by the Senate of Virginia, the House of Delegates concurring, That there is hereby established the Coastal Erosion Abatement Commission. The Commission shall be composed of seven legislative members, three of whom shall be appointed by the Committee of Privileges and Elections of the Senate from the membership of the Senate and four of whom shall be appointed by the Speaker of the House of Delegates from the membership thereof. Such additional citizen members may be added to the membership of the Commission as the Commission shall find necessary, provided that the total membership of the Commission shall not exceed thirteen members.

The Commission shall conduct a study on the effects of erosion on the beaches, islands and inlets of the Commonwealth and shall make such recommendations as are deemed necessary to prevent the further destruction of these valued natural resources. The Commission shall coordinate its efforts with the Virginia Institute of Marine Science and with all interested persons and agencies, including the federal government and neighboring states. All officers and agencies of the Commonwealth and its political subdivisions shall assist the Commission in its work upon request.

All legislative and citizen members, other than salaried State employees, shall receive such compensation as is provided for in § 14.1-18 of the Code of Virginia, and all members shall be reimbursed for their actual and necessary expenses incurred in the course of their official duties, for which there is hereby allocated from the general appropriation to the General Assembly the sum of fifteen thousand dollars.

The Commission shall complete its study and report its findings and recommendations to the Governor and General Assembly no later than December one, nineteen hundred seventy-nine.

SHORELINE EROSION RATES FOR TIDEWATER VIRGINIA
CHESAPEAKE BAY SYSTEM

APPENDIX B

	Erosion Rates (Ft./Yr.)						
	0-1	1-2	2-3	3-4	4-5	Erosion Rates >5 Ft./Yr.	
	Miles of Shoreline in Each Category					Rate (Ft./Yr.)	Length (Miles)
*Accomack	0.3	18.5	10.6	6.6	6.1	32.6	0.3
						22.0	3.0
	3.5	3.5					
Charles City	6.1	11.6	1.1				
Chesterfield	3.6	5.1	0.5			20.7	3.9
	1.7	11.5	13.4	9.1	0.9		
Gloucester	24.9	21.8	8.5	1.4	0.7		
	1.9	3.1	2.4	0.9	1.9	6.4	2.5
	0.6	1.7				6.1	0.2
*Isle of Wight	3.9	12.9	1.4	7.0			
James City	2.7	17.0					
*King George		7.0	1.7				
King and Queen	1.8	2.2					
King William	0.8						
Lancaster	1.7	12.1	7.2	0.4	17.	7.9	4.1
						5.6	0.8
						6.0	0.5
						6.6	1.0
						5.1	0.7
	1.9	15.1	12.7	2.1	3.5	30.9	0.1
						8.0	0.5
						7.1	3.6
Middlesex	1.6	16.8	4.1	3.7	0.6	6.5	0.9
						6.1	1.8
New Kent	1.1	4.6					
Newport News	2.6	6.3	0.5				
*Norfolk		3.0	0.7				
*Northampton	1.1	4.5	8.3	3.1	2.4	5.7	1.8
						7.0	1.3
*Northumberland	1.6	8.8	10.3	5.7	8.0	5.2	2.4
						7.1	0.4
						6.1	3.3
						10.6	0.6
						5.7	1.3
Prince George	6.8	16.4	2.0				
*Richmond	0.5	8.5	9.7	2.0			
*Suffolk		1.6	1.3				
Spotsylvania	0.5	1.9					
Surry	0.3	15.8	2.5			11.8	3.8
*Virginia Beach					6.0		
*Westmoreland	2.3	5.0	11.3	7.1	1.5		
York	9.1	21.8	5.0	6.0		7.4	0.6
Total (Miles)	82.9	258.1	115.2	55.1	33.3		39.4

CUMULATIVE MILES OF EROSION

Erosion Rates (Ft./Yr.)	>0	>1	>2			>5
Shoreline	584.0	501.1	243.0	127.8	72.7	39.4

+ Does not include Fairfax, Prince William, and Stafford Counties for which there was no data.

* Includes only a portion of the county.

Data from: "Shoreline Erosion in Tidewater Virginia", Byrne and Anderson, Special Report in Applied Marine Science and Ocean Engineering Number 111 of the Virginia Institute of Marine Science, 102 pages; 1977.

Occurence of Major Storms in Virginia Beach
From 1956-1978
Appendix C

Storm	Date	Storm Surge (m)	Wind Speed (kn)	Direction
	11 Jan. 1956	1.04	33	NE.
	11 Apr. 1956	1.3	62	N.
	3 Nov. 1956	0.61	29	NE.
	28 Feb. 1957	0.73	33	NE.
	8 Mar. 1957	0.67	27	NE.
	1 Nov. 1957	0.82	28	NE.
	25 Jan. 1958	0.70	44	E.
	1 Feb. 1958	0.67	30	W.
	19 Mar. 1958	0.67	21	NE.
	27 Mar. 1958	0.79	20	N.
	11 Dec. 1958	0.64	27	NE.
	29 Dec. 1958	0.70	38	E.
	12 Apr. 1959	0.76	45	NE.
	19 Dec. 1959	0.64	29	N.
	31 Jan. 1960	0.91	42	NE.
	13 Feb. 1960	0.70	49	NE.
	3 Mar. 1960	0.88	52	E.
	12 Dec. 1960	0.61	40	W.
	16 Jan. 1961	0.61	13	W.
	8 Feb. 1961	0.73	27	NE.
	22 Mar. 1961	0.67	33	E.
	28 Nov. 1961	0.61	23	NW.
	28 Jan. 1962	0.67	37	NE.
Ash Wed	7 Mar. 1962	1.70	41	NE.
	22 Mar. 1962	0.73	20	N.
	3 Nov. 1962	0.76	33	N.
	26 Nov. 1962	1.02	41	N.
	8 Feb. 1963	0.70	30	NE.
	6 Nov. 1963	0.73	38	E.
	4 Jan. 1964[2]	0.6	28	W.
	12 Jan. 1964[2]	0.8	42	E.
	12 Feb. 1964[2]	0.6	32	E.
Cleo	1 Sept. 1964[2]	0.3	42	E.
Dora	13 Sept. 1964[2]	0.1	61	NE.
Gladys	23 Sept. 1964[2]	0.7	44	N.
Isabell	16 Oct. 1964[2]	0.8	50	NE.

(From W. S. Richardson, U. S. Weather Service, personal communication, 1979)

Appendix C—Continued

Occurence of Major Storms in Virginia Beach
From 1956-1978
Appendix C—Continued

Storm	Date	Storm Surge (m)	Wind Speed (kn)	Direction
	16 Jan. 1965[2]	1.2	35	NE.
	22 Jan. 1965	0.9	36	E.
	29 Jan. 1966[2]	1.1	37	E.
	24 Dec. 1966[2]	0.7	31	NE.
Alma	13 June 1966[2]	0.3	40	N.
	7 Feb. 1967[2]	0.8	33	NE.
	12 Dec. 1967[2]	0.6	30	E.
	29 Dec. 1967[2]	0.6	31	W.
Doria	16 Sept. 1967[2]	1.2	55	N.
	14 Jan. 1968[2]	0.7	33	E.
	8 Feb. 1968[2]	0.8	30	NE.
Gladys	20 Oct. 1968[2]	0.4	46	NE.
	10 Nov. 1968[2]	1.3	34	N.
	12 Nov. 1968[2]	0.8	47	NE.
	2 Mar. 1969[2]	1.8	40	N.
	2 Nov. 1969[2]	0.8	36	NE.
	10 Nov. 1970		22	SE.
	16 Dec. 1970	2.0	31	E.
	27 Mar. 1971	2.8	45	NE.
	6 Apr. 1971	4.0	44	NE.
	19 Oct. 1972		34	N.
	11 Feb. 1973	3.5	44	N.
	21 Mar. 1973	3.1	28	N.
	2 Mar. 1975	2.2	22	S-SE.
	14 Oct. 1977	2.6	29	NE.
	30 Oct. 1977	2.3	24	NE.
	20 Dec. 1977			
	28 Apr. 1978	4.6	39	NE.

Defined as having a surge >2 feet (0.6 meter) at Hampton Roads tide gage.
Virginia Beach gage operating.
(From W. S. Richardson, U.S. Weather Service, personal communication, 1979)