1974

HAMPTON ROADS AREA

FUTURE DREDGE DISPOSAL SITE

REPORT OF THE

VIRGINIA PORT AUTHORITY

TO

THE GOVERNOR

AND

THE GENERAL ASSEMBLY OF VIRGINIA

House Document No. 3

COMMONWEALTH OF VIRGINIA
Virginia Port Authority
Norfolk
1973

HAMPTON ROADS AREA FUTURE DREDGE DISPOSAL SITE

Report of the
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Norfolk, Virginia
September 1973

To: HONORABLE LINWOOD HOLTON, *Governor of Virginia*
and
THE GENERAL ASSEMBLY OF VIRGINIA

I. INTRODUCTION

At the 1972 session of the General Assembly of Virginia, the Virginia Port Authority was directed to consider the need for a future disposal site convenient to the Hampton Roads area at which spoil and other waste materials from dredging, port development, and other activities can be disposed of safely and conveniently. House Joint Resolution No. 136 reads as follows:

> WHEREAS, for many years the Craney Island area was used as the disposal area for spoil from dredging operations conducted in and around the Hampton Roads area; and
>
> WHEREAS, this area has been substantially filled and is no longer available for large deposits of spoil, and the continued economic health and advancement of the Hampton Roads area is dependent upon a disposal area for the spoil generated by dredging and other activities in connection with the development of channels and ports; and
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> WHEREAS, it is necessary for a disposal area to be found and it would appear that the area near the Virginia Capes might be employed for this purpose; now, therefore, be it
>
> RESOLVED by the House of Delegates, the Senate concurring, That the Virginia Port Authority shall consider the need for a disposal area convenient to the Hampton Roads area at which spoil and other waste materials from dredging, port development and other activities can be disposed of safely and conveniently. The Port Authority shall work closely with the Virginia Institute of Marine Science, the Army Corps of Engineers and other interested agencies and groups in the gathering of information and studying the need for a disposal area as well as selecting such an area. All agencies of the State shall assist the Port Authority in its work upon request.
>
> The Port Authority shall conclude its study and make its report to the Governor and the General Assembly not later than October one, nineteen hundred seventy-three.

In response to House Resolution No. 136, the Virginia Port Authority in December 1972, recognizing that the scope of the study and subsequent selection of the site to be recommended would affect many agencies and areas of Virginia, requested the Commonwealth's Secretary of Commerce and Resources to consider a joint State agency to examine dredge spoil disposal in the Hampton Roads area.

In January 1973, the Secretary of Commerce and Resources designated the following agencies to serve on a Craney Island Task Force: Commission of Game and Inland Fisheries, Division of Industrial Development, Division of State Planning and Community Affairs, Governor's Council on the Environment, Marine Resources Commission, State Water Control Board, Virginia Institute of Marine Science, and Virginia Port Authority. (Attorney General — legal consultant)

Inasmuch as the U. S. Corps of Engineers was authorized on 20 June 1969 by Congress to review the Corps of Engineers' Study of the Hampton Roads Harbor Channels, and this review has included extensive studies toward replacing the existing Craney Island Disposal Area when it has been filled to design capacity, and additionally, recent Federal legislation requires State financial participation in development of any future sites to contain dredging spoils, the Craney Island Task Force defined its general objectives as:

- o Review and evaluate each of the feasible alternatives identified by the Army Corps of Engineers (COE) and any other approaches that the task force considers to merit study, as they affect the environment, development within the area, and other pertinent criteria.
- o Recommend a site or a combination of sites for the future disposal area, and identify the procedure that the State should follow in fulfilling its obligations to the COE in the development of the site(s).

The report of the Craney Island Task Force was submitted to the Secretary of Commerce and Resources for the Commonwealth in September 1973. This report of the Virginia Port Authority is the consensus of findings and recommendations of the multi-State agency task force, and the full task force report is attached as an appendix for ready reference.

II. RECOMMENDATIONS

On the basis of the State task force study, it is recommended that the General Assembly adopt the following:

1. Of all alternatives available at the present time for future dredge spoil deposit, the continued use of the Craney Island site is the most practicable and acceptable, both ecologically and economically.

2. The continued use of the Craney Island site should be accomplished by:

   A. Raising the present design elevation to about 28 feet on the western portion so as not to interfere with plans for development of port facilities on the eastern portion. Such raising shall be contingent on an engineering determination that the substructure can bear the weight of the additional deposit without creating adverse side effects such as mud-waves or collapsing of navigational channels.

   B. Following the raising of the existing Island, additional capacity for dredge spoil should be obtained by extending the existing site to the westward incrementally as required, retaining a channel along the existing shore line and with a configuration to be determined by model tests.

Recognizing that the capacity and useful life of the existing Craney Island site depends upon final engineering studies regarding feasible design height, as well as when the Hampton Roads channels are deepened to 55 feet, it should be the intent to accommodate future dredge spoil by using the most beneficial combination of raising the existing Craney Island and constructing the westward extension.

3. Throughout this period, ocean disposal should be utilized for dredged material whose chemical and physical parameters meet the criteria established by the U. S. Environmental Protection Agency for open-water disposal.

On the basis of this report and considering the importance of adequate dredge spoil deposition to maintenance of Virginia as a leading port community, it is recommended that the General Assembly in adopting the findings of this report recognize the need in acquiring and planning for the future use of the present and expanded Craney Island site, and, therefore, it is recommended that the General Assembly adopt the following:

1. Support the Governor's Office in negotiations with the Federal Government for acquisition of the present site.

2. Support the Governor's Office in negotiations with the Federal Government to determine respective responsibility in expanding the Craney Island dredge spoil disposal site.

3. Direct the Virginia Port Authority and the Division of State Planning and Community Affairs to develop a plan for future use for the total development of the Craney Island area.

4. Recognizing that a large research effort is presently under way, on a nationwide basis, to seek solutions which will provide a positive approach to the total question of spoil removal, all State agencies having responsibility in these areas of research are

directed to participate, thereby providing the Commonwealth with the best possible solution to future dredge spoil disposal.

The named State agencies shall make a report to the General Assembly not later than October 1, 1975.

Future Disposal of Dredged Material From
Hampton Roads

REPORT OF THE CRANEY ISLAND TASK FORCE

To

The Secretary of Commerce and Resources
The Honorable Maurice B. Rowe

September 1973

SUMMARY OF RECOMMENDATIONS

The present dilemma of dredged material deposition faced by the Commonwealth and the Nation, and in this case the Port of Hampton Roads, is cogently summarized by the following passage from the U. S. Army Corps of Engineers Feasibility Report — Craney Island Study:

"Realistically, the need for another disposal area is not open to question. In the case at hand, the need for a disposal area is related to the need to maintain the navigation features of Hampton Roads. Maintenance of the harbors of Hampton Roads, in turn, is vital to the very existence of the ports themselves. However, this is not to say that a solution to the problem of spoil disposal can be simply advanced without regard for the environmental factors so important to man's health and well-being. There are other interrelated and often conflicting goals and needs which must be recognized and synthesized with that of harbor maintenance and spoil disposal. Hampton Roads is, in this respect, a good example of a subsystem in which the feedback of two included elements threatens the viability of the subsystem itself. It was dredging (and disposal) that allowed Hampton Roads to develop into a major port. Now, dredging and disposal has become more acute because of the developing and growing port cities. Industries and people are now competing for the land still available. This virtually precludes the possibility of a large land disposal area within 10 miles of the harbor. The water surface area remains constant while the number of people continues to grow. From a long range point of view, say the next 100 years, the filling of the harbor cannot be continued indefinitely. At the rate of 4 square miles every 20 to 25 years (which is the present rate, considering the Craney Island Disposal Area), Hampton Roads would eventually be completely filled. This points out that past methods of disposal are not satisfactory for the future. New solutions must be found."

Based on an approach which emphasizes the positive utilization of spoil material, the Craney Island Task Force first acknowledges that existing alternative solutions to the problem are marginally acceptable and it shall be the responsibility of both the Corps and the Commonwealth to work toward the "new solutions" which must be found. Thus, the recommendations stress first the need to direct our full attention to the positive solution of the problem while at the same time offering options if the answers are not readily forthcoming.

I. The Commonwealth, in cooperation with the federal government, should initiate studies for the positive utilization or harmless disposition of dredged material in several areas to include:

   a. the creation of artificial islands for a predetermined, desirable and needed use.

   b. the impact of dumping dredged material into open water.

   c. the likelihood of recycling dredged material for construction materials manufacture.

d. the utilization of dredged material for land improvement for both development and agriculture.

e. the possibility of rendering contaminated dredged material harmless.

II. While these studies are being conducted, the existing Craney Island should be filled to its design capacity. When filled, and if no new solutions are found, the existing disposal area should be raised to a height determined to be feasible by the COE.

III. If it appears that no viable alternative is available by the mid 1980's, when it is likely that a decision on the next phase must be made, the existing Craney Island should be extended incrementally to the west. By building incrementally in two stages, each with a life of approximately ten years, the option of possibly not having to fully extend the fill area is created.

IV. During all phases, ocean disposal of uncontaminated material should be employed.

V. The Governor's Office should begin negotiating with COE officials to determine the exact responsibilities of each party in meeting the maintenance needs of Hampton Roads.

If all alternatives are fully utilized, dredged material from Hampton Roads could be handled for approximately fifty years; however, by making a separate commitment at each ensuing stage, the option to employ a positive solution remains open. The thrust now must be directed toward finding that solution.

FUTURE DISPOSAL OF DREDGED MATERIAL FROM HAMPTON ROADS

In a memorandum dated January 23, 1973, the Honorable Maurice B. Rowe, Secretary of Commerce and Resources in the Governor's Cabinet, established a Craney Island Task Force.

> The responsibility of this group will be to assist the Division of State Planning and Community Affairs in developing acceptable and feasible recommendations on the disposal of dredging spoils from Virginia's ports and access channels.

State agencies represented on this task force are the Governor's Council on the Environment, Commission of Game and Inland Fisheries, State Water Control Board, Virginia Port Authority, Virginia Institute of Marine Science, Marine Resources Commission and Division of Industrial Development. The Office of the Attorney General serves as the legal consultant.

The purpose of the task force, as outlined in Secretary Rowe's memorandum, is to present to the U. S. Army Corps of Engineers the recommendation of the Commonwealth of Virginia for replacing the existing Craney Island Disposal Area when it has been filled to design capacity.

Initially, the general objectives of the Craney Island Task Force were to:

- Review and evaluate each of the feasible alternatives identified by the Army Corps of Engineers (COE) and any other approaches that the task force considers to merit study, as they affect the environment, development within the area, and other pertinent criteria.
- Recommend a site or a combination of sites for the future disposal area, and identify the procedure that the State should follow in fulfilling its obligations to the COE in the development of the site(s).
- Determine the costs to the State for the acquisition and development of the disposal area in as much detail as possible.
- Develop a scheme for the funding of the project, giving consideration to the possibility of a State appropriation, a State bond issue, assumptions by the Virginia Port Authority, or other alternative approaches.

Because of the nature of the task force recommendations to the COE, the last two objectives have not been considered in-depth and do not constitute a part of this report.

Background [1]

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[1] Division of State Planning and Community Affairs, *Craney Island Study*, (Division of State Planning and Community Affairs, Richmond, Virginia, May 1971)

Historically, dredge spoil material removed from the harbor at Hampton Roads has been deposited in various low areas behind bulkheads and in the harbor itself at Fort Wool; in the James River above Newport News; on Craney Island and the land just west of that island; and in the inshore waters of the Chesapeake Bay. Ultimately, the need for an appropriate disposal area of large capacity became apparent, resulting in a Congressionally approved proposal to build a contained area projecting north from the U. S. Navy's fuel depot at Craney Island. Thus, the Craney Island Disposal Area, with the cooperation of the Commonwealth, was conceived to contain the material removed in harbor improvement and maintenance for a period of twenty years.

Construction began on August 19, 1954. Preliminary work which preceded actual construction included site analysis, engineering considerations and specifications, contractual arrangements and funding. The results of these studies indicated that the waters 4,000 feet west of the Norfolk Harbor deepwater channel, site of the planned fill area, varied in depth from the shoreline to a maximum of 12 feet. The harbor bottom was composed of sand from the shore to a point about 3,000 feet north of the existing Craney Island and, at this location, the bottom composition changed to marine clay with depths up to 100 feet.

These characteristics required the utilization of special construction techniques during the early phases of construction. The base of each levee was built up with sand pumped from a hydraulic dredge. The hydraulic sand fill was built to a height of 3.5 feet above mean sea level and had a slope of 1 on 15 down to 3.5 feet below mean sea level. Beyond this point the slope was reduced to 1 on 30 all the way to the natural bottom. The flat slope was needed to spread the weight of the levee over a wide area of the very unstable harbor bottom. The west and north levees were completed first to allow depositing of material prior to the completion of the east levee. The final levees were completed in January 1957 at a design height of 6.5 feet above mean sea level. As mentioned, some material was being deposited before the project was completed; however, it was not until mid-1957 that substantial amounts of spoil were being received within the completed enclosure.

The extensive tests made of the harbor bottom prior to construction indicated that there would be substantial consolidation of the marine clay bed under the weight of the levee and any subsequently deposited spoil material. It was estimated that consolidation of up to 7.5 feet could be expected. The actual settlement that has taken place has not been uniform. The most that has occurred in any one year and in any one place totaled 2.8 feet. At some locations, total settlement did attain the projected 7.5 feet. The resultant changes to the design height of the main levee were corrected by maintenance personnel. Most of this consolidation took place during the first seven years of the life of the main levee. Since 1964, much of the subsidence has ceased and the levees have remained practically stable.

As spoil material was placed behind the levees, this consolidation also became an important factor in calculating the design life of the fill area. As designed, it was estimated that the ultimate capacity would be in the vicinity

of 100,000,000 cubic yards. Due to compaction of the underlying marine clay bed, this figure has been periodically revised upwards. It is now believed that the area, when brought to design specifications, will hold more than 125,000,000 cubic yards of material. As of March 1972, about 100,000,000 cubic yards has been deposited. Based on current projections, the area will be filled by approximately 1980. This estimate is computed on the assumption that the average annual fill rate of 4,000,000 cubic yards generated by presently authorized maintenance dredging projects will continue, and that no major new work will be undertaken in the intervening period.

When completed and stabilized, the Craney Island Disposal Area will have the following configuration if the original design is maintained:

Shape	Trapezoidal — offshore dimension east-west, 9,000 feet; inshore dimension east-west, 11,000 feet;
Area:	2,546 acres plus or minus
Elevation:	Main levee — +6.5 feet above m. s. l. Step levee — +16.5 feet above m. s. l. (Step levee approximately 100 feet inside main levee.)
Material:	marine clay shells silt sand

With approximately 6 to 8 years remaining before the projected capacity of Craney Island is reached, it is imperative that a strategy be developed to allow for the continual maintenance and improvement of Hampton Roads. In recent years there has been an increasing emphasis placed upon the role of local and state governments in taking positive action to provide the facilities needed to ensure that their ports and waterways are maintained for their benefit. A survey of some of the major U. S. ports has shown that in almost all cases it is the responsibility of the non-federal interests to provide the land and associated structures (dikes, spillways) for spoil disposal areas. This will necessitate a strong commitment on the part of the Commonwealth to work toward a solution which will enhance both the economic viability and environmental quality of the region and, indirectly, that of the entire State.

Possible Solutions

The Corps of Engineers has initiated an effort to determine a suitable alternative to the present Craney Island after it has been filled to its design capacity. For more than three years, various investigations have been made concerning approaches and locations which may be acceptable for spoil

removal. A broad spectrum of alternative solutions, ranging from inland disposal by rail haul to disposal at sea by pipeline, has been studied by the Corps. Criteria against which each concept was independently measured consisted of (1) engineering and economic feasibility, and (2) social and environmental impacts.

Upon subjection to the above two criteria, several of the original alternative proposals (from a list of twelve alternatives) were eliminated by the COE from further consideration, and the following five proposals were deemed worthy of additional study (see attached location map):

a. Raising the existing Craney Island Disposal Area to an elevation of +29 feet above mean low water (m. l. w.).

b. Constructing a westward extention to the Craney Island Disposal Area.

c. Disposal in Chesapeake Bay offshore of Buckroe Beach.

d. Disposal in Nansemond City east of Suffolk and north of U. S. Highway 58/460.

e. Ocean disposal east of Cape Henry, Virginia.

More detailed studies of these five alternatives were made by the COE based on the following two basic assumptions:

a. That any overall disposal-area plan must have an economic life expectancy of 50 years.

b. Additionally, there must be space available in the new disposal area for dredge spoil generated by the proposed deepening of the channels of Hampton Roads to a depth of 55 feet. Thus, the annual 4 million cubic yards of maintenance dredging should be increased by 50 million cubic yards, or about 1 million cubic yards per year for the 50-year life of the project.

Based on these two assumptions, twelve alternative plans for the replacement of the existing Craney Island were developed by the COE. These plans comprise one or a combination of the foregoing five proposals studied in depth by the COE. In computing the cost of these twelve plans, cost apportionment was based on the State furnishing the following:

a. Lands, easements, and rights-of-way

b. Levees and structures associated with the diked area

The Task Force Alternatives

The Craney Island Task Force investigated the five proposals given additional study by the COE, and at this time the task force essentially has no new viable solutions to offer beyond those already studied. One major modification of one of the proposals may be considered a different approach which will be subsequently addressed in the task force's recommendations. A description of the five COE alternatives follows.[2]

a. *Raising the Existing Craney Island Disposal Area*

This plan would raise the levees at the existing disposal area, thereby increasing its capacity and prolonging the useful life. The design height of the existing step levees at Craney Island is 16.5 feet above m. s. l. By continuing fill operations beyond the present design elevation to 28.5 feet m. s. l. (i. e., raising the existing levees an additional 12 feet), the capacity would be increased by about 40 to 45 million cubic yards and the useful life by about 9 years. The levees could be built up gradually as needed or all at once. The increase in capacity was calculated under the assumption that three feet of settlement and compaction will take place during filling of the area. This plan would not entail changes in present dredging or disposal methods. The present rehandling facilities for hopper dredges and scows would be adequate. A slightly increased energy requirement for pumping into the area, resulting from the greater lift, would present no practical difficulty, since most of the material pumped is of a very liquid silty consistency.

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[2] U. S. Army Corps of Engineers Feasibility Report — Craney Island Study

The total first cost of this plan is estimated by the COE to be five million dollars, which includes the initial construction cost of levees and spillways and accounts for the salvage value of the filled land. (Costs for contingencies, engineering and design, and supervision and administration were added to obtain the total estimated cost.) Based on experience at the existing facility, probable annual operation and maintenance and replacement costs are estimated to be $300,000. The annual charges for interest and amortization, based on a rate of 5-1/2 percent, are $700,000.

The average annual dredging cost for this alternative is computed to be $4,600,000. This includes $3,600,000 for maintenance dredging plus $1,000,000 for expected new work. The total estimated annual charges are then $5,600,000 or about $1.20 per cubic yard.[3]

b. *A Westward Extension of the Craney Island Disposal Area*

An extension to the west of the existing Craney Island Disposal Area would be similar to the present disposal area. A channel would be provided between the shoreline and levee to provide water access for the residents along the waterfront and allow drainage from Streeter and Hoffler Creeks.

Various shapes for the addition are possible, but in general it would extend westward, gradually tapering from the north, with the westernmost point near the mouth of the Nansemond River at Pig Point. An accompanying sketch shows the two most probable shapes, which are labeled Plan B1 and Plan B2. The configuration of Plan B1 was suggested by the Virginia Institute of Marine Science on the basis of hydrodynamic soundness. Plan B2 allows for greater storage capacity with no increase in the length of levee required. Model tests of the two shapes made at the COE Waterways Experiment Station in Vicksburg, Mississippi, showed that the proposed westward extension of the Craney Island Disposal Area by construction of either Plan B1 or Plan B2 dike configuration would have no significant effects on current velocities, salinities, or tidal heights in the area.

In both cases, about 31,000 feet of levee would be required. In Plan B1, the levee would enclose about 1,750 acres and in Plan B2 about 2,380 acres. The water depth in the area averages 9.5 feet, and a levee with an ultimate height of 16.5 feet would provide a storage capacity of 79,000,000 cubic yards in Plan B1, 115,000,000 cubic yards in Plan B2. These capacities correspond to effective lives of 16 and 24 years, respectively. Neither plan would interfere with harbor

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[3] For each plan, the costs of construction, operation, maintenance, replacement and all other necessary items were estimated, and using the appropriate interest rate, were reduced to yearly (annual) costs. Added to these were the costs for various methods of dredging throughout the year. These annual costs were then divided by the estimated annual maintenance dredging requirement, plus an allowance for new work — about 4.8 million cubic yards — to obtain an overall average cost per cubic yard. For example, the yearly costs associated with the plan to raise the existing levees are estimated to be $5,600,000. Dividing this amount by the 4.8 million cubic yards yields a rounded figure of $1.20 per cubic yard. These derived costs, of course, reflect the larger figures, but they offer a more convenient method to compare alternatives from a cost standpoint.

traffic, since the area west of the existing disposal site is aside from harbor channels and small craft routes.

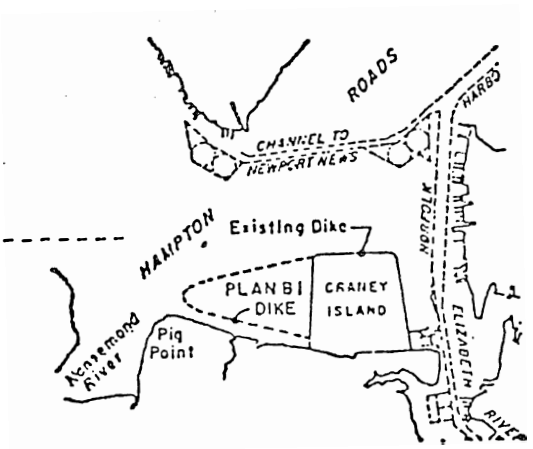
The area is suitably located with respect to dredging and disposal activities. Its sheltered and centralized location would facilitate the continuance of the economical dredging and disposal methods now employed. By extending shore pipeline to the new area, the existing rehandling facilities could be used.

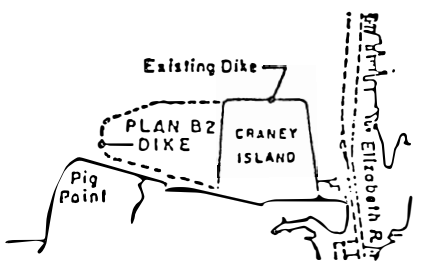
This alternative would accomplish maintenance of the navigation features as follows: (1) initial removal of in-place shoal material by current methods; i. e., hopper dredge, hydraulic pipeline and bucket scow; and (2) transfer of the material, using the existing rehandling facilities, to the diked area for final disposal. Essentially, the rehandling operation would be the same as at present, with the exception that about two miles of additional shore pipeline would be needed from the rehandling area to the new disposal area. In hydraulic pipeline dredging, the outfall end of the pipe would be inside the disposal area; i. e., the rehandling facilities would not be used.

Since Plan B2 would have a larger storage capacity than Plan B1, only its cost has been computed. The estimated cost of maintaining navigation by Plan B2 (115,000,000 cubic yards) is $5,900,000 per year or $1.20 per cubic yard over the plan's 24-year life.

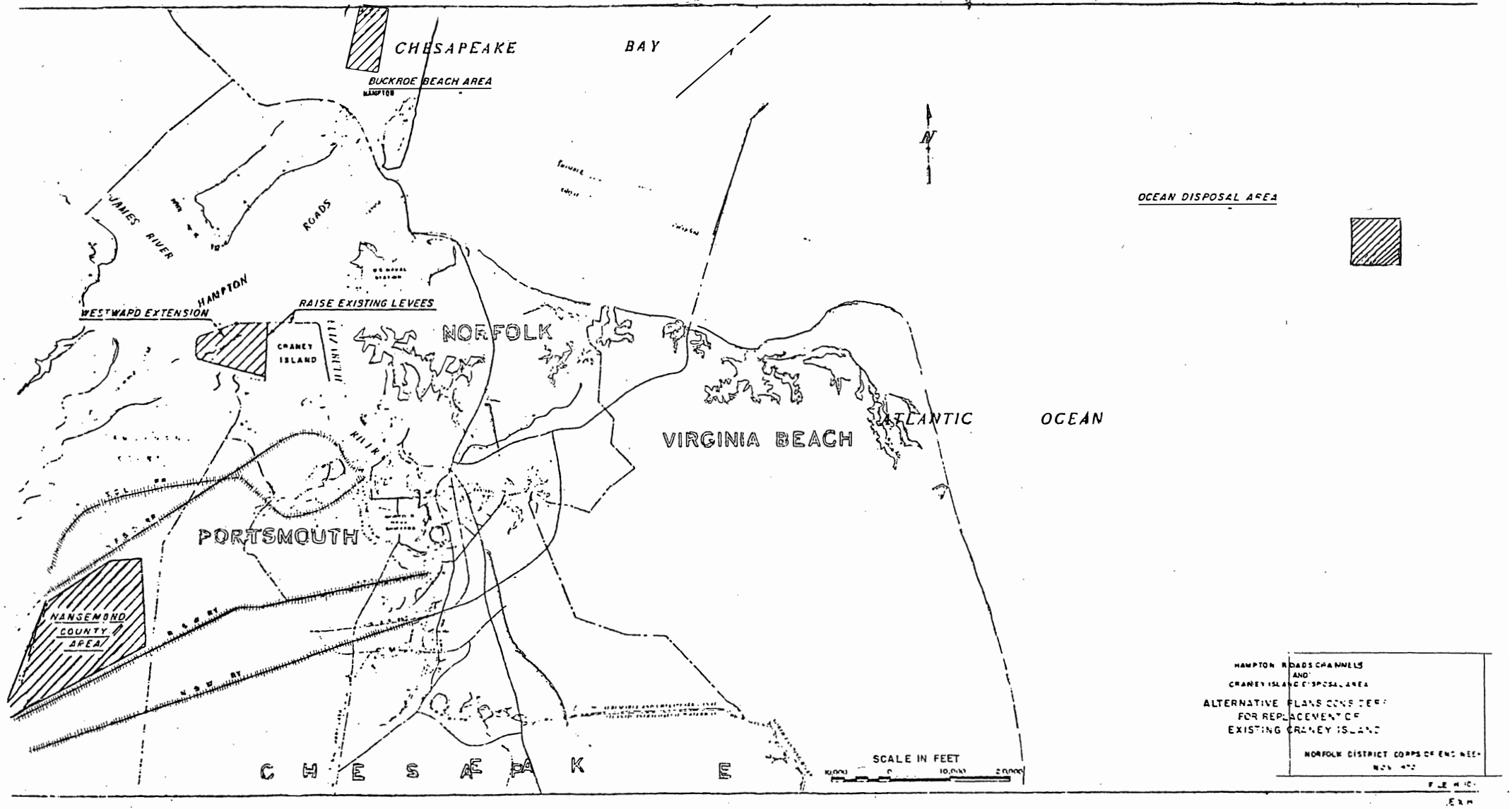
A Westward Extension of the Craney Island Disposal Area

Plan B1 ----------





----------Plan B2



HAMPTON ROADS CHANNELS AND CRANEY ISLAND DISPOSAL AREA

ALTERNATIVE PLANS CONSIDERED FOR REPLACEMENT OF EXISTING CRANEY ISLAND

NORFOLK DISTRICT CORPS OF ENGINEERS

Another approach to the westward extension alternative would be to expand the Craney Island Disposal Area incrementally or section by section instead of enclosing and filling in the total area at the outset as proposed in Plans B1 and B2. Though such a procedure would not create a disposal area with an initial capacity comparable to the COE plans, neither would it require the immediate enclosing of another large area in the Hampton Roads Harbor with the subsequent destruction of marine resources and recreational opportunity. The premise behind this proposal is that research activities investigating new uses for dredge spoil and methods of disposal may be successful and make it unnecessary to proceed with the construction of the entire large spoil disposal area as now proposed.

c. *Disposal Area Off of Buckroe Beach*

This plan would build a dredge-spoil island off Buckroe Beach in Chesapeake Bay in an area known as the Horseshoe. The area is somewhat removed from harbor facilities where the majority of dredging is required. Rehandling operations would be situated on the south side of the island where they would be protected from northern exposure. The entire facility, located offshore, would avoid conflict with existing development and costly disruption of present use, and would allow continued access to the present shoreline. Drainage of the adjacent land area would not be affected.

About 63,000 feet of levee would be required and would enclose approximately 6,100 acres. With the water depth averaging 15.5 feet, a levee with an eventual height of 16.5 feet would provide a storage capacity of 340,000,000 cubic yards over an effective life of 71 years. This contains an allowance for three feet of settlement during filling. Current dredging methods could be continued. The plan calls for the construction of a rehandling area for scows and hopper dredge pumpout facilities, similar to those at the Craney Island Disposal Area.

Maintenance of navigation features would be accomplished by (1) removal of shoal material by current methods; namely, hopper dredge, hydraulic pipeline, and bucket-scow dredging; and (2) transfer of the material through rehandling facilities to the diked area for final disposal. The estimated cost under this plan is $11,900,000 per year or $2.50 per cubic yard over its 71-year life.

d. *Disposal in Nansemond City*

It is technologically feasible to transport dredged material by pipeline over long distances. Such a capability allows the consideration of alternative disposal areas far removed from the harbor itself. The nearest onshore area feasible is approximately 5,000 acres located in the eastern sector of the City of Nansemond (formerly Nansemond County). The area is bounded by U. S. Highway 460 on the southeast; a pipeline on the southwest; the Atlantic Coastline, and Norfolk, Franklin and Danville Railroads on the west and north; and by the Nansemond City-Chesapeake City boundary line on the east. The site is not accessible by navigable waterways; however, it is possible to connect Craney Island to the Nansemond area by pipeline. The projected pipeline would

be 16 inches in diameter and about 55,000 feet in length, and would utilize five successive booster stations. As envisioned, the line would run from a rehandling basin formed from part of the west side of Craney Island (around 500 acres) alongside the existing rail line to the northern tip of the proposed disposal area. Drainage would be southeastward through the disposal area to the Nansemond River, or be returned to Craney Island via the pipeline.

In this plan, about 58,000 feet of levee would be required. It would be a single, non-riprapped, earth-raised type and would encompass about 5,000 acres. The area elevation averages +20 feet m. s. l. which, with a levee of final height +47 feet m. s. l., would provide a storage capacity of about 240,000,000 cubic yards. This allows for three feet of settlement, and the capacity corresponds to an effective life of 50 years.

The existing rehandling facilities at the Craney Island Disposal Area would be used for hopper dredge pumpout and scow unloading. The dredged material would be pumped through pipelines across the filled portion of Craney Island to the confined rehandling basin on the west side of the disposal area. The material would then be injected into a long pipeline by rehandling unit and pumped to the Nansemond site by successive booster stations. Several pipeline rights-of-way would be reserved in this plan; other than these and the rehandling area, the filled Craney Island Disposal Area would be available for development. Also, it is conceivable that the useful life of the Nansemond area could be significantly prolonged by removing native material from the site and using it for construction fill or topsoil.

The estimated cost of maintaining navigation features by this plan is $9,200,000 per year, or $1.90 per cubic yard over its 50-year life.

The area is heavily timbered and relatively flat. Numerous drainage canals have been cut through the area, primarily to regulate water levels and to afford fire prevention measures. The surface soils are mostly peat and are generally less than five feet thick. Subsurface mineral deposits of any economic value, with the exception of a thin stratum of sand, are not known to exist. The site of the proposed disposal area is, in actuality, the northern part of the Great Dismal Swamp. Present commercial land use consists of timber and related industry. Three hunt clubs currently use the area during the winter months, the largest of which has about 60 members who take about 60 deer per year from the forest.

The COE in April 1973 completed a *Hydrogeologic Study of Nansemond City Disposal Area.*[4] Based upon an evaluation of this investigation, the COE judges that is feasible from an engineering standpoint to provide the necessary protective measures to prevent contamination of the subsurface environment surrounding the proposed disposal area. The COE acknowledges that such safeguards must be a part of any plan to utilize this site for the deposition of Hampton Roads dredge spoil.

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[4] See Appendix A

e. *Ocean disposal*

Several methods of disposal at sea were considered by the COE. With present technology, a long pipeline could be built with successive booster stations that would carry the dredged material from the Craney Island Disposal Area out to sea; however, it is recognized that maintenance and other related engineering problems could make this approach essentially infeasible. The material could also be carried to sea in barges filled from Craney Island, or conveyed by a specially designed dredge, or by hopper dredge. The cost of the different plans considered was estimated to range from $1.60 per cubic yard to $3.00 per cubic yard. All plans for disposal at sea share a common disadvantage; namely, the potentially adverse environmental effects of ocean dumping.

One plan would employ a hopper dredge and bucket dredge with the material disposed at sea. The hopper dredge would be filled to overflow, whereupon dredging would cease and the load would be carried to sea for dumping. Where possible, all work would be done by hopper dredge; the dredging around piers and slips and other confined places would be done by bucket dredge discharging into attendant barges. The barges would be towed to sea when loaded, two at a time, and the material dumped.

The estimated cost under this plan is $11,700,000 per year or $2.40 per cubic yard, which includes both the dredging and transportation of the material.

A second plan would accomplish maintenance dredging in three steps: (1) initial dredging by current methods; (2) temporary storage in a diked harborside rehandling area (a portion of the Craney Island Disposal Area); and (3) rehandling, which consists of removing the material from the rehandling area with transport by tug and barge to sea for final disposal.

The shoal material would be removed from the rehandling basin area by a semi-portable rehandling unit, which would inject the material into a short pipeline emptying into barges. The filled barges would then be conveyed by tug to sea for final disposal. Several pipeline rights-of-way at Craney Island would be reserved; other than these and the rehandling area, the filled disposal area would be available for development.

The cost estimate for this plan is $15,300,000 per year or $3.20 per cubic yard over the 50-year period of analysis.

Disposal at sea by pipeline would entail the following three steps: (1) dredging by current methods; (2) temporary storage in a diked harborside rehandling basin (Craney Island); and (3) rehandling, which consists of removing the material from the temporary disposal area with transport to sea by pipeline for final disposal. The rehandling phase would be accomplished by a government owned and operated rehandling unit that would inject the material into a long pipeline to be pumped to sea by successive booster stations. The booster stations would be unmanned and remotely operated and controlled from the rehandling unit.

The estimated cost of maintaining navigation features by this plan is $10,800,000 per year or $2.30 per cubic yard over the 50-year period of analysis. The chief drawback of this scheme is its inflexibility, a large initial investment, and a long period required for amortization.

A fourth plan would be implemented by using a specially designed dredge and a bucket dredge, with the dredged material being carried out to sea by barge for disposal.

The special dredge, as designed by personnel of the Philadelphia District, COE, is essentially a hopper dredge without hoppers. Operation of this special dredge would require 10 barges, 10 tenders, and 9 tugs. The dredge would operate in the dredging area and pump the shoal material directly into the hopper barges placed alongside the dredge. The dredged material would be taken to sea in these barges, which are of the bottom dumping, hydraulically operated type. Barges would be used in pairs for this operation.

The cost estimate for this plan is $7,700,000 per year or $1.60 per cubic yard over the 50-year period of analysis.

Recommendations of the Task Force

The Craney Island Task Force, having evaluated the various alternatives for their social, economic, environmental, and aesthetic impacts, submits the following recommendations for the replacement of the existing Craney Island Disposal Area.

The Craney Island Disposal Area should be filled to its design elevation of approximately 18 feet above mean sea level, which at the present rate of dredged material deposition will be accomplished in 1979-80. When this stage of the Craney Island project is reached and a better alternative remains to be found, the disposal area should be further filled to an elevation of 28-30 feet above mean sea level, or to whatever final elevation is determined to be technologically feasible by the Corps of Engineers. Raising the existing Craney Island Disposal Area to an elevation of 28-30 feet above mean sea level will increase the capacity of the disposal area by 40-45 million cubic yards and extend the useful life by about 9 years.

Due to the unstable condition of the underlying harbor bottom, it is now unlikely that intensive use of the completed disposal area will be possible. Thus, the demand to develop the site, based upon its original design configuration, is largely negated. One proposal, however, remains viable and, with little difficulty, can be realized even if Craney Island continues to be filled and its resulting final elevation is beyond that which was originally proposed.

Port development along the eastern shore of Craney Island can be effectuated, since associated shore structures are not intense and a relatively small upland area would be required. To raise the level of Craney Island as proposed, new levees will have to be set back from existing levees. With minor design modifications during or after filling, port facilities can be built without significantly effecting the amount of spoil deposited. This particular utilization of the completed disposal facility should be anticipated.

If by 1988-90, after the Craney Island Disposal Area will have been elevated to its maximum feasible height, it is determined that the science of spoil removal will be unchanged, a decision should be made to begin extending to the west, incrementally or in a section-by-section mode. Each enlarging section could be designed to accept a quantity of dredged material that would extend the life of the Craney Island Disposal Area approximately 8-10 years.

It is acknowledged that the time frames used in these first two recommendations were derived from using average rates of dredged material accumulation over an extended period of time. When a decision to proceed with the deepening of the channel at Hampton Roads to fifty-five feet is actually made, the life span of these recommended actions could be shortened by as much as five years.

It is not likely that any work on such a project would begin before the onset of that period when the existing Craney Island was being raised above its present designed capacity; therefore, with approximately 50 million cubic yards of contaminated material attributable to the deepening, the life of this phase of the proposal could be immediately effected. The actual impact upon the stated projections based upon an average spoil deposition figure will depend upon the level of funding authorized for deepening purposes and the availability of equipment to do the work. The fifty million cubic yards of material may be dredged and deposited in as little as 3 or 4 years or in as much as 10 years.

Should the life of a raised Craney Island be substantially shorter than the nine years alluded to earlier, it will merely necessitate an earlier commitment to initiate work on a portion of the westward extension. Rather than possibly having to proceed with construction in the vicinity of 1985-87, it may become evident that action will have to be taken as soon as 1981-83. This only emphasizes the necessity to begin the earnest implementation of research to find new solutions.

Beginning now, during which time the existing site is being utilized to its fullest potential, research should be initiated into the feasibility of building an island or islands from dredged material in the lower Chesapeake Bay, which would ultimately be put to a use desired by the region or the State.[5] Once a policy determination was made concerning the exact nature of the project, the Commonwealth of Virginia might actively solicit the participation of private interests and investment capital. This island could be specifically designed for the purposes of commercial, industrial, or recreational development, and serve as more than just a depository for dredged material thereby offering a clear incentive to plan for and fund such an effort. Much basic study and research should precede a definite commitment.

During this period and possibly as a continuing practice, ocean disposal should be utilized for dredged material whose chemical and physical

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[5] See Appendix B

parameters meet the criteria established by the U. S. Environmental Protection Agency for open-water disposal.

Presently, even the ocean disposal of nonpolluted dredged material is questionable since the ultimate environmental impact is not known. Therefore, the task force recommends that the Virginia Institute of Marine Science (VIMS) submit a dredged material research proposal for funding to the Office of Dredged Material Research of the U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, to evaluate the effects of ocean dumping on the marine ecosystem. Further, VIMS could participate in a program to develop new uses for dredged material, such as recycling for construction materials manufacture and land improvement for agriculture.

By following these recommendations, a solution is offered for the deposition of spoil that should have a minimal danger of significantly degrading existing environmental quality while creating additional time for the State and the COE to seriously study the total question of spoil removal. The problem must be addressed more from a positive approach of utilization and not from solely the negative aspect of finding a location to store substantial amounts of a nuisance material.

It is upon this basis that the Nansemond City Site and the Buckroe Beach Site were rejected as conceived, and the raising of the existing Craney Island, incrementally moving to the west, if necessary, and nonpolluting ocean dumping were recommended as an appropriate, staged means for spoil removal. The Nansemond City Site was rejected because of the potentially significant adverse socioenvironmental impact with no desirable resultant effect to justify this degradation. The area in question is a valuable forest and wildlife resource, and its proximity to the urban population of Tidewater Virginia gives this natural area irreplaceable qualities as open space and potential recreational land.

Another compelling consideration was the potential detrimental impact of polluted saline dredged material on the aquifer underlying the Nansemond site and the surrounding area, and the costly and as yet untested measures that would be required to adequately protect the subsurface environment from this toxic material and its effluent. To destroy this natural area for a purpose which, at best, is an expedient solution, cannot be justified and would not be in the best future interests of the Commonwealth.

Similarly, the Buckroe Beach Site, as now formulated, was rejected because it too would be creating merely another disposal area with no envisioned use or positive approach to the spoil removal problem. To adversely affect the marine environment without achieving a resultant benefit that can be attributed to such a decision, is difficult to justify. In addition, continued filling of the inner harbor, without first attempting to assess all the long term consequences, both good and bad, is somewhat irresponsible.

Local Cooperation

The entire issue of harbor maintenance and improvement and the directly

related problem of spoil removal must be of concern to the Commonwealth. It is likely that a future State commitment, beyond just providing bottom lands or other sites will be necessary to facilitate harbor maintenance and improvement. COE regulations [6] set forth the nature of local responsibility in rather explicit terms, although it is recognized that specific legislative action concerning a particular project could alter such COE requirements.

Action on ultimately expanding the capacity of the existing Craney Island by first elevating the area and then possibly beginning a westward extension must deal with this question of local cooperation. Several arrangements [7] have been suggested by the COE, but based upon the nature of the task force recommendations, there will be a need for still further negotiations on this issue. It appears, however, that some form of alternative "e" will prevail. To officially settle this question, the Governor, or his designees, should meet with COE officials to reach a definitive understanding of the responsibilities of each party based upon certain actions or events.

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[6] See Appendix C

[7] See Appendix D

APPENDICES

A. COE RECOMMENDATIONS CONTAINED IN THE *HYDROGEOLOGIC STUDY OF NANSEMOND CITY DISPOSAL AREA*

"It is recommended that use of the Nansemond Disposal Area for marine waste disposal be contingent upon adoption of the following design measures:

a. A 5 foot wide bentonite slurry cutoff wall to be constructed around the perimeter of the disposal area, extending from the surface 10 feet into the impermeable upper beds of the Yorktown Formation.

b. An impermeable dike to be built around the disposal area contiguous with the bentonite slurry cutoff wall.

c. Drainage, settling, and pumping facilities sufficient to pump excess saline water from the disposal area to a marine environment.

Future Investigations — This study proves the feasibility of disposing of dredge spoil in the study area with adoption of the design measures stipulated. It should be emphasized, however, that although this study is adequate for project feasibility, additional exploration is required before proceeding with design. It is recommended for project design that borings be conducted on a minimum spacing of 500' around the perimeter of the disposal area and through the disposal area where sectioning will be required. Permanent piezometric measuring and water sampling stations should be established at 1000' intervals around the perimeter and immediately outside of the disposal area to monitor the effectiveness of the cutoff wall. Additional permeability studies should also be conducted for project design. An early seismic refraction survey of the area is recommended as a possible substitute or supplement to the exploration borings."

Besides the above measures, it was suggested that scavenger wells might be necessary to maintain a lowered water table within the area and further reduce the possibility of saline effluent penetrating the foundation beds of the Yorktown Formation underlying the site and/or infiltrating the bentonite slurry cutoff wall.

It is readily conceded by those with expertise in geology and geohydrology that the investigations conducted to date are of a preliminary nature only, and that before actual site preparation could begin more field and laboratory tests would be essential. (It should be noted that the current proposal is to divide the site into four sections, with the drainage, settling and pumping facilities to be located in the approximate center of the whole area. The spoil disposal operation would be confined to one section at a time; initially, the cutoff wall and dike would encompass just the section receiving spoil and the central drainage and pumping area. The COE estimates that about 11 million cubic yards of material would be deposited over a 300-day period (per annum). The rate of return of saline water to the marine environment (probable discharge at Craney Island) would be about 8,000 gallons per minute, 3,000 gallons of which would be diverted as sealing water for the incoming pipeline booster pumps.)

B. ABSTRACT OF A PROPOSAL SUBMITTED BY DR. JOHN M. ZEIGLER, ASSISTANT DIRECTOR, VIRGINIA INSTITUTE OF MARINE SCIENCE, AND MEMBER OF THE CRANEY ISLAND TASK FORCE

The objective of this proposal is to use for a profit the spoil dredged from the Norfolk-Newport News-Hampton Roads area and connecting channels to build an island or islands out in the lower Chesapeake Bay, whose use will be for tourism and housing, thereby deriving an income and profit far greater than the cost of spoil removal. In short, the use of the island will be designated *before* it is built and therefore its exact location, design and characteristics will be governed by *economics* and planning relevant to tourism or high cost housing.

The benefits will be:

1) A long term solution to spoil removal, not only maintenance but channel and port improvement.

2) A major assist to the cash flow which will be required of the Commonwealth of Virginia for site preparation.

3) Development of a major industry in the area.

4) Time saved. This would be a State decision and would not require Congressional approval in contrast to a Corps of Engineers decision, which would.

Inasmuch as this proposal is primarily a business proposition, it is recommended that planning and financing be done through the private sector as much as possible, but close coordination with all concerned State agencies would have to be maintained throughout.

The proposed schedule is as follows:

Phase I:

Economic and planning study to determine the market, restraints and costs. Could be completed within six months. At that time a go or no-go decision could be given.

Phase I & II:

Technical evaluation and planning to begin concurrently with the economic study but on a relatively low level during Phase I, principally to arrive at a physical and engineering systems analysis design which can apply to the economic decision. (It is assumed that an economic evaluation will eliminate some potential sites and have preference for others.) The design criteria should be ready by the end of Phase II; i. e., the end of 12 months. Stockpiling of site construction materials.

Phase II & III:

Assuming that design criteria have been far advanced during Phase II, far enough that the type of construction materials are known, construction can

begin in Phase III. Since we are dealing with a relatively small area (a single year's supply of spoil or about 80 acres) it would seem that the site could be ready to receive spoil by the end of this phase (18 months).

Phase IV:

Assuming the legal and financial agreements have been worked out between state officials and private interests during Phase I and II (one year), construction of the spoil site could begin in the third six month period. In short, there is a chance that spoil could be deposited at the new site within eighteen to twenty-four months and for as long thereafter as desired.

Phase V:

Tourism construction to begin as soon as the site warrants. This is a function of spoil type and would itself be part of the study. However, it is assumed that all structures would be on piling and the spoil would be required to support only roads or light structures.

This proposal would not entail delay to a final solution by "muddying the waters" so to speak by introducing something new to study. We already have most of what we need on hand. It is not a proposal intended to compete in the sense that you must choose it now and forever be bound by the decision.

If the Commonwealth waits for a Corps of Engineers approved plan it will be years before the plan makes its way through the various legal requirements and receives Congressional approval.

If, on the other hand, the Commonwealth makes its own decision, based on sound economics, there is hope that the Corps could use it at once. No Congressional approval is required. Craney Island will last long enough to permit the new site to be made ready.

It is intended that this proposal will demonstrate that not only is the plan economically beneficial to the State but that it can be started years before any other plan.

C. COE REGULATIONS RELATING TO LOCAL COOPERATION

Local Cooperation in General Navigation Projects

Favorable recommendations in navigation reports will include a general provision that local interests agree to meet the following requirements of local cooperation, among others, when applicable and appropriate. Items (1), (2) and (3) are generally required by the physical and economic nature of most improvements; items (4), (5) and (6) depend upon local conditions and special local benefits.

(1) When lands, easements and rights-of-way will or may be required for both construction and subsequent maintenance, the following wording will be acceptable:

"Provide without cost to the United States all lands, easements and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil, and also necessary retaining dikes, bulkheads and embankments therefor or the costs of such retaining works."

(a) When spoil disposal areas will not be needed for construction or maintenance, the following wording may be used:

"Provide without cost to the United States all lands, easements, and rights-of-way required for construction of the project, and for construction and maintenance of aids to navigation, upon the request of the Chief of Engineers."

(b) When spoil disposal areas will be needed only for construction, the basic wording in (1) would be used, eliminating the unnecessary references to spoil areas for "subsequent" maintenance or disposal; similarly, when such areas will be needed only for maintenance, the references to areas for "initial" disposal of spoil will be eliminated.

(2) Hold and save the United States free from damages due to the construction works, when special conditions and contingencies and the possibilities of damages can be foreseen and warrant this provision, as, for example, when the possibility of damage to property such as wharves, buildings, agricultural lands, etc., from dredging, changes in ground water levels, wave action, caused by the construction works and effects thereof may result in claims against the Federal Government. Local interests cannot be expected and should not be required to be responsible for damages resulting from construction operations, such as blasting, or negligence of the construction contractor. Likewise, local interests cannot be expected and should not be required to hold and save for indefinite periods against unspecified or unpredictable contingencies. Inclusion of a blanket hold and save clause will be the exception rather than the rule. A separate letter of explanation will accompany the report, if necessary, setting forth the circumstances for the manner of treatment of this matter in the report.

(3) Provide and maintain at local expense adequate public terminal and transfer facilities open to all on equal terms in accordance with plans approved by the Chief of Engineers where appropriate.

(4) Provide and maintain without cost to the United States depths in berthing areas and local access channels serving the terminals commensurate with the depths provided in the related project areas.

(5) Accomplish without cost to the United States such alterations as required in sewer, water supply, drainage, and other utility facilities, as well as their maintenance except that this may be modified when appropriate in major projects involving artificial waterways (cuts in fast land and in summit sections).

(6) Provide a cash contribution toward the project, if appropriate, expressed as a percentage of the Federal construction costs in view of special or local benefits. (Contributions because of enhanced land values due to dredged fill will be computed in accordance with EM 1120-2-113.)

D. *SCHEMES CONSIDERED FOR COST SHARING — CRANEY ISLAND DISPOSAL STUDY*

a. One alternative is to give Craney Island to the State at no cost in return for the State providing the United States with title to new sites in perpetuity. This exchange of a new site for a completed site would require specific legislation which would have to waive the requirement of House Document 563 that the Federal investment in Craney Island be recovered since the fair market value of Craney Island might not be received upon its disposition. In connection with construction of a new disposal area, the Federal government would pay for dikes, pipelines, etc., with the investment being recovered by levying user fees.

b. As a second alternative, the State would provide the United States with title to the new site. Dikes, pipelines, etc., would again be paid for by the Federal government and recovered by levying user fees. However, Craney Island would be transferred to the State only upon the stipulation that the United States receive the fair market value of that land. Pursuant to 33 U.S.C. 558b (1970), the Corps has the authority to trade lands it has in exchange for lands required for a navigation project. Therefore, where the value of the lands for the new site is equal to the value of Craney Island, a simple exchange of lands can be made. If the value of the lands provided by the State were less than the value of Craney Island, then the difference would have to be made up, presumably as a cash contribution, and specific legislation would be needed in order to transfer Craney Island to the State.

c. The rationale for a third alternative is that Craney Island has set a precedent for the manner in which spoil disposal in Norfolk Harbor is to be funded and accomplished. The State would deliver title to the United States for all lands, easements, and rights-of-way needed for the new site with no reimbursement required for the value of land. Once again, the Federal Government would pay for dikes, pipelines, etc. with the investment being recovered by levying user fees. When filled, Craney Island would be subject to the provisions of the Federal Property Act, 40 U.S.C. 484 (1970). Treating Craney Island in this manner would mean that any enhancement in the value of the site which has accrued because of the deposition of spoil would inure to the benefit of the Federal Government. In dealing with the property, the first step would be to determine whether the property is excess to Department of Army needs. If it is, then it must be determined if it is surplus to the needs of other Federal agencies. This requires contacting other Federal agencies; for example, the Department of the Interior may have use for the land as a park or wildlife refuge or the Department of the Navy may desire the site for a depot, etc. If Craney Island, or some part of it, is surplus property, then it is reported to General Services Administration and disposed of by them. Whoever wishes to acquire Craney Island would then have to deal with GSA, and such a party would pay a price based upon the provisions of the act. The State would have first option on the land if it agreed to put it to one of several specified uses, such as low income housing, park land, or civil defense needs.

d. Under the fourth alternative, the State would provide all necesary lands, easements, and rights-of-way but need not deliver to the United States. In addition, the State would pay for pipelines, dikes, etc., as required for construction of the new site. Since the State would have retained title to Craney Island and would have enjoyed all enhancement in real estate values had this approach been adopted when Craney Island was authorized, it appears logical that the title would be returned to the State at no cost. A law specifically addressing the point could accomplish this action. This law would also have to waive the requirement that Craney Island be "self-liquidating" since the $2.5 million estimated value of the site would not be recovered. Annual maintenance expenses would be borne by the Corps; however, private dredgers would be charged for their share of the use. Two fees would be levied, both being based on the relative capacity of the site which private dredgers use. The first fee would be for recovery of the initial investment by the State while the second would be to cover operation and maintenance costs of the Corps.

e. The final alternative would be a combination of the third and fourth alternatives. On the assumption that a historical commitment has been established for Norfolk Harbor by the Federal government to build the dikes with Federal funds the present arrangement could continue for that part of the dredging operations in Norfolk Harbor which is attributable to the maintenance dredging of currently authorized projects. New work and the maintenance thereof would be handled as part of the non-Federal cost sharing based on current regulations. To accomplish this arrangement, the following items are necessary:

> State to provide all necessary lands, easements, and rights-of-way, and need not deliver title to United States.
>
> Federal Government to pay back to State, in the form of user fees, that part of the State's investment in dikes which is proportional to the amount of capacity taken up by the disposal of maintenance spoil from existing authorized projects.
>
> State would not be reimbursed for disposal of spoil and subsequent maintenance from new work.
>
> Existing Craney Island would be given to State and new site administered according to above.

Of all the alternatives discussed, indications are that the fourth alternative is probably the only one that will be acceptable to OMB. It should be noted that the fifth alternative could possibly become a viable approach in the one situation in which the recommended plan for the replacement of Craney Island is a westward extension. This is based on the fact that the westward extension is simply a continuation of the current spoil disposal practice, and higher authority might be persuaded by the argument of a historical commitment on the part of the Federal government.