


**WETLAND STATEMENT OF FINDINGS**

**SHORELINE MANAGEMENT  
COLONIAL NATIONAL HISTORICAL PARK  
JAMESTOWN ISLAND, VIRGINIA**

**July 2002  
Revised July 2003**

RECOMMENDED:  8/7/03  
SUPERINTENDENT, DATE

CERTIFIED FOR TECHNICAL ADEQUACY AND SERVICEWIDE CONSISTENCY:

 ACTING FOR DAN B. KIRBAU OCT 14, 2003  
CHIEF, WATER RESOURCES DIVISION, NPS DATE

APPROVED: \_\_\_\_\_  
DIRECTOR, NORTHEAST REGION DATE

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

**INTRODUCTION**

The National Park Service (NPS) has prepared an environmental assessment (EA) to evaluate a proposed shoreline management project at Colonial National Historical Park, Jamestown Island, Virginia. Because the shoreline project is expected to affect wetlands, the resource must be analyzed in an environmental document, and a federal permit must be acquired for construction in and placement of fill on the wetlands. Executive Order 11990 requires the NPS to evaluate project impacts to wetlands. The goals presented in the Executive Order are to avoid, to the extent possible, the short- and long-term adverse impacts associated with destruction or modification of wetlands, and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

The NPS has chosen a proposed action for this EA. Both the proposed action and its compared alternative involve impact to wetlands. The purpose of this Statement of Findings is to provide rationale for locating the proposed actions in the wetlands and to document the expected effects on wetland functions and values.

The NPS has described agency policies for compliance with Executive Order 11990 in Director's Order 77-1: Wetland Protection and Procedural Manual #77-1: Wetland Protection. These policies and procedures stress exploring all practicable alternatives to building on or working in wetlands. NPS policies define a wetland as any area classified as wetland habitat according to the U.S. Fish and Wildlife Service's "Classification of Wetlands and Deepwater Habitats of the U.S." (Cowardin et al. 1979). The NPS must follow the steps below during development of proposed actions that have the potential to have adverse impacts on wetlands:

- 1) avoid adverse wetland impacts to the extent practicable,
- 2) minimize impacts that could not be avoided, and
- 3) compensate for remaining unavoidable adverse wetland impacts via restoration of degraded wetlands.

This sequencing process ensures that the project also meets the requirements of Section 404 of the Clean Water Act. A project must meet these requirements before the U.S. Army Corps of Engineers can issue a Section 404 wetland fill permit. NPS guidelines require a "Statement of Findings" to be written justifying any unavoidable impacts to wetlands. In addition, National Park Service policy requires wetland impact compensation if the adverse impacts on wetlands from the entire project total 0.1 acre or more. Compensation in the form of restoration of degraded or former wetland habitat is preferred. NPS guidance states that wetland compensation should, first, occur within the same wetland system or, second, occur within the same watershed or, third, occur within the same park unit.

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

***Proposed Project Description***

The National Park Service (NPS) proposes to develop and implement erosion control measures at the Colonial National Historical Park (COLO) that would stabilize eroding shorelines that are impacting or have the potential to impact significant archaeological sites. The measures would stop the progress of ongoing erosion generated by both anthropogenic and natural wave forces by establishing vegetative wetland fringes with the use of rock sills and breakwaters. The specific purposes of the actions described in this environmental assessment include the following:

- Protect historic and pre-historic archaeological sites
- Protection, maintenance, enhancement and/or creation of wetlands habitat both vegetated and non-vegetated.
- Management of upland runoff and groundwater flow through the maintenance of vegetated wetland fringes.
- Minimize potential secondary impacts to downdrift shores through a reduction in the sand supply or the encroachment of structures onto subaqueous land and wetlands.
- For Jamestown and environs, a proposed shoreline strategy should not interfere with historical interpretation.
- Minimize the impacts from the staging of equipment and materials during construction.

There is an immediate need to take action on the erosion problems at significant archeological sites on Jamestown Island and the Colonial Parkway. The continuing erosion of shoreline areas adjacent to (and in some cases in the middle of) significant archeological sites threatens the permanent loss of these resources. (Appendix A, Figures 1-2 of the Jamestown Island Shoreline Management Plan EA).

**WETLAND TYPES AND THEIR FUNCTIONS AND VALUES**

***Wetland Types***

Wetland types found in the vicinity of Jamestown Island include mud flats, persistent emergent salt marshes, unconsolidated (sandy) shorelines and man-made rocky or riprap shorelines. Mud flats are thick layers of fine-grained sediments that occur along the margins of relatively calm, highly saline waters. They are typically classified as non-vegetated wetlands, with a rich concentration of phytoplankton and other microscopic and submicroscopic life forms, as well as a large assortment of invertebrates. Mud flats are partially flooded on a daily basis. These mud flats are prevalent in the tidal creeks and guts that are prevalent in and around Jamestown Island.

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

Salt marshes are often found directly landward of mud flats, and also occur in low-lying areas that are close enough to saline water bodies to be flooded on a regular basis. Vegetation in Jamestown Island salt marshes consists primarily of various species of cordgrass, saltgrass, and saltbushes. Maps have been prepared to depict the distribution of tidal wetlands in the project area (Appendix G of the Jamestown Island Shoreline Management Plan EA). The following narrative is taken from the VIMS tidal marsh inventory for James City County (Moore 1980).

*“Historic Jamestown Island, which contains over 706 acres of tidal wetlands, is located in a zone of the James River which marks the upper limits of saltwater. As such, one generally finds the waters surrounding the island to be quite fresh during the spring but somewhat brackish during the fall. This upper limit of saltwater intrusion is evident within the vegetative patterns of the various tidal creeks. In most of these areas freshwater species such as arrow arum dominate the upstream areas, while brackish water species such as big cordgrass and saltmarsh cordgrass are found near the mouths.*

*Back River Marsh is one of the largest wetland areas on the island and it consists of extensive stands of wild rice and arrow arum as well as large areas of big cordgrass. Kingsmill Creek is dominated for most of its length by big cordgrass but grades to an upstream portion of reduced salinity known as Pitch and Tar Swamp, where such species as cattails and arrow arum are most abundant. At the most upstream section of this creek these marsh species are being replaced by pioneer swamp species including red maple and black gum.*

*Passmore Creek contains the most extensive wetlands acreage on Jamestown Island. The lower sections of the creek system are for the most part again dominated by big cordgrass. At the heads of the numerous branches, which are located between a series of ancient beach ridges, arrow arum and wild rice dominate. Active erosion along the western face of the island is slowly truncating these ridge and marsh areas. But because the waves also maintain a shallow sand beach along this retreating shoreline, drainage continues east to Passmore Creek rather than directly into the James River.”*

In addition to Jamestown Island proper, the College Creek shoreline on the James River to the east is also a proposed project site (see Appendix D, Plate 5 of the Jamestown Island Shoreline Management Plan EA). As depicted on figure 15 (VIMS tidal marsh inventory for College Creek), location number 75 (project site) is described by the VIMS inventory as predominantly a *Spartina cynosuroides*, big cordgrass (30%), *Spartina patens*, saltmeadow grass (25%), and remainder a mixture of

## *Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

marsh mallow (*Kosteletzkya virginica*), marsh hibiscus (*Hibiscus moscheutos*), arrow arum (*Peltandra virginica*), and smartweed (*Polygonum spp.*). The high marsh fringe is mixed with myrtle and pine.

Unconsolidated sandy shorelines exist in several locations along the Thorofare between marsh headlands and along Jamestown Island facing the main stem of the James River. These shorelines are characterized as low-elevation sandy beaches that are supplied with sediments eroding from upland banks. These shorelines are mainly composed of medium to fine grained sands and are generally less than 20-feet in width.

Man-made rocky shorelines exist in several locations along the shoreline of Jamestown Island. The longest (approximately 3000 feet) and largest structure is adjacent to the Newtowne area. Additional revetments are located just south of Black Point and adjacent to the headwaters of Passmore Creek.

### ***Functions and Values***

#### *Fish and Wildlife Habitat*

The wetlands of Jamestown Island and vicinity are used by a large variety of birds, fish, mammals, and invertebrates for food, shelter, and spawning and nesting sites. Among the most valued food items in wetlands are plant leaves, detritus, tubers, seeds, snails, clams, worms, frogs, and insects. Approximately two-thirds of the fish and shellfish species that are harvested commercially are associated with wetlands (Mitsch and Gosselink, 1986). These species include: blue crab, oyster, clam, shrimp, striped bass, menhaden, bluefish, flounder, sea trout, spot, and croaker. Rozas and Hackney (1984) found 29 species of fish in a tidal marsh and suggested that shallow marsh areas are a preferred habitat because of reduced competition, slow currents, scarcity of predators and an abundant food supply.

In 1967-1968, 95% of Virginia's annual fish harvest was shown to be at least partially dependent on wetlands (Wass and Wright, 1969). Blue crabs use tidal marsh creeks as shelter from predators during molting (Hines et al., 1987). Juvenile blue crabs and 14 species of fish were more abundant on flooded salt marsh surfaces than in nonvegetated subtidal areas (Zimmerman and Minello, 1984a). Some species, such as mummichogs (minnows) and fiddler crabs, utilize wetlands throughout their lifespan. Other species, such as striped bass, spawn in waters adjacent to tidal freshwater marshes. Many coastal fish, including spot, menhaden, and mullet, use wetlands as nursery areas for their juvenile stage (Weinstein,

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

1979). The diet of menhaden has been shown to consist of 30% marsh derived detritus and 70% plankton (Deegan et al., 1990).

Several anadromous fish (those which migrate from saltwater to freshwater to spawn) spawn in wetlands of the freshwater portions of rivers. For example, the blueback herring spawns on the hardwood forest floor during flooding (Adams, 1970), and the American shad spawns in freshwater streams (Tiner, 1985). Striped bass migrate to fresh water areas to spawn allowing the juveniles to utilize tidal fresh wetlands as nursery and feeding areas (Odum et. al. 1984). Bottomland hardwoods of the southeastern U.S. are important to fish that use them for spawning, feeding, and hiding (Sather et al., 1990). Estuarine and marine fish and crabs have been reported to migrate into freshwater wetlands for food, spawning, and nursery areas (Conner and Day, 1982).

Wetlands provide a critical habitat for many birds including waterfowl, migratory songbirds, and shorebirds. Some species may utilize wetlands year round while others use them seasonally for breeding, feeding, resting, or over- wintering. Wetland nesting birds include redwinged blackbirds, green herons, least bitterns, mallards, black ducks, wood ducks, and Virginia rails (Tiner, 1985). Migratory waterfowl are dependent on wetlands for feeding during their seasonal stopovers. Metzgar et al., (1973) estimated that the Chesapeake Bay's wintering population of waterfowl has been more than one million. Various shore and wading birds use wetlands as a food source and a location for nest sites. Atlantic coast salt marshes are used for nesting by birds such as laughing gulls, Forster's terns, clapper rails, willets, and marsh hawks (Tiner, 1984). Coastal wetlands are also used as foraging and nest sites for wading birds such as the herons and egrets (Tiner, 1984). Other birds utilizing nontidal wetlands may include towhees, chickadees, titmouses, warblers, tanagers, vireos, flycatchers, and sparrows (Tiner, 1985). Predaceous birds such as hawks, bald eagles, ospreys, and owls also feed and nest in wetlands. Wetland seeds and tubers provide essential winter food for ducks and geese (Weller, 1979). Bottomland forested wetlands are primary wintering grounds for waterfowl, as well as important breeding areas for wood ducks, herons, egrets, and wild turkeys (Tiner, 1984).

Muskrats, beavers, rabbits, river otters, raccoons, mice, and white-tailed deer are among the furbearers utilizing wetlands. Muskrats may feed on plant parts including belowground tubers; they may also feed on invertebrates found in wetlands such as clams and mussels. Muskrat lodges are often made of tall robust plants such as big cordgrass and cattails. White-tailed deer depend on wetlands for winter shelter, food, cover and breeding (Tiner, 1985).

## *Wetland Statement of Findings— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA*

Another major component in wetland wildlife populations are the reptiles (turtles, snakes) and amphibians (frogs, salamanders). Almost all amphibians depend on wetlands for breeding. They lay eggs in water where their larvae develop and feed on algae as well as other foods (Weller, 1979). Frogs often found in wetlands include green, bull, and leopard frogs, and spring peepers (Tiner, 1985). Amphibians are a prime food source for larger animals such as raccoons, herons, mink, bitterns, and fish (Weller, 1981). Turtles and snakes use freshwater wetlands for food and cover and move to drier land to deposit eggs. Turtles are most common in freshwater marshes and ponds, the most common being box, snapping, painted, pond, and mud turtles (Clark, 1979). Water snakes are the most abundant snake in wetlands, though cottonmouths, garter, and mud snakes are also found.

For the survival of many fish and wildlife, it is critical to preserve not only the wetland habitat in which the species is most common, but also a portion of the adjacent areas. Maximum wildlife usage may be dependent on preservation of upland buffer areas adjacent to wetlands (Adamus, 1990). Certain species are dependent on adjacent upland or aquatic areas for some part of their life history such as breeding, feeding, protection, or raising young. For example, trees and shrubs along a wetland edge make valuable nesting sites, song perches, and cover for birds. The upland adjacent to a wetland may be favored by wildlife for feeding, denning, nesting, cover, roosting, or breeding (Porter, 1981). Upland buffers in urban areas may provide the necessary shield and concealment from human activities to allow for wildlife usage (Porter, 1981). The combination of the wetland and upland fringe provides an abundance of food close to good cover.

### *Water Quality*

Located at the interface between terrestrial and aquatic systems, wetlands often intercept pollutants and nutrients in upland runoff before they reach an adjacent waterway. Substances that can affect water quality include nutrients, dissolved gases, heavy metals, pesticides, pathogens, and industrial wastes. The nutrients of most importance in wetland and aquatic systems are nitrogen and phosphorous. In excessive quantities, they can cause nuisance algal blooms and subsequent low oxygen levels; however, they are essential for growth of wetland plants. Dissolved oxygen is produced by plants and is necessary for aquatic animals to survive. The processes occurring in wetland systems that impact water quality are plant uptake and cycling, filtering, sedimentation, reduction in shoreline erosion, soil adsorption, and soil microbial activity.

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

*Nutrient Uptake and Cycling*

As wetland plants grow they take up inorganic forms of nutrients (nitrogen, phosphorous) as they die they release organic or detrital forms (decaying plant material) of nutrients. The result is a valuable cycling and transformation of nutrients in the ecosystem. The transformation from inorganic to organic forms of nutrients reduces potential problems from excessive nutrient loadings, while providing organic forms of nutrients that are more useful to aquatic animals.

The organic forms of nutrients provide the base of the detrital food web, which may support many commercially important fish, crabs, and shellfish (Elder, 1985). Detritus is consumed by many small invertebrates, juvenile fish, and oysters, which in turn are eaten by larger fish, birds, and crabs. This pattern of feeding is called a food web and is essential to the viability of the Chesapeake Bay and for providing fish for human consumption. Excessive nutrients may come from septic system leakage, sewage effluent, runoff from fertilized lawns and farms, and stormwater outflows. Uncontrolled inputs of nutrients may contribute to decreased water clarity by stimulating algal blooms. As the algae bloom dies and decomposes, it may also reduce the oxygen content in the water.

Some wetlands function as nutrient sinks in which the net output of nutrients is less than the net input. Most wetlands are at least seasonal sinks for nutrients, taking them up during the growing season. This wetland function can be very important in managing urban and agricultural runoff with high concentrations of nutrients which may degrade downstream water quality. The research of Cerco and Kuo (1979) concluded that a tidal marsh creek that received effluent from a poultry processing plant significantly reduced levels of nutrients and increased levels of dissolved oxygen. A review by Van der Valk et al. (1979) of 17 studies showed that freshwater wetlands trapped nutrients during the growing season. Even a slight increase in the amount of wetlands in an agricultural watershed reduced the amount of nitrogen leaving the watershed (Jones et al., 1976).

Plants may also take up heavy metals, and other chemical pollutants and incorporate them into their leaves, roots, and stems (Kadlec and Kadlec, 1979; Boto and Patrick, 1979). As the plant dies, the pollutants may be buried and removed from the system or returned to the water column. If the plant is consumed by an animal the pollutants may be passed up the food web.

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

*Filtering and Sedimentation*

Wetlands are sites of increased sedimentation, which improves water quality by reducing suspended solids and increases bank stabilization through the accumulation of sediment. Wetland vegetation and the associated root mass act to slow water flow, which results in settlement and deposition of suspended sediments, and the associated pollutants, and nutrients (Boto and Patrick, 1979). Riparian areas have been shown to retain 80 percent of sediment runoff from adjacent agricultural lands (Richardson, 1989). Wetlands located in depressions may retain all the sediment entering them (Novitzki, 1979). Benefits are realized by increased water clarity and reduced siltation in downdrift oyster beds, fish spawning and nursery areas, seagrass beds, and navigation channels (Anderson et al., 1978).

As sediments are removed from the water column, so are attached nutrients, heavy metals, and other toxins. Mitsch et al. (1979) found that large amounts of phosphorous were deposited with river sediments during river flooding in a swamp. Most wetland sediments accumulate faster than they are removed. This accumulation rate allows the wetland to retain a significant portion of the nutrients and other pollutants buried in the soil (Sather et al., 1990). Heavy metals and other toxic substances attached to sediment particles will become immobile through burial in sediments until they become disturbed through dredging or lowering of the water table (Boto and Patrick, 1979).

*Shoreline Erosion Control*

Wetlands located at the interface between upland and aquatic habitats have the potential to reduce upland erosion by reducing wave energy and current velocity. As water moves across the reduced slope of shallow waters and wetlands, the energy dissipates. As friction or drag from the bottom increases the erosive force declines. This action occurs in nonvegetated as well as vegetated wetlands. Wave height and current speed are reduced by nonvegetated wetlands, such as beaches and mudflats by causing waves to spread out as they pass over the flat (Theberge and Boesch, 1978). Vegetated wetlands can reduce shoreline erosion by several mechanisms. The complex root system binds and stabilizes the sediment; as a wave propagates through vegetation additional frictional drag reduces wave energy and current velocity (Dean, 1979). Wetland vegetation also increases deposition of sediment which helps build the shoreline channelward of the uplands. Wetlands reduce the final impact on the upland, thereby reducing erosion of upland areas.

*Wetland Statement of Findings— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA*

As wave action and current speed are reduced by the wetland, sediments in the water settle to the bottom, resulting in improved water quality and the build-up of the marsh surface. Knutson et al., (1982) found that more than 50% of the energy associated with waves passing through a fringe marsh was dissipated within the first eight feet of the marsh. A planted salt marsh fringe may be an effective, inexpensive, and ecologically-preferred alternative to a bulkhead or a revetment (Hardaway et al., 1984). Bulrushes and reed grass have been reported as the most successful herbaceous vegetation in freshwater wetlands in erosion abatement (Seibert, 1968; Kadlec and Wentz, 1974). Forested wetlands or buffer areas are also useful in minimizing erosion. Trees stabilize banks of streams and rivers with their deep penetrating roots (Siebert, 1968; Virginia State Water Control Board, 1979a). Shoreline erosion control with vegetation has its limitations depending on many factors such as: potential wave energies, current velocities, flood magnitude, vegetation type, soil type, and slope.

All of the wetlands in the project area have special value because they are located within a national park, where citizens expect the landscape to remain undisturbed, and where people expect to be able to see and learn about unique natural features.

**ALTERNATIVES AND IMPACTS**

Three alternatives are described in detail in the project EA and are briefly described below:

- No Action Alternative
- Alternative 1 – Proposed Action – Shoreline erosion control by means of breakwaters, stone revetments, sills, and vegetated wetland creation
- Alternative 2 –Shoreline erosion control by means of cantilevered vertical steel sheet-pile bulkheads.

***Other alternatives considered early in the project but dismissed.***

Two other shoreline erosion control alternatives were evaluated, but dismissed after undergoing the National Park Service CBA process. These included sand nourishment (beach fill) and groins. Sand nourishment was eliminated because of high maintenance costs and the potential to encourage the use of the shoreline for recreational purposes. Groins were eliminated because of potential hazards to navigation and the potential to increase erosion along down drift shorelines.

***No Action Alternative:***

Under the no-action alternative, erosion of the Jamestown Island shoreline would continue indefinitely leading to the loss of valuable historic and cultural resources.

*Wetland Statement of Findings— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA*

***Alternative 1: Shoreline Management Plan (Proposed Action)***

Under Alternative 1, a series of breakwaters, sills, and revetments would be constructed along erosional areas of the Jamestown Island shoreline that would control the erosion being experienced and prevent the loss of valuable historic and cultural resources.

***Alternative 2: Bulkhead Plan***

Under Alternative 2, a series of bulkheads would be constructed along erosional areas of the Jamestown Island shoreline that would control the erosion being experienced and prevent the further loss of valuable historic and cultural resources.

***Impacts of No Action Alternative on Wetlands***

Currently, wind-wave erosion (on the James River and the Thorofare) and boat wake (on Back River) results in the loss of vegetated wetlands along much of the Jamestown Island shoreline. The continued erosion of the Jamestown Island shoreline as is currently occurring under the no action alternative would continue to result in the loss of existing vegetated wetlands that are currently located along many stretches of shoreline.

***Impacts of Alternative 1 on Wetlands.***

Nonvegetated estuarine intertidal and subtidal habitats will be affected to varying degrees with the implementation of Alternative 1. These habitat zones will be impacted as a result of the sand-fill required for the vegetative fringe (in the intertidal zone) of approximately 2.08 acres and the placement of rock structures (in the subtidal zone) of approximately 6.03 acres as shown on the maps appended to this Statement of Findings document. All of the structures will provide protection to existing vegetated wetland areas as well as increase the acreage of estuarine intertidal emergent wetland habitat (salt marsh). Currently, wind-wave erosion (on the James River and the Thorofare) and boat wake (on Back River) results in the loss of vegetated wetlands along much of the Jamestown Island shoreline. Construction of sills, breakwaters, and accompanying fill will not only protect existing vegetated wetlands but will also provide intertidal areas for establishment of saltmarsh wetland habitat along the water's edge.

The areas of impacted wetlands were calculated by using standard topographic and hydrographic survey data collected in August 2000. Tidal information from the National Oceanic and Atmospheric Administration (NOAA) 1999 Tide Tables was used to determine the extreme spring high and low water elevations. This information was then used to determine the impacted wetland areas. The following table presents a break down of wetland impacts as well as the proposed intertidal emergent and rocky shore wetland acreages.

**Wetland and Deepwater Habitat Impacts Related to Shoreline Protection Plan**

Location Plate (Appendix D Jamestown Island Shoreline EA)	Impacted (ft <sup>2</sup> )		Establish (ft <sup>2</sup> ) (proposed)	
	E2USN* (intertidal wetland)	E1UB2* (deepwater habitat)	E2RS2* (intertidal wetland)	E2EM1* (intertidal wetland)
	I**	21,588	35,575	36,914
II	13,107	72,107	42,523	29,584
III	7,398	64,031	61,004	0
IV	12,991	27,718	20,757	9,493
V	35,755	63,183	36,435	43,683
Total	90,839	262,614	197,633	82,760
Total (acres)	2.08	6.03	4.54	1.90

\*(Cowardin et al. 1979) Wetland Type or Deepwater Habitat Type:

E2USN = Estuarine, Intertidal, Unconsolidated Shore, Regularly Flooded Wetland

E1UB2 = Estuarine, Subtidal, Unconsolidated Bottom, Sand (deepwater habitat)

E2EM1 = Estuarine, Intertidal, Emergent Wetland, Persistent

E2RS2 = Estuarine, Intertidal, Rocky Shore, Rubble

\*\* Erosion of the shoreline located on Back River is primarily caused by boat wake.

Intertidal wetland areas (E2USN) impacted by the fill will be converted to emergent persistent intertidal wetlands (E2EM1). Compensation for these same intertidal habitat areas will be the structure rocks (E2RS2, 4.54 acres) that provide substrate and shelter for sessile species and the establishment of emergent persistent intertidal wetlands (E2EM1, 1.90 acres) landward of the structures. The compensation wetlands will be created from existing estuarine subtidal (i.e., nonwetland) habitat. They are therefore new wetland habitat above and beyond the intertidal wetland habitat (E2USN) that currently exists. Conversion of existing intertidal unconsolidated shore wetland (E2USN) to intertidal emergent wetland (E2EM1), as proposed in this project, is not counted as part of the compensation acreage.

There will be a net positive impact (moderate and long-term) to vegetated wetlands with implementation of the proposed Plan and a net adverse impact (moderate and long-term) to unvegetated intertidal and subtidal habitats. A mitigation plan is presented that provides for

*Wetland Statement of Findings— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA*

establishment of 6.44 acres of new wetland habitat to compensate for the loss or alteration of 2.08 acres of wetlands (a compensation ratio of 3.1:1). While there may be some minor erosion between the breakwater structures, where no sill is proposed, the long term benefits of erosion protection to existing wetlands and the creation of the proposed wetlands far outweigh these effects. These impacts would not constitute an impairment of park resources and values. No cumulative impacts would be anticipated.

***Impacts of Alternative 2 on Wetlands.***

The implementation of Alternative 2 along the Jamestown Island shoreline would result in a net adverse impact to vegetated wetlands as the result of grading and filling associated with site preparation prior to the placement of the bulkhead. There would also be a net adverse (moderate), long-term impact to unvegetated intertidal and subtidal habitats as a result of the site preparation activities. Unprotected wetland areas located between sections of bulkheads could eventually be damaged or destroyed as continued erosion could flank the ends of the bulkheads. However, these impacts would not constitute an impairment of the park's resources and values. The loss of wetlands due to construction activities and placement of bulkheads would not (1) conflict with the purposes of the park, (2) damage or alter resources or values that are key to the natural or cultural integrity of the park or to opportunities for visitor enjoyment, or (3) conflict with a goal in the park's general management plan or other planning documents. No cumulative impacts would be anticipated.

**WETLAND IMPACT MITIGATION MEASURES**

The project (Alternative 1—proposed) was designed to avoid adverse environmental impacts to the greatest extent practicable. As shown in the appended maps, several measures have been incorporated in the designed project to minimize impacts. These include implementation of best management practices such as temporary erosion control structures and adherence to management recommendations of DCR when working in areas adjacent to sensitive habitats, such as bald eagle nests and heron rookeries. This current shoreline is rapidly eroding, resulting in the loss of acres of shoreline wetland areas. While the project, as proposed, would directly and indirectly impact some wetlands, these losses would be exponentially compensated for via reduced erosion and new wetland establishment related to shoreline protection features as discussed previously.

**CONCLUSIONS**

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

The National Park Service has identified Alternative 1 as the proposed action for providing protection to the eroding Jamestown Island shoreline. Wetland impact has been minimized to the practicable extent allowed by sound engineering and design and incorporating vegetated wetland creation as a project feature. The proposed shoreline management project would adequately compensate for wetland loss caused by project implementation at a 3.1:1 acreage ratio. Therefore, this project is consistent with Executive Order 11990 and Director's Order 77-1: Wetland Protection, including the no net loss of wetlands policy.

**REFERENCES**

- Adams, J.G. 1970. Clupeids in the Altamaha River, Georgia. Coastal Fisheries office, Georgia Game and Fish Commission, Contribution Series No. 20. Brunswick, GA.
- Adamus, P. R., R. D. Smith, and T. Muir. 1990. Manual for assessment of bottomland hardwood functions. EPA 600/3-90/053. Prepared by U.S. Army Engineer Waterways Experiment Station. Vicksburg, MS.
- Anderson, G., J. Brokaw, T. Lassen, G. Mapp, and L. D. Theberge. 1978. In: E. L. Shea and N. B. Theberge, eds. Wetland Evaluation and Management in Virginia. SRAMSOE No. 211, Virginia Institute of Marine Science, Gloucester Point, Virginia. 116 pp.
- Boto, K.G. and W.H. Patrick, Jr. 1979. Role of wetlands in the removal of suspended sediments. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 479-489.
- Cerco, C. F. and A. Y. Kuo. 1979. Water quality in a small tidal creek: Parker Creek, Virginia. SRAMSOE No. 231 Virginia Institute of Marine Science, Gloucester Point, Va. 112 pp.
- Clark, J.E. 1979. Fresh water wetlands: habitats for aquatic invertebrates, amphibians, reptiles, and fish. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 330-343.
- Conner, W.H. and J.W. Day, Jr. 1982. The ecology of forested wetlands in the southeastern United States. In: B. Gopal, R.E. Turner, R.G. Wetzel, and D.F. Whigham (eds.) Wetlands Ecology and Management. National Institute of Ecology and International Scientific Publications. UNESCO, Paris and Dept. of Science and Technology, New Delhi. pp. 69-87.
- Dean, R.G. 1979. Effects of vegetation on shoreline erosional processes. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 415-426.

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

Deegan, L. A., B. J. Peterson, and R. Portier. 1990. Stable isotopes and cellulase activity as evidence for detritus as a food source for juvenile Gulf menhaden. *Estuaries* 13:14-19.

Elder, J.F. 1985. Nitrogen and Phosphorus Speciation and Flux in a Large Florida River-Wetland System, *Water Resources Research*, 21: 724-732.

Hardaway, C. S., G. R. Thomas, A. W. Azcherle, and B. K. Fowler. 1984. Vegetative erosion control project: Final report 1984. Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, Virginia.

Hardaway, C. S., Jr. and M. Hudgins. 1999. Colonial National Historical Park, Shoreline Management Plan for Jamestown Island, Powhatan Creek, Sandy Bay, Back River, The Thorofare, and James River Shorelines. Prepared by Virginia Institute of Marine Science and U.S. Army Corps of Engineers for National Park Service, Colonial National Historical Park.

Hines, A. H., R. N. Lipcius and A. M. Haddon. 1987. Population dynamics and habitat partitioning by size, sex, and molt stage of blue crabs *Callinectes sapidus* in a subestuary of central Chesapeake Bay. *Mar. Ecol. Prog. Ser.* 36: 55-64.

Jones, J.R., B.P. Borofka, and R.W. Bachmann. 1976. Factors Affecting Nutrient Loads in Some Iowa Streams. *Water Research* 10: 117-122.

Kadlec, J.A. and W.A. Wentz. 1974. State-of-the-art Survey and Evaluation of Marsh Plant Establishment Techniques: Induced and Natural. Vol. I: Report of Research, Contract Report D-74-9, U.S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Mississippi.

Kadlec, R.G. and J.A. Kadlec. 1979. Wetlands and water quality. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) *Wetland Functions and Values: The State of Our Understanding*. Amer. Water Resources Assoc. pp. 436-456.

Knutson, P. L., R. A. Brochu, W. N. Seelin, and M. Inskeep. 1982. Wave damping in *Spartina alterniflora* marshes. *Wetlands* 2: 87-104.

Metzgar, R. G. 1973. Wetlands in Maryland. Maryland Dept. of State Planning, Baltimore, Md.  
Mitsch, W.J., C.L. Dorge, and J.R. Wiemhoff. 1979. Ecosystem dynamics and a phosphorus budget of an alluvial cypress swamp in southern Illinois, *Ecology* 60: 1116-1124.

Mitsch, W.J. and J.G. Gosselink. 1986. *Wetlands*. Van Nostrand Reinhold Co., New York, NY. 329pp.

National Park Service. 1998. Director's Order and Procedural Manual 77-1: Wetland Protection. U.S. Department of the Interior. Washington, D.C.

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

Niering, W.A. 1988. Endangered, threatened and rare wetland plants and animals of the continental United States. In: D.D. Hook and others, eds. *The Ecology and Management of Wetlands*, Vol. 1 Ecology of Wetlands. Timber Press, Portland, Oregon. p. 227-238.

Novitzki, R.P. 1979. Hydrologic characteristics of Wisconsin's wetlands and their influence on floods, stream flow, and sediment. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) *Wetland Functions and Values: The State of Our Understanding*. Amer. Water Resources Assoc. pp. 377-388.

Odum, W.E., T.J. Smith III, J.K. Hoover, and C.C. McIvor. 1984. The ecology of tidal freshwater marshes of the United States east coast: a community profile. U.S. Fish Wildl. Serv. FWS/OBS-83/ 17. 177 pp.

Porter, B.W. 1981. The wetland edge as a community and its value to wildlife. In: Richardson, B. ed. *Selected Proceedings of the Midwest Conference on Wetland Values and Management*. Navarre, Minnesota: Freshwater Society; pp. 15-26.

Richardson, C.J. 1989. Freshwater wetlands: transformers, filters, or sinks? In: R.R. Sharitz and J.W. Gibbons (eds.) *Freshwater wetlands and wildlife. Proceedings of a symposium held at Charleston, South Carolina, March 24-27, 1986*. U.S. Department of Energy. Available from NTIS as DE90005384. pp. 25-46.

Rozas, L. P. and C. T. Hackney. 1984. Use of oligohaline marshes by fishes and macrofaunal crustaceans in North Carolina. *Estuaries* 7: 213-224.

Sather, J. H., R. D. Smith, and J. S. Larson. 1990. Natural values of wetlands. In: *Wetlands and shallow continental water bodies*, Vol. 1. Natural and human relationships, B. C. Patten (ed.). SPB Academic publishing. pp. 373-388.

Seibert, P. 1968. Importance of natural vegetation for the protection of the banks of streams, rivers, and canals. In: *Nature and Environment Series (Vol. Freshwater)*. Council of Europe, pp. 35-67.

Theberge, L. and D. F. Boesch. 1978. Values and management strategies for nonvegetated tidal wetlands. Special Scientific Report No. 90, Virginia Institute of Marine Science, Gloucester Point, Virginia. 55 pp.

Tiner, R.W., Jr. 1984. *Wetlands of the United States: Current Status and Recent Trends*. Washington, D.C.: U.S. Fish and Wildlife Service.

Tiner, R.W., Jr. 1985. *Wetlands of New Jersey*. U.S. Fish and Wildlife Service, Washington D.C., pp. 117.

*Wetland Statement of Findings*— SHORELINE MANAGEMENT, COLONIAL NATIONAL HISTORICAL PARK, JAMESTOWN ISLAND, VIRGINIA

Tiner, R. W., Jr. 1987. Mid-Atlantic Wetlands a Disappearing Natural Treasure. Washington, D. C.: U.S. Fish and Wildlife Service. U.S. Army Corps of Engineers. 1972. Charles River Watershed, Massachusetts. New England Division, U.S. Army Corps of Engrs., Waltham, Massachusetts, 65 pp.

Van der Valk, A.G., C.B. Davis, J.L. Baker, and C.E. Beer. 1979. Natural freshwater wetlands as nitrogen and phosphorus traps for land runoff. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) *Wetland Functions and Values: The State of Our Understanding*, American Water Resources Assoc., Minneapolis, Minn., pp. 457-467.

Virginia State Water Control Board. 1979b. *Best Management Practices Handbook, Urban Planning Bulletin 321* pp.

Wass, M. L., and T. D. Wright. 1969. Coastal wetlands of Virginia. Special Report No. 10 in *Applied Marine Science and Ocean Engineering*, Virginia Institute of Marine Science, Gloucester Point, Virginia.

Weinstein, M. P. 1979. Shallow marsh habitats as primary nurseries for fishes and shellfish; Cape Fear River, North Carolina. *Fish. Bull.* 77: 339-357.

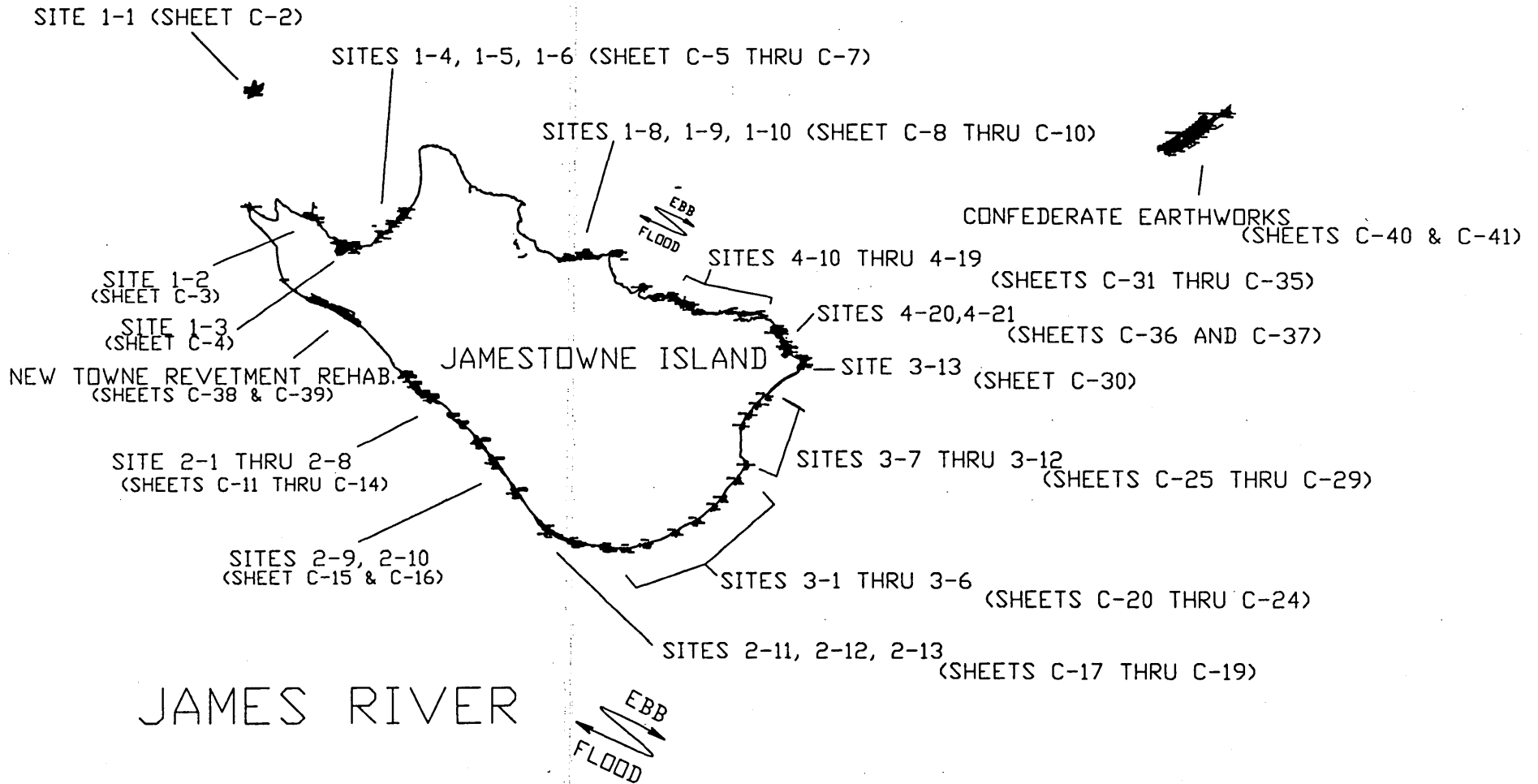
Weller, M.W. 1981. *Freshwater marshes*. University of Minnesota Press, Minneapolis. 146 pp.

Weller, M.W. 1979. Wetland habitats. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) *Wetland Functions and Values: The State of Our Understanding*. Amer. Water Resources Assoc. pp. 210-234.

Wetzel, R.G. 1989. Wetland and littoral interfaces of lakes: productivity and nutrient regulation in the Lawrence Lake ecosystem. In: *Proceedings of a Symposium Held at Charleston, South Carolina, March 24-27, 1986*. U.S. Department of Energy. Available from NTIS, Springfield, VA as DE90005384. pp. 283-302.

Zimmerman, R. J. and T. J. Minello. 1984. Densities of *Penaeus aztecus*, *Penaeus setiferus*, and other natant macrofauna in a Texas salt marsh. *Estuaries* 7: 421-433.

# SITE KEY SHEET



**Adjacent Properties Owners:**

APVA

Jamestown-Yorktown Foundation

PLAN VIEW  
1" = 4000'

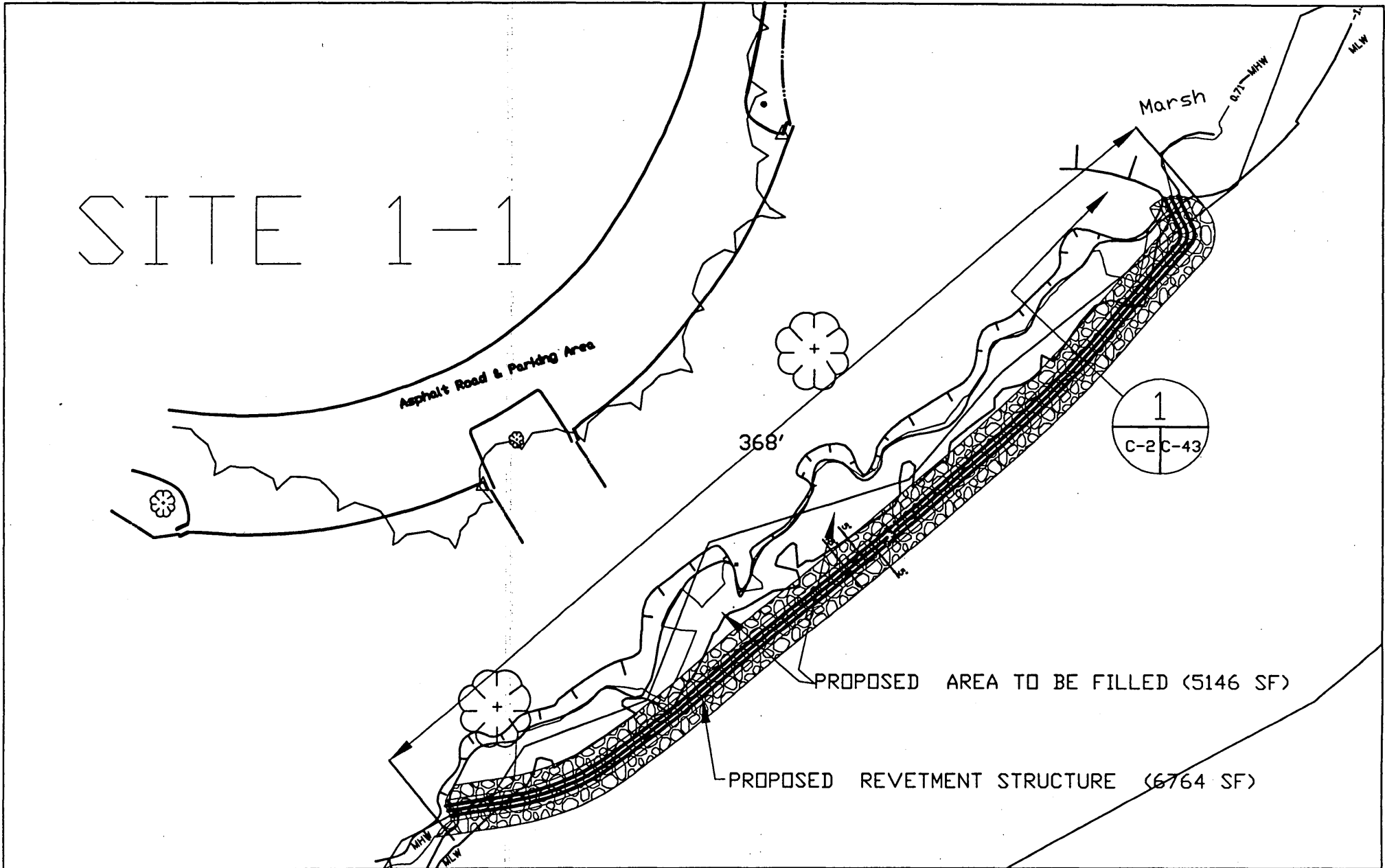
**Shoreline Protection**

Jamestown Island, Virginia

**Proposed Shoreline Protection  
Jamestown Island**

County of : James City County  
Applicant: National Park Service  
Sheet C-1

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 1-1

1" = 50'

Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of: James City County

Applicant: National Park Service

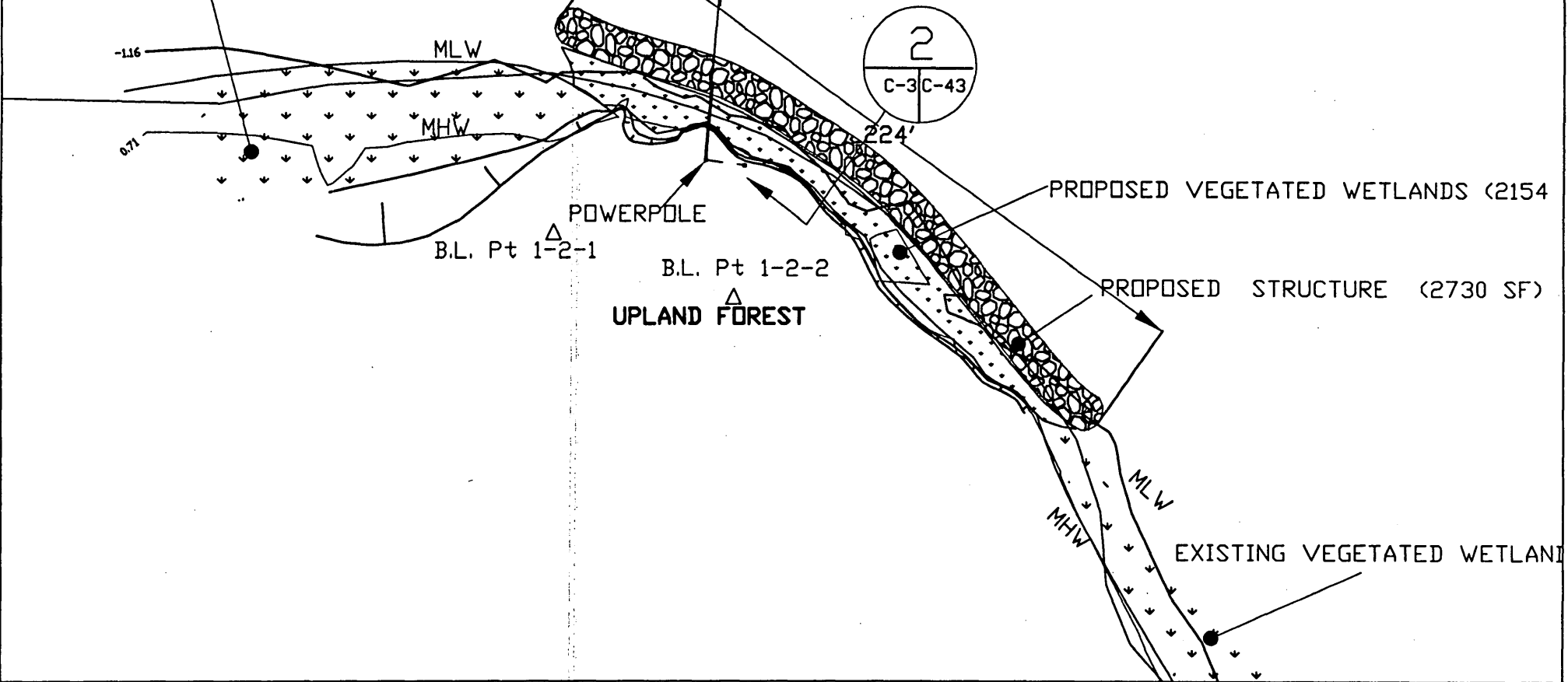
Sheet C-2

Sept 2003

# SITE 1-2

EXISTING VEGETATED WETLANDS

SUBMERGED POWER LINE



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 1-2

1" = 50'

Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection

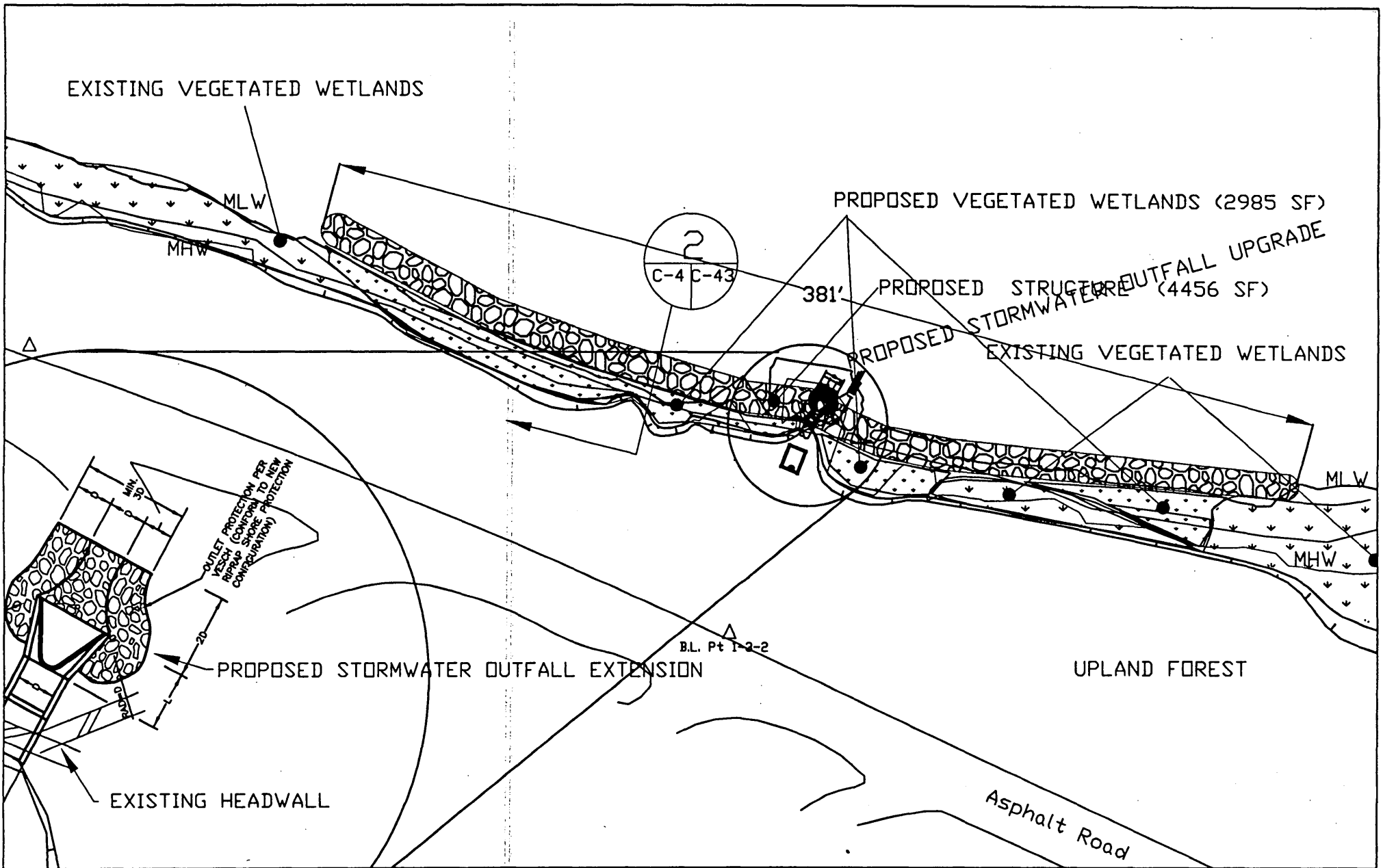
Jamestown Island

County of : James City County

Applicant: National Park Service

Sheet C-3

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 1-3

1" = 50'

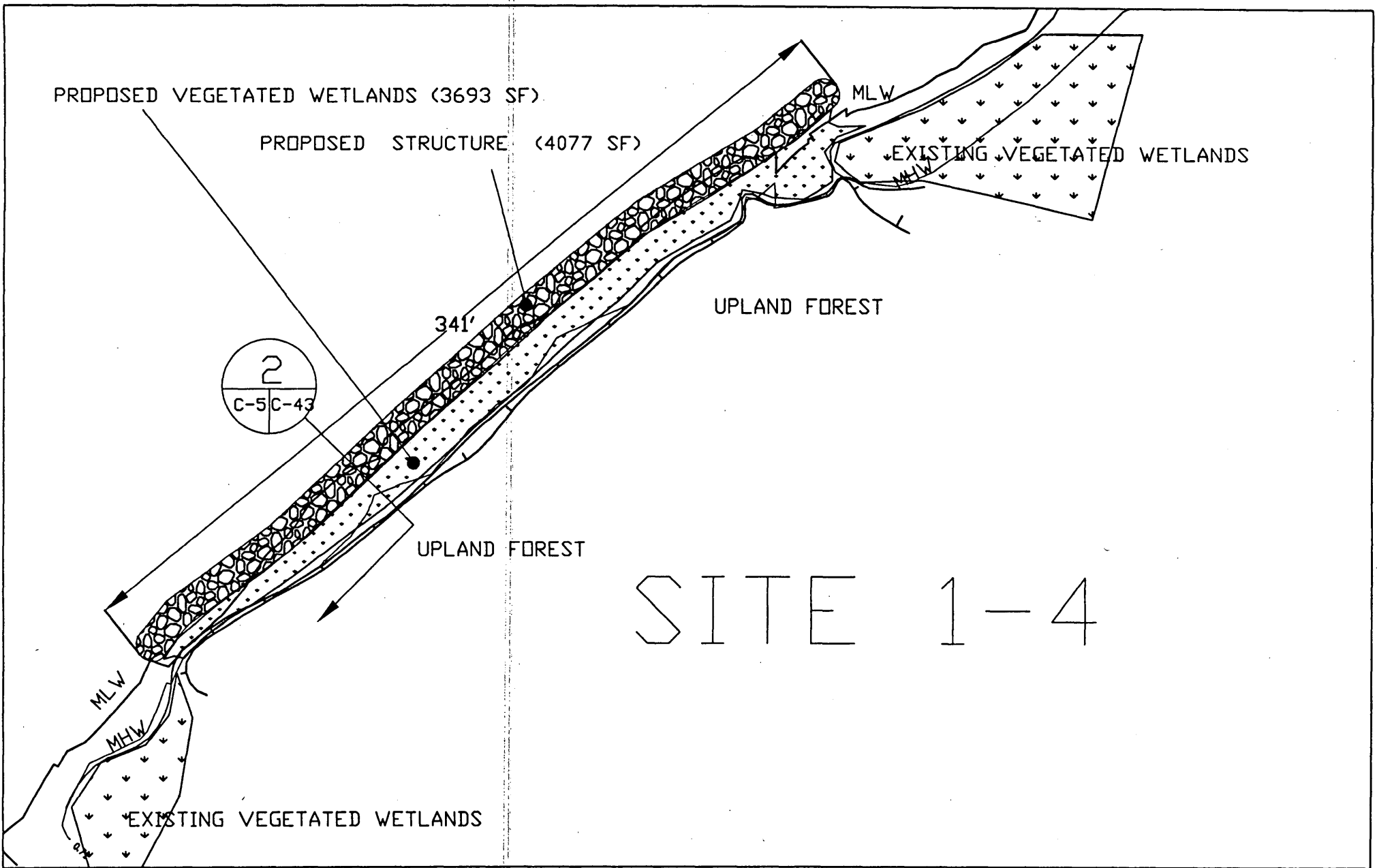
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-4

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 1-4

1" = 50'

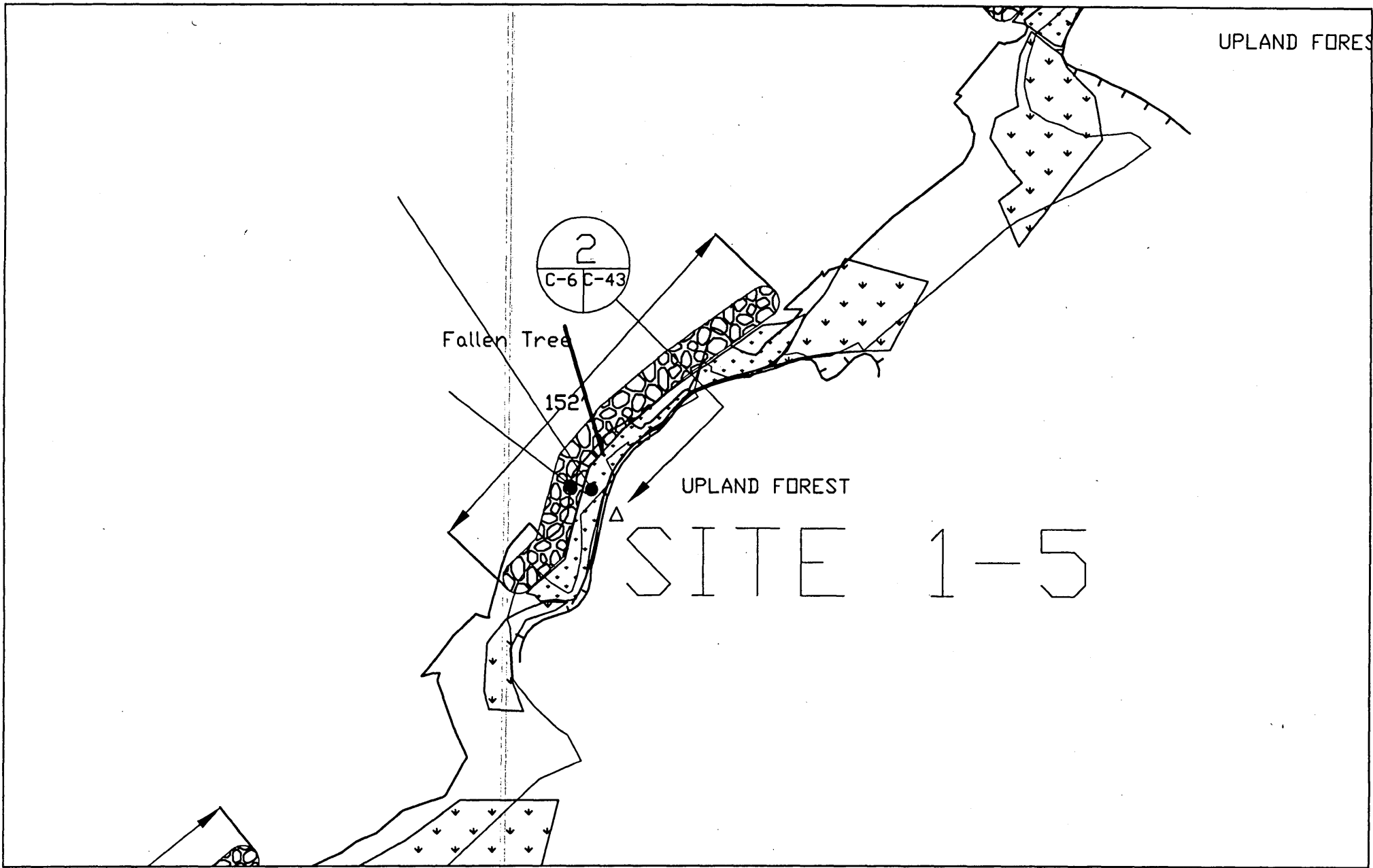
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-5

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 1-5

1" = 50'

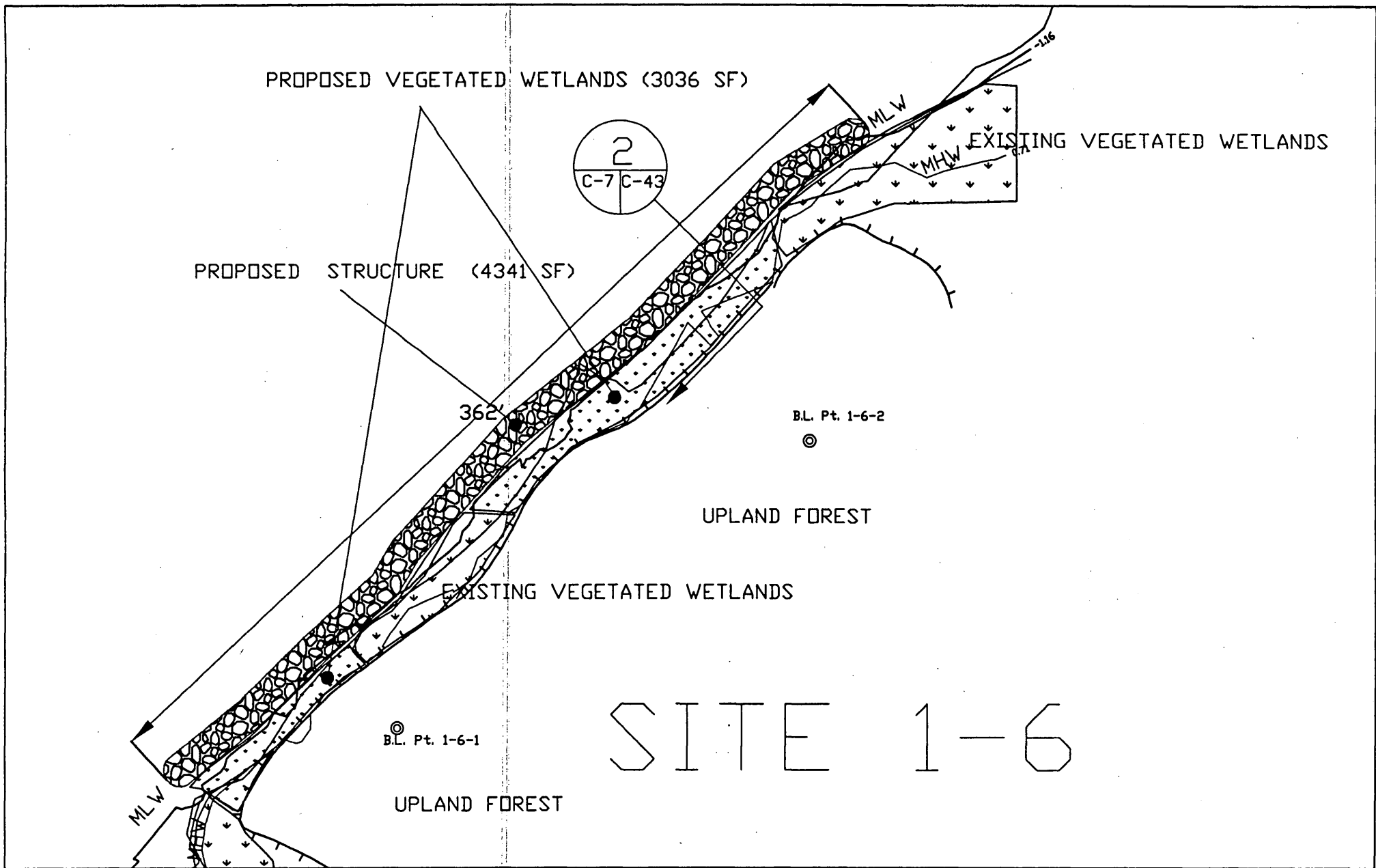
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-6

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 1-6

1" = 50'

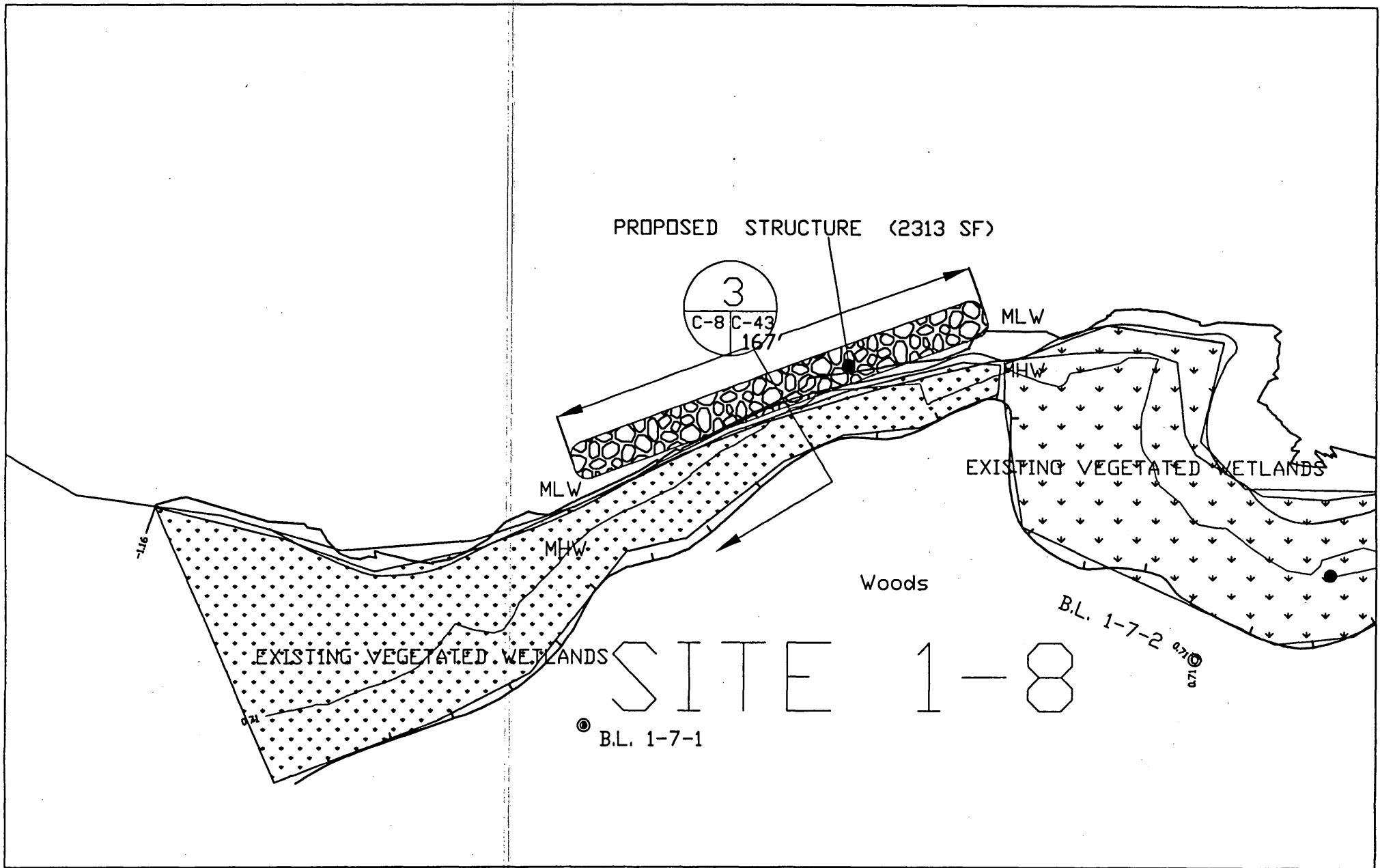
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-7

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 1-8

1" = 50'

Shoreline Protection

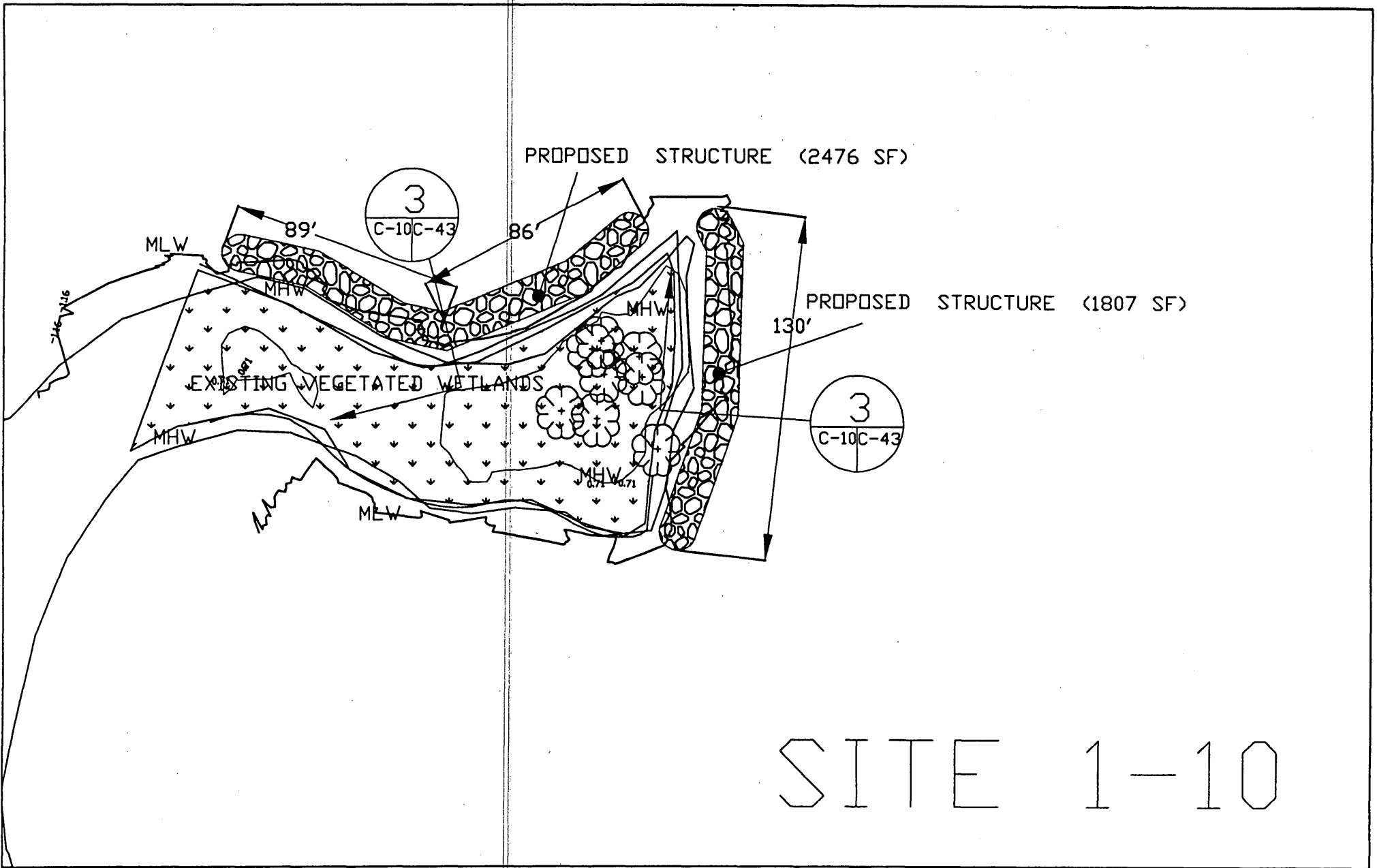
Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-8

SEPT 2003





Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 1-10  
1" = 50'

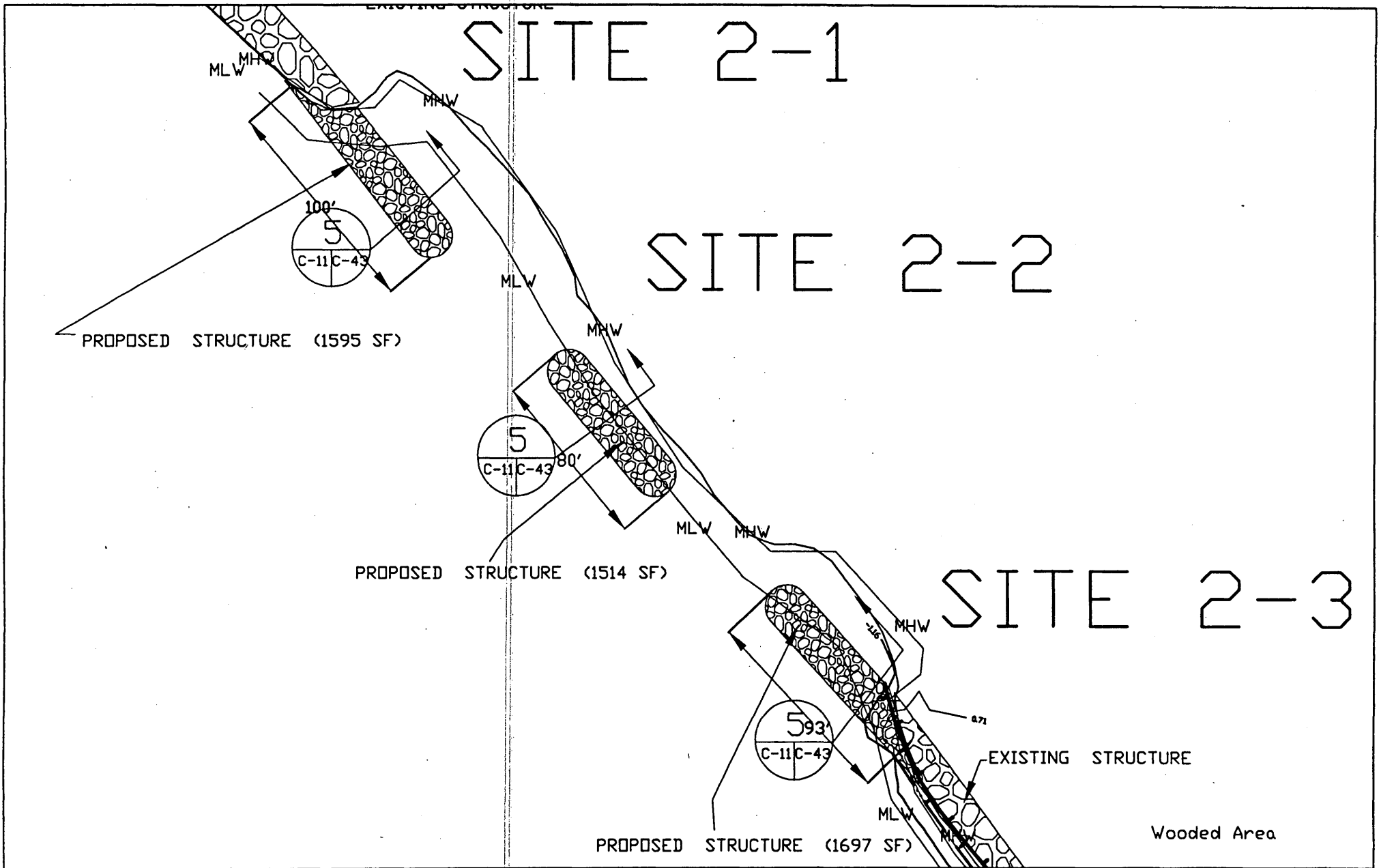
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-10

SEPT 2003



Adjacent Properties Owners:  
 APVA  
 Jamestown-Yorktown Foundation

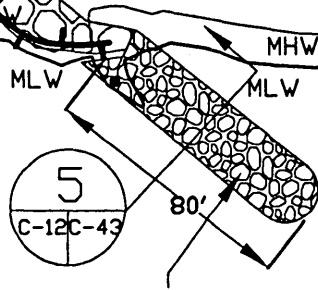
PLAN VIEW SITE 2-1, 2-2, 2-3  
 1" = 60'  
 Shoreline Protection  
 Jamestown Island, Virginia

**Proposed Shoreline Protection  
 Jamestown Island**  
 County of : James City County  
 Applicant: National Park Service  
 Sheet C-11  
 SEPT 2003

Levee

# SITE 2-4

EXISTING STRUCTURE

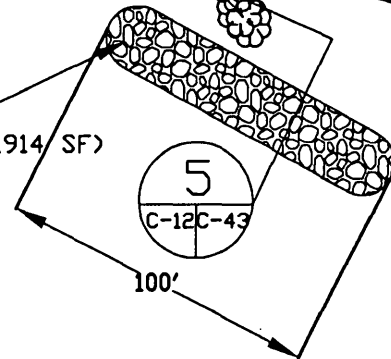


PROPOSED STRUCTURE (1467 SF)

# SITE 2-5

## Wooded Swamp

PROPOSED STRUCTURE (1914 SF)

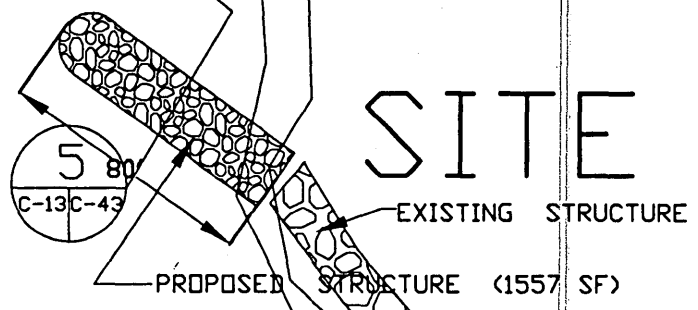


Adjacent Properties Owners:  
 APVA  
 Jamestown-Yorktown Foundation

PLAN VIEW SITE 2-4, 2-5  
 1" = 60'  
 Shoreline Protection  
 Jamestown Island, Virginia

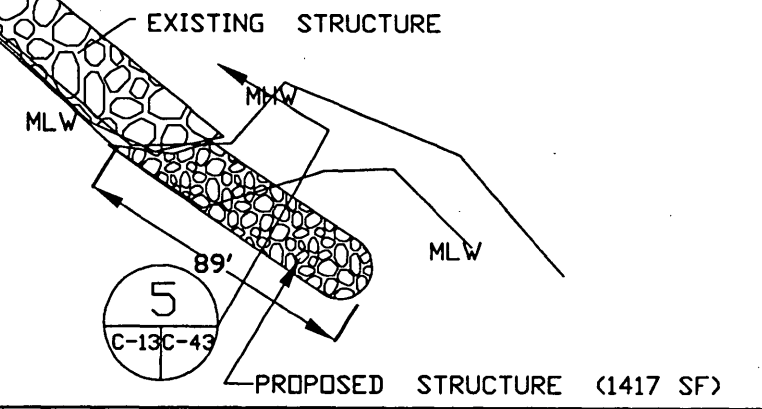
Proposed Shoreline Protection  
 Jamestown Island  
 County of : James City County  
 Applicant: National Park Service  
 Sheet C-12  
 SEPT 2003

# SITE 2-6



EXISTING STRUCTURE

# SITE 2-7



PROPOSED STRUCTURE (1417 SF)

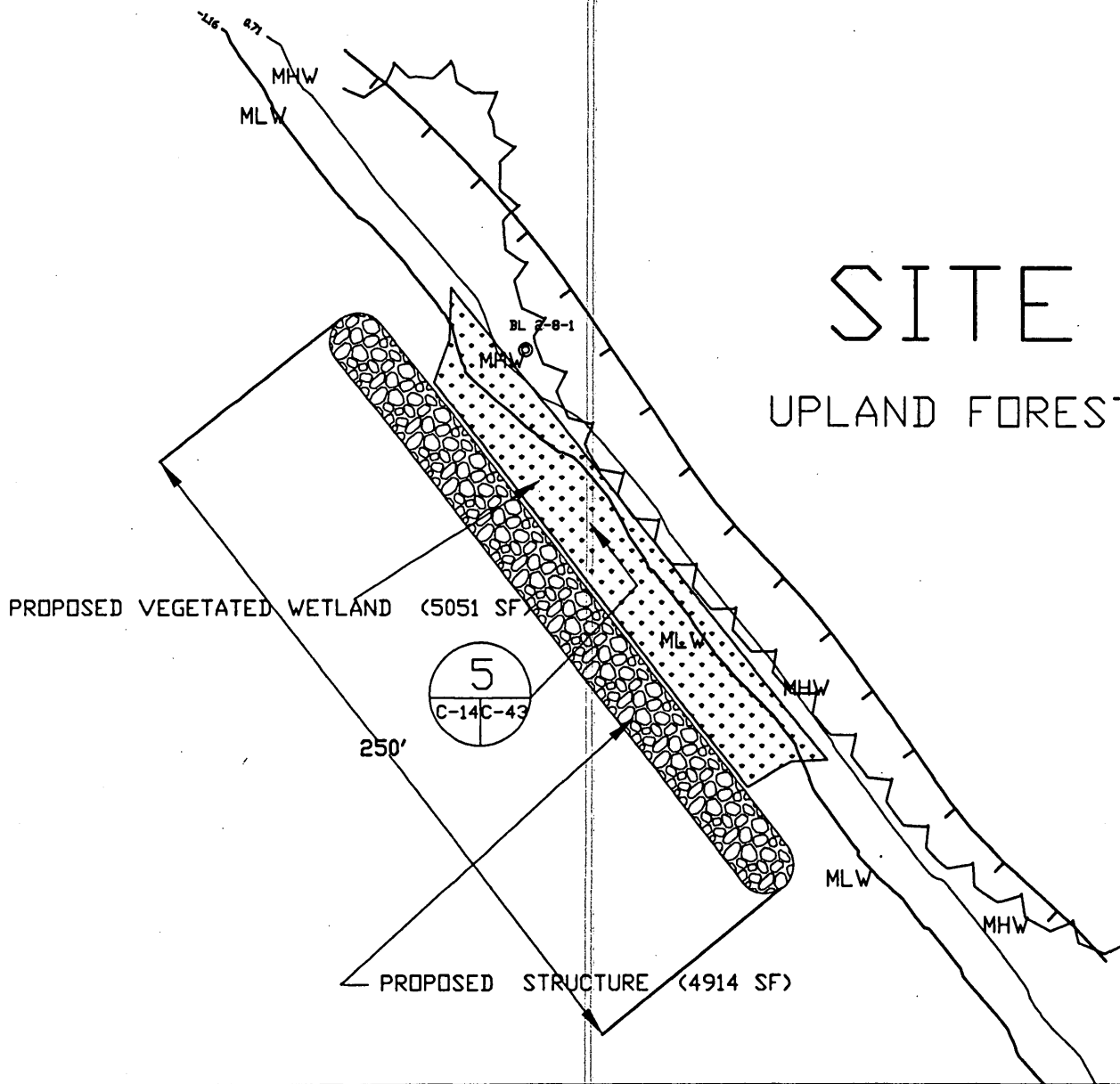
Adjacent Properties Owners:  
APVA  
Jamestown-Yorktown Foundation

PLAN VIEW SITE 2-6 and 2-7  
1" = 60'  
Shoreline Protection  
Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island  
County of : James City County  
Applicant: National Park Service  
Sheet C-13  
SEPT 2003

# SITE 2-8

UPLAND FOREST



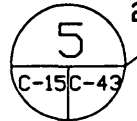
Adjacent Properties Owners:  
APVA  
Jamestown-Yorktown Foundation

PLAN VIEW SITE 2-8  
1" = 60'  
**Shoreline Protection**  
Jamestown Island, Virginia

**Proposed Shoreline Protection  
Jamestown Island**  
County of : James City County  
Applicant: National Park Service  
Sheet C-14  
SEPT 2003

# SITE 2-9

PROPOSED VEGETATED WETLAND (8664 SF)



250'

PROPOSED STRUCTURE (4914 SF)

MHW  
MLW

MHW  
MLW

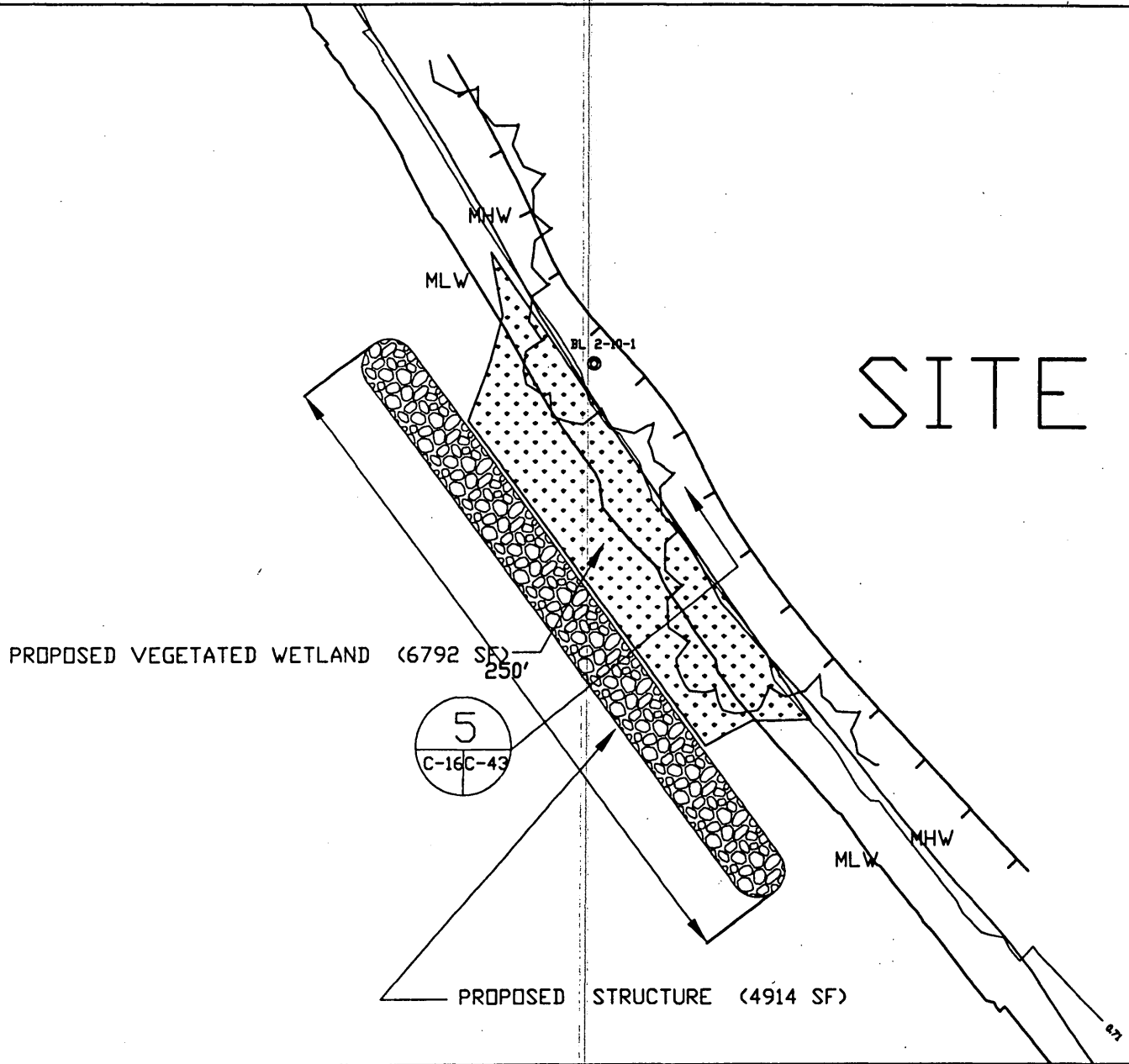
Adjacent Properties Owners:  
APVA  
Jamestown-Yorktown Foundation

PLAN VIEW SITE 2-9  
1" = 60'  
Shoreline Protection  
Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island  
County of : James City County  
Applicant: National Park Service  
Sheet C-15

SEPT 2003

# SITE 2-10



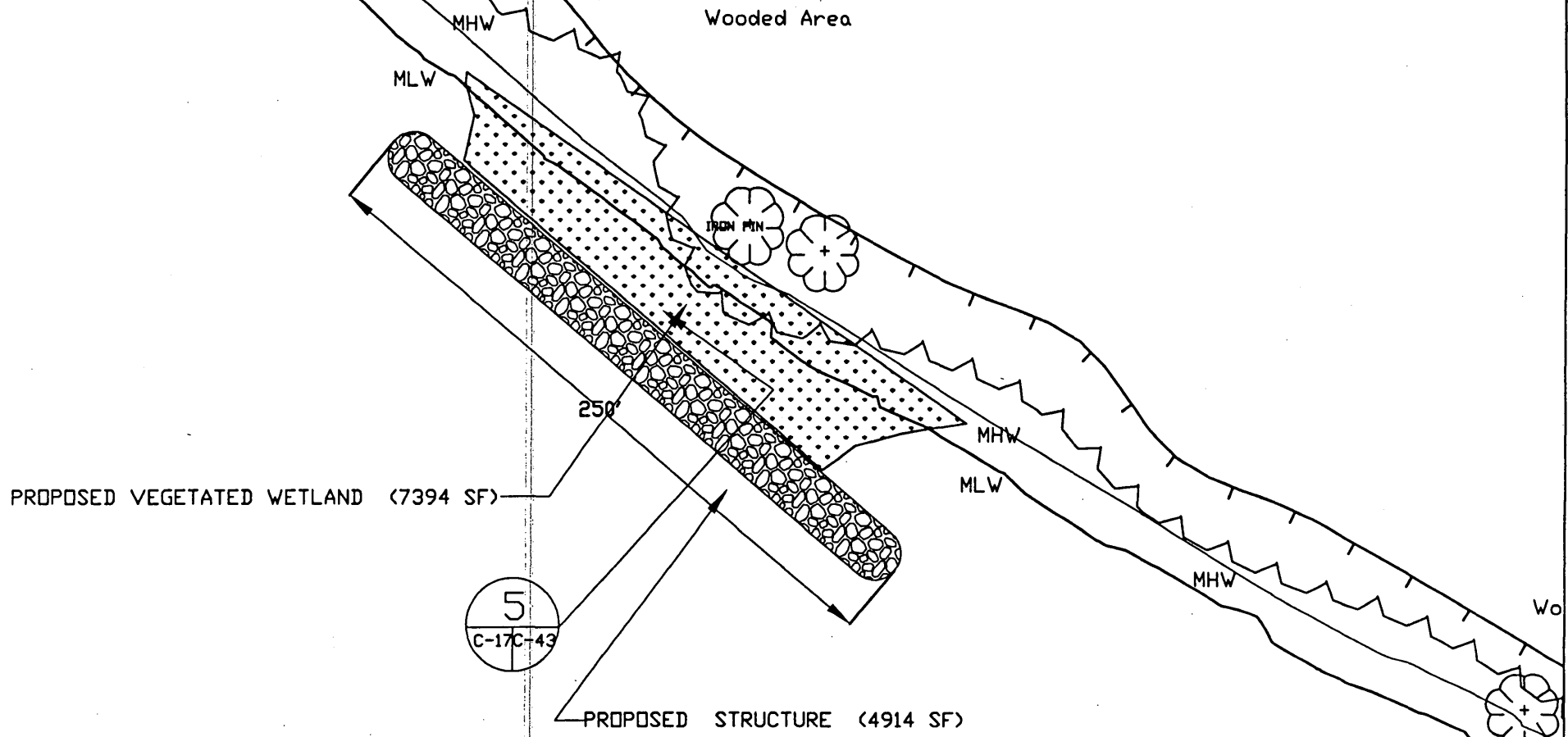
Adjacent Properties Owners:  
APVA  
Jamestown-Yorktown Foundation

PLAN VIEW SITE 2-10  
1" = 60'  
**Shoreline Protection**  
Jamestown Island, Virginia

**Proposed Shoreline Protection  
Jamestown Island**  
County of : James City County  
Applicant: National Park Service  
Sheet C-16  
SEPT 2003

# SITE 2-11

Wooded Area



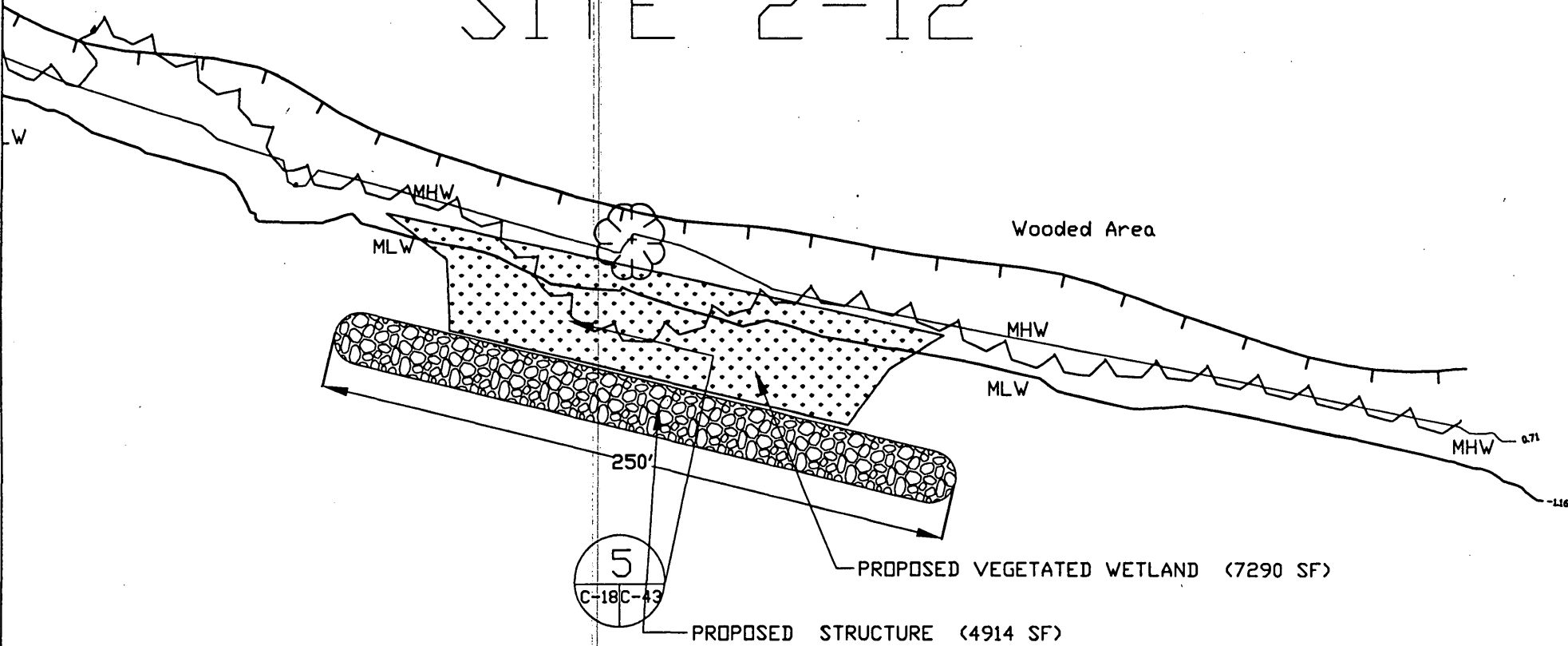
5  
C-17C-43

Adjacent Properties Owners:  
APVA  
Jamestown-Yorktown Foundation

PLAN VIEW SITE 2-11  
1" = 60'  
**Shoreline Protection**  
Jamestown Island, Virginia

**Proposed Shoreline Protection  
Jamestown Island**  
County of : James City County  
Applicant: National Park Service  
Sheet C-17  
SEPT 2003

# SITE 2-12



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 2-12

1" = 60'

Shoreline Protection

Jamestown Island, Virginia

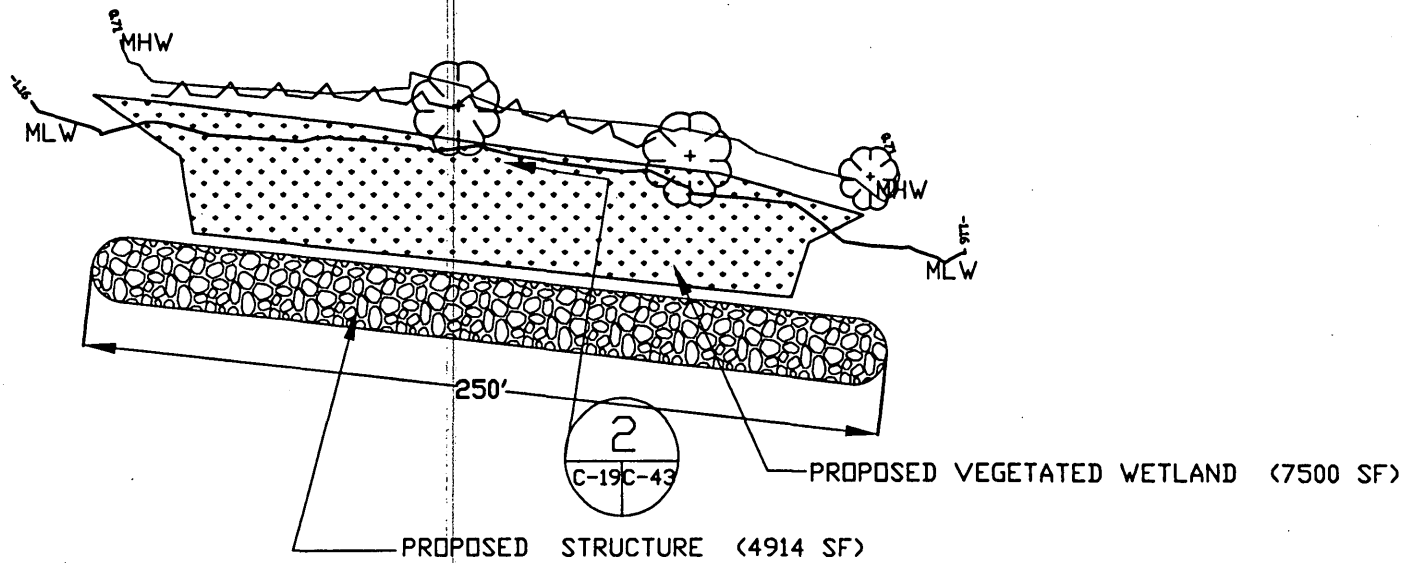
Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-18

SEPT 2003

# SITE 2-13

Wooded Area



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 2-13

1" = 60'

Shoreline Protection

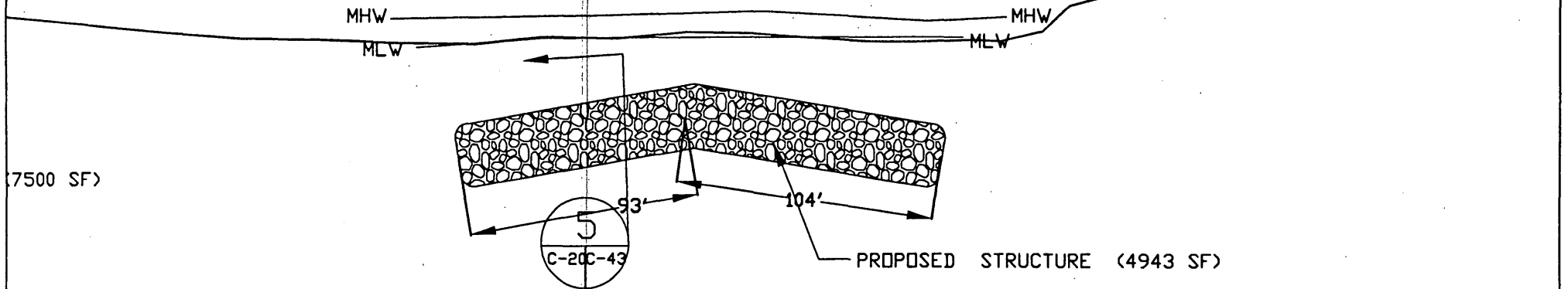
Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-19

SEPT 2003

# SITE 3-1



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-1

1" = 60'

Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection

Jamestown Island

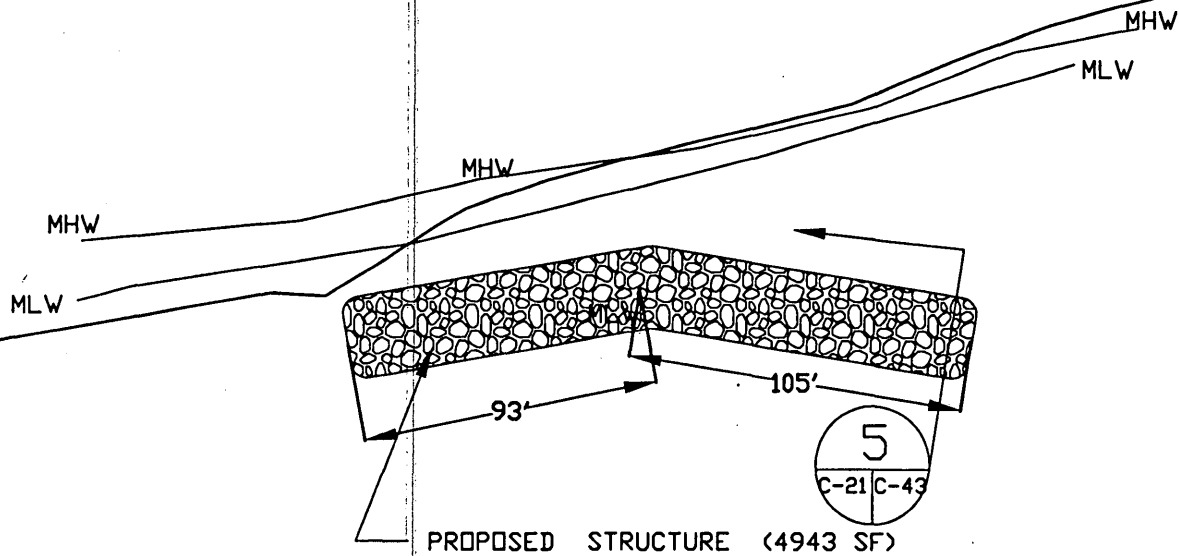
County of : James City County

Applicant: National Park Service

Sheet C-20

SEPT 2003

# SITE 3-2



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-2

1" = 60'

Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection

Jamestown Island

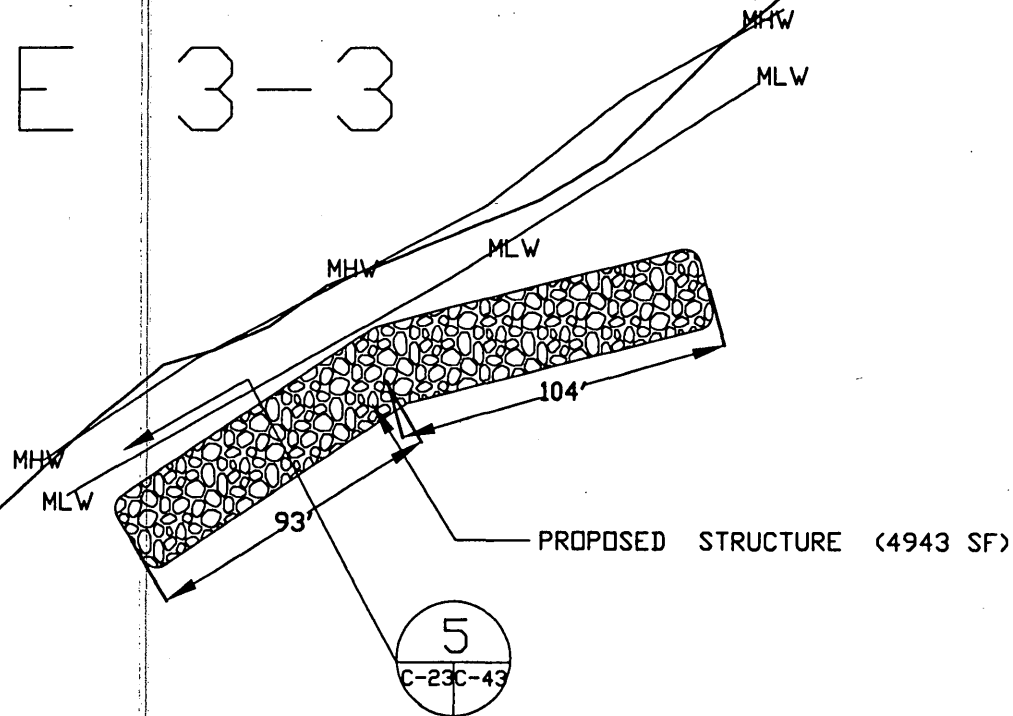
County of : James City County

Applicant: National Park Service

Sheet C-21

SEPT 2003

SITE 3-3



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-3

1" = 60'

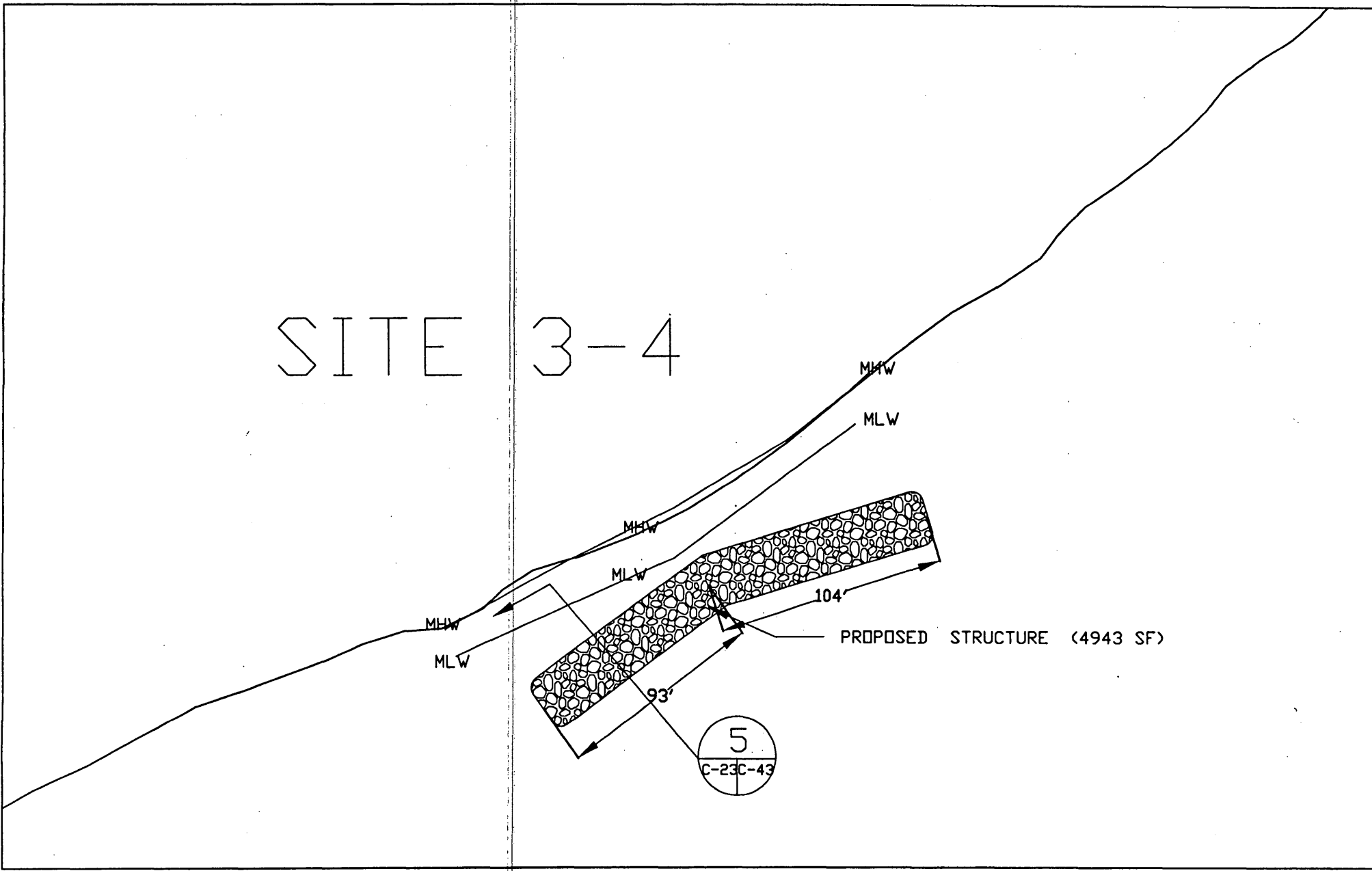
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-22

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-4

1" = 60'

**Shoreline Protection**

Jamestown Island, Virginia

**Proposed Shoreline Protection**

**Jamestown Island**

County of : James City County

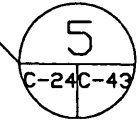
Applicant: National Park Service

Sheet C-23

SEPT 2003

SITE 3-6

MHW  
MLW

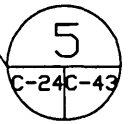


PROPOSED STRUCTURE (4943 SF)

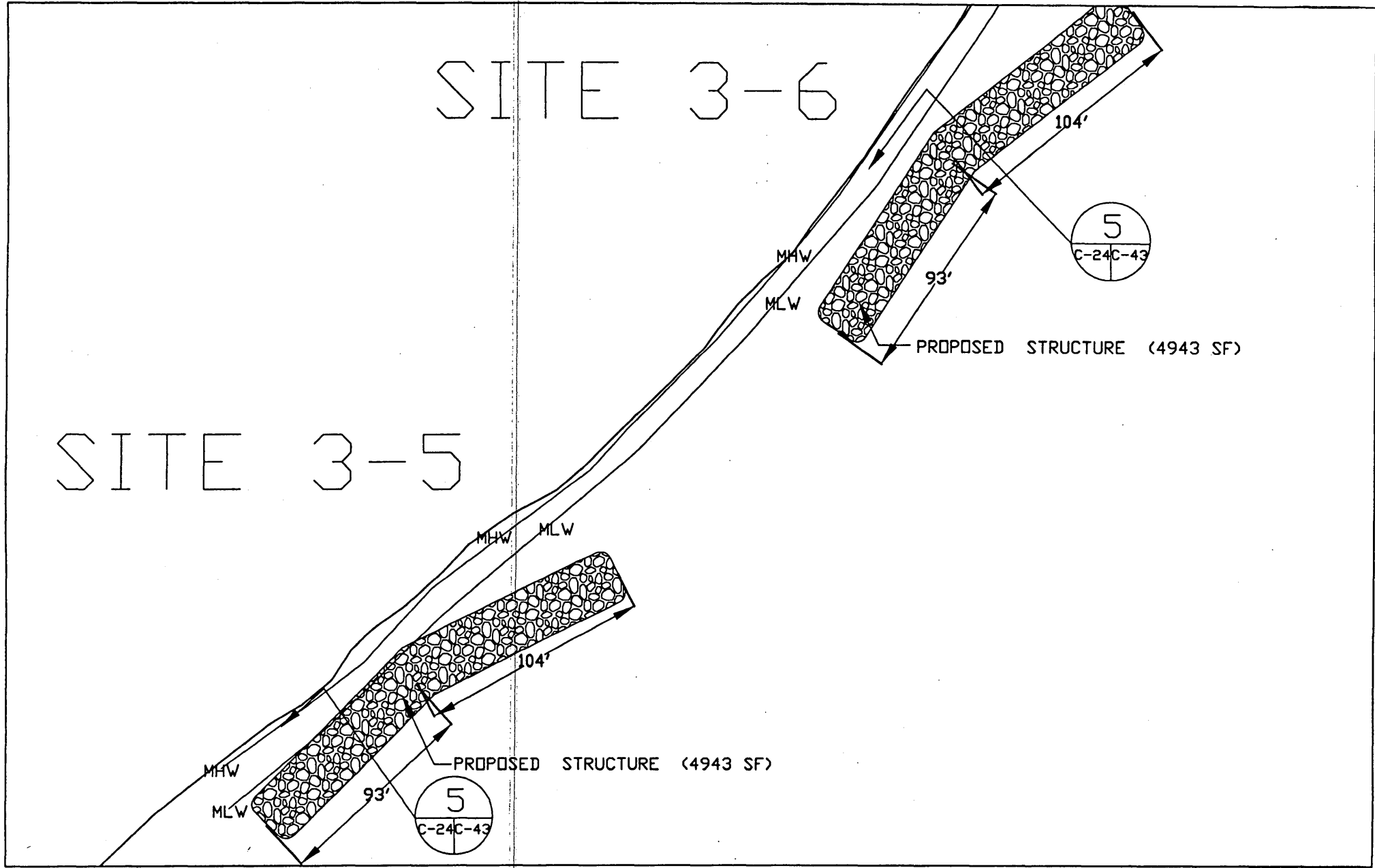
SITE 3-5

MHW  
MLW

MHW  
MLW



PROPOSED STRUCTURE (4943 SF)



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-5 and 3-6

1" = 60'

Shoreline Protection

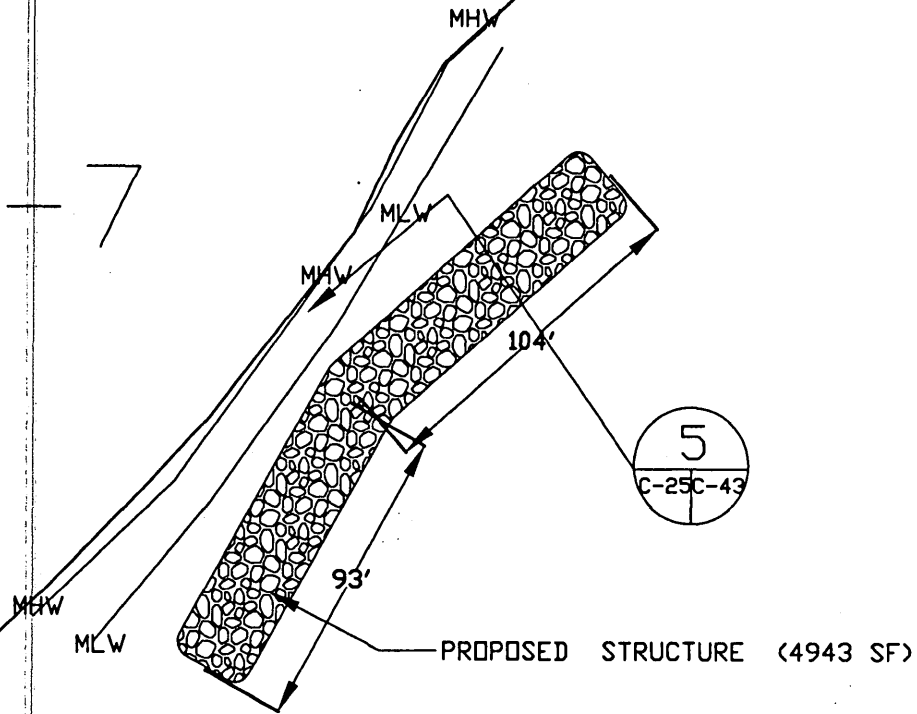
Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-24

SEPT 2003

SITE 3-7



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-7

1" = 60'

Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection

Jamestown Island

County of: James City County

Applicant: National Park Service

Sheet C-25

SEPT 2003

SITE 3-8

MHW

MLW

MLW

104'

PROPOSED STRUCTURE (4943 SF)

5

C-26C-43

MHW

MLW

93'

Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-8

1" = 60'

Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection

Jamestown Island

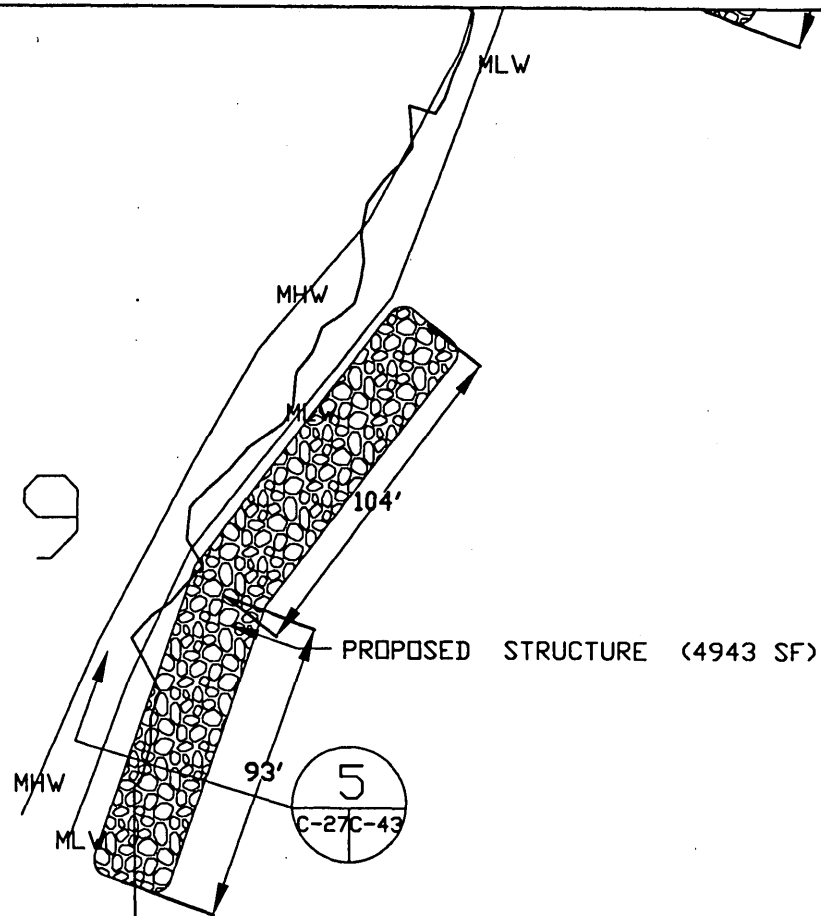
County of : James City County

Applicant: National Park Service

Sheet C-26

SEPT 2003

SITE 3-9



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-9

1" = 60'

Shoreline Protection

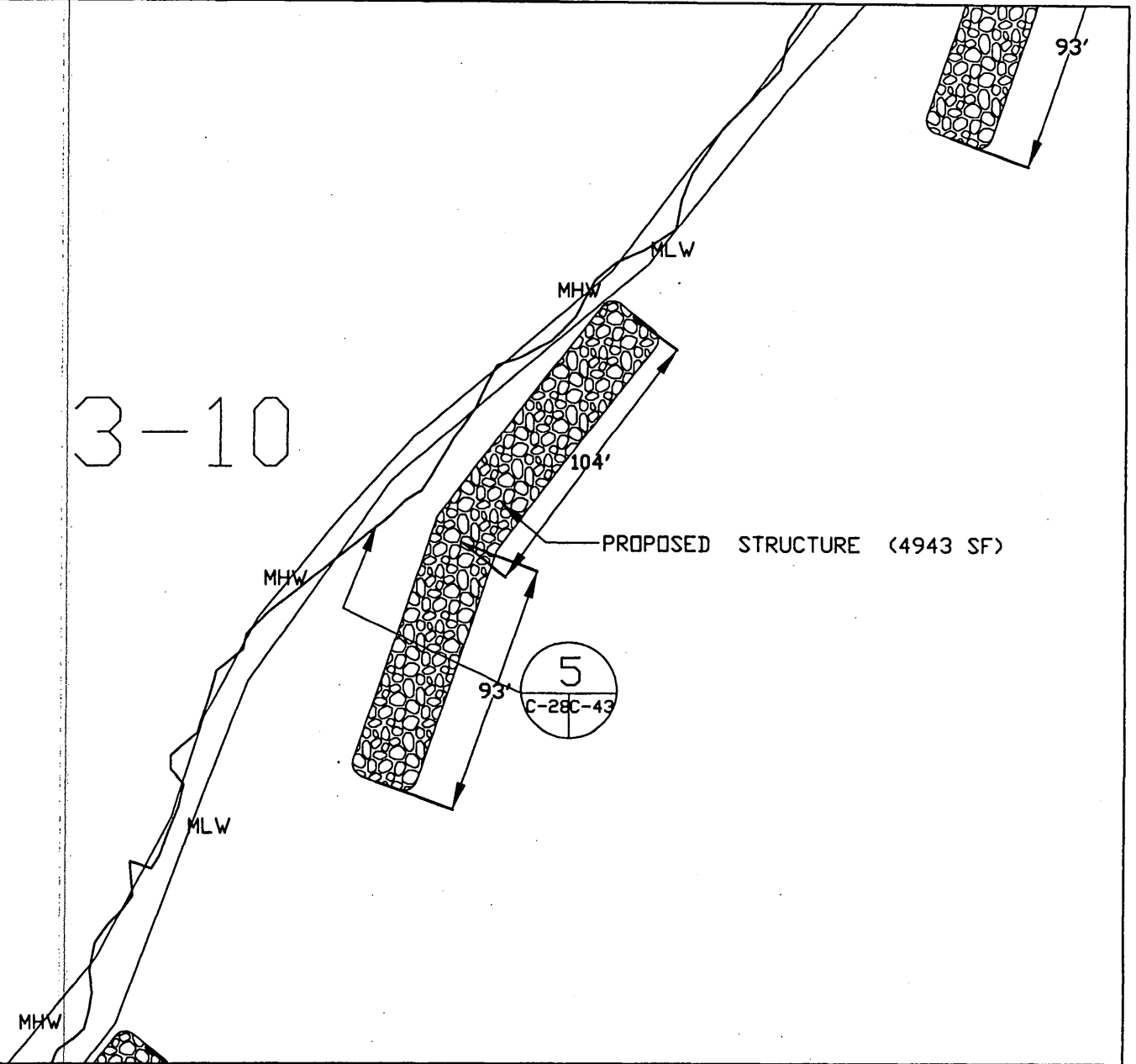
Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-27

SEPT 2003

SITE 3-10



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-10

1" = 60'

Shoreline Protection

Jamestown Island, Virginia

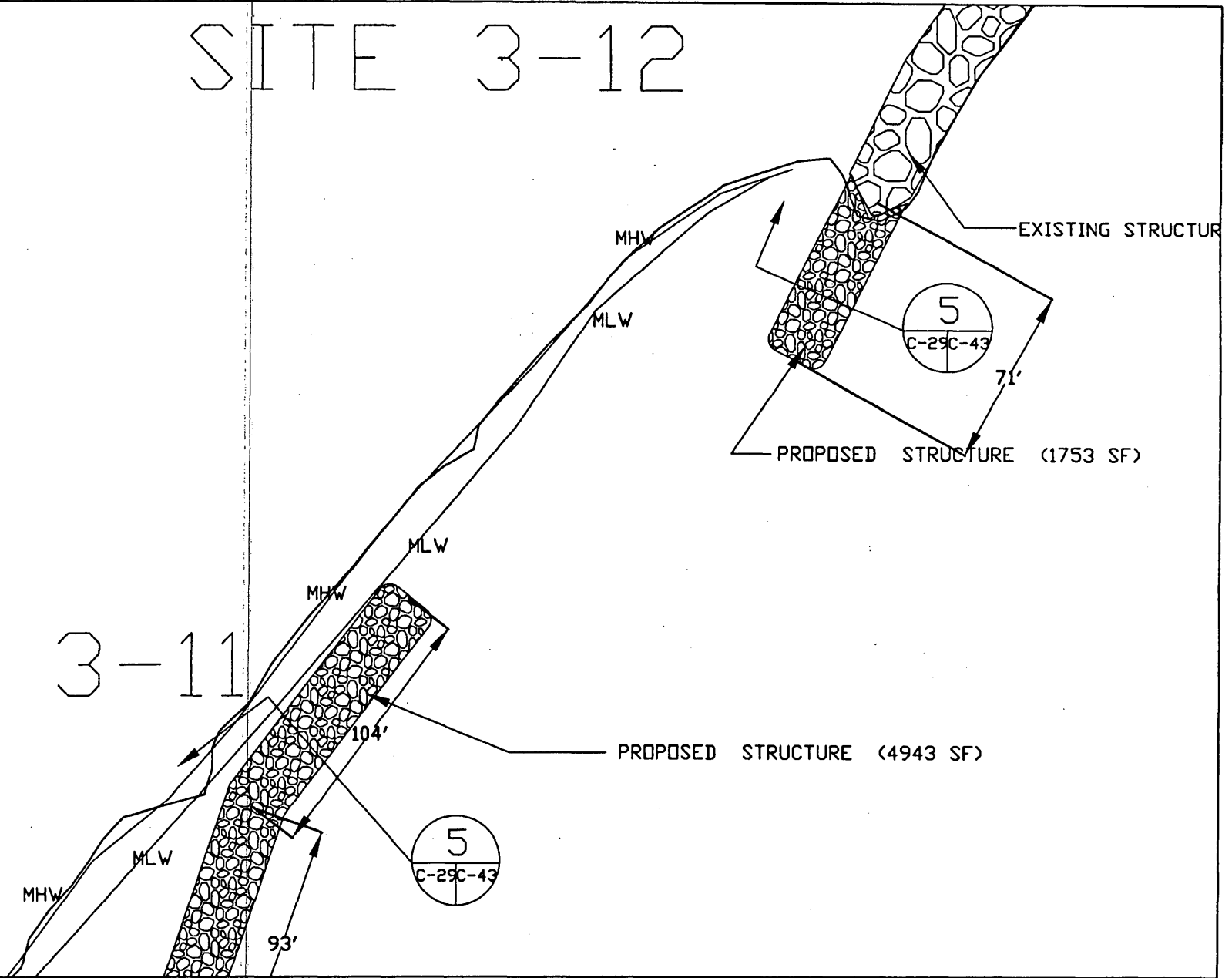
Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-28

SEPT 2003

SITE 3-12

SITE 3-11



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-11 and 3-12

1" = 60'

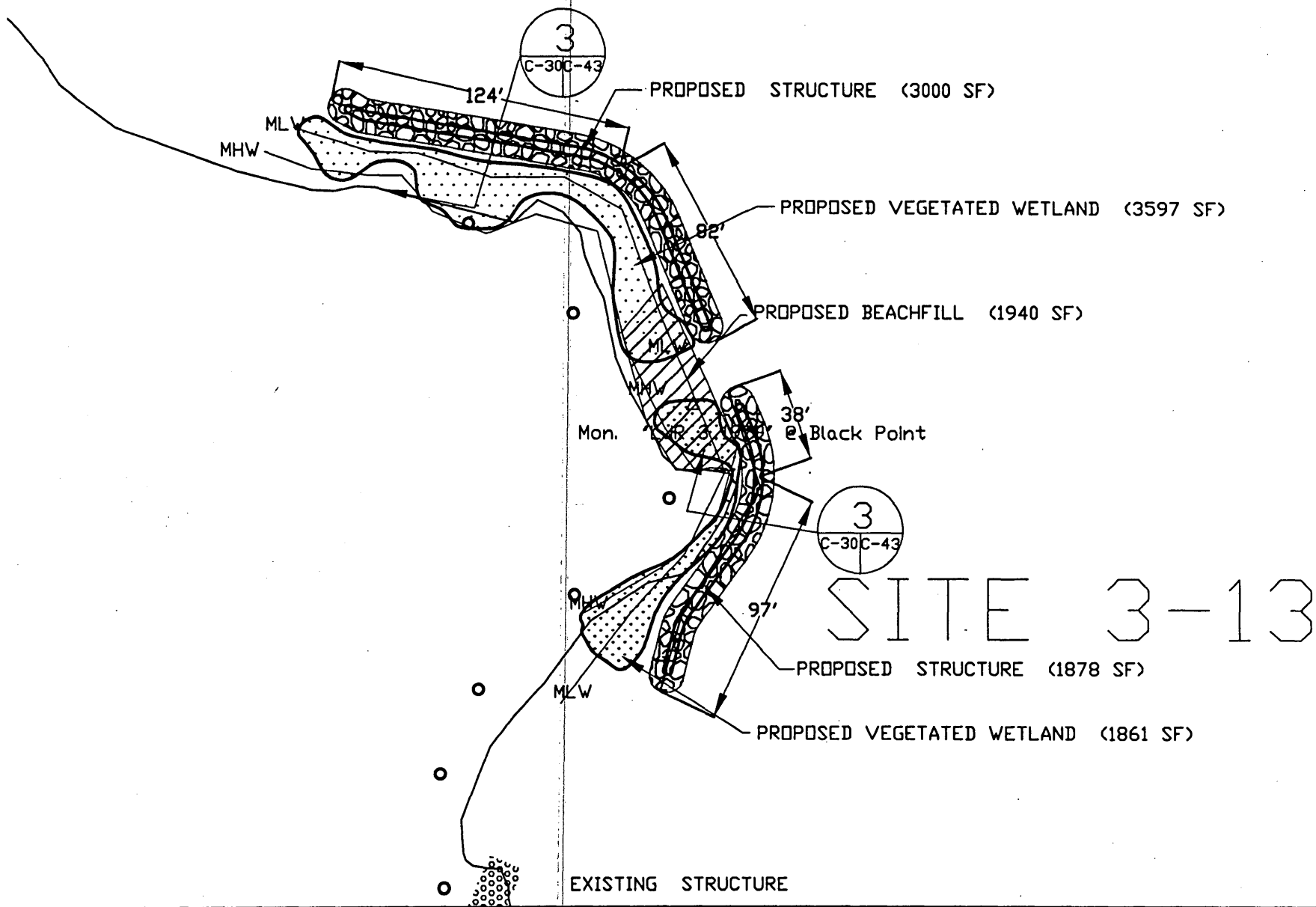
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-29

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 3-13

1" = 60'

Shoreline Protection

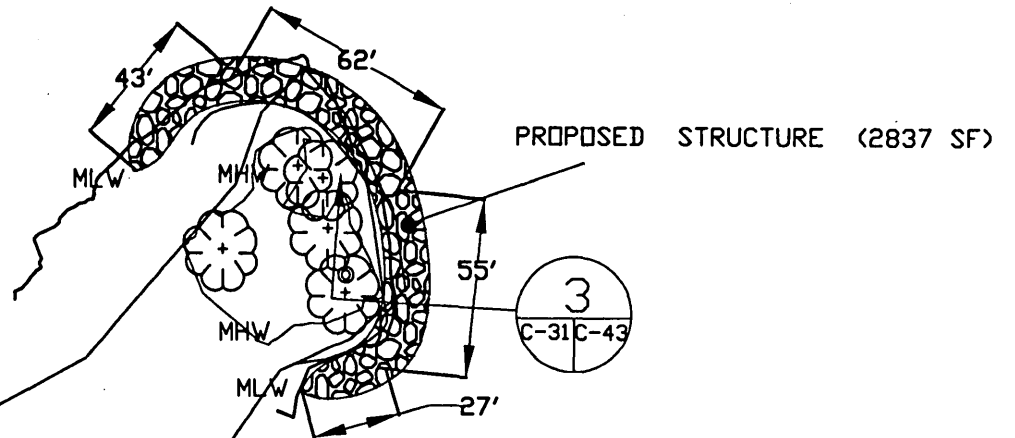
Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-30

SEPT 2003

SITE 4-10



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 4-10

1" = 60'

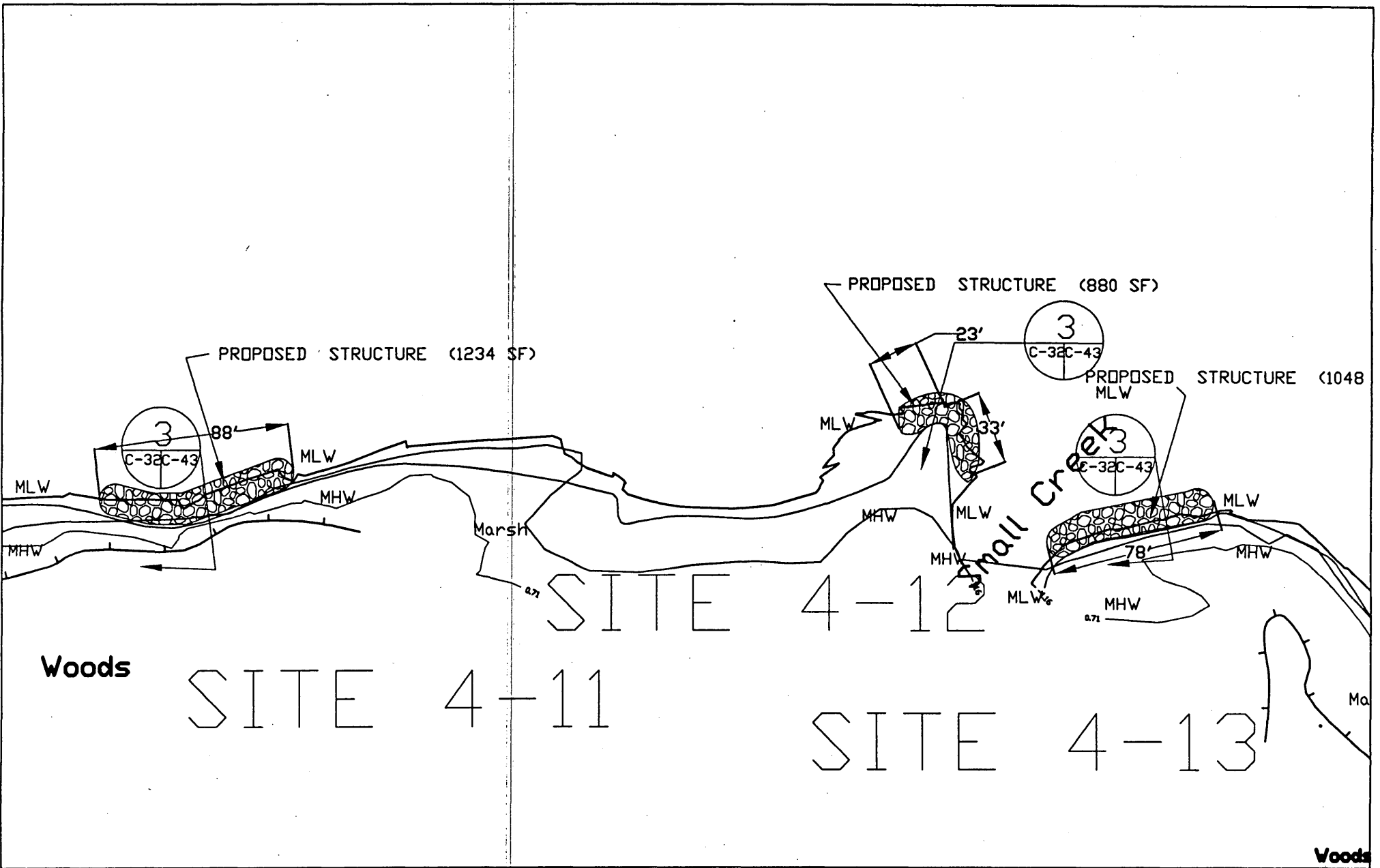
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-31

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITES 4-11, 4-12, 4-13

1" = 60'

Shoreline Protection

Jamestown Island, Virginia

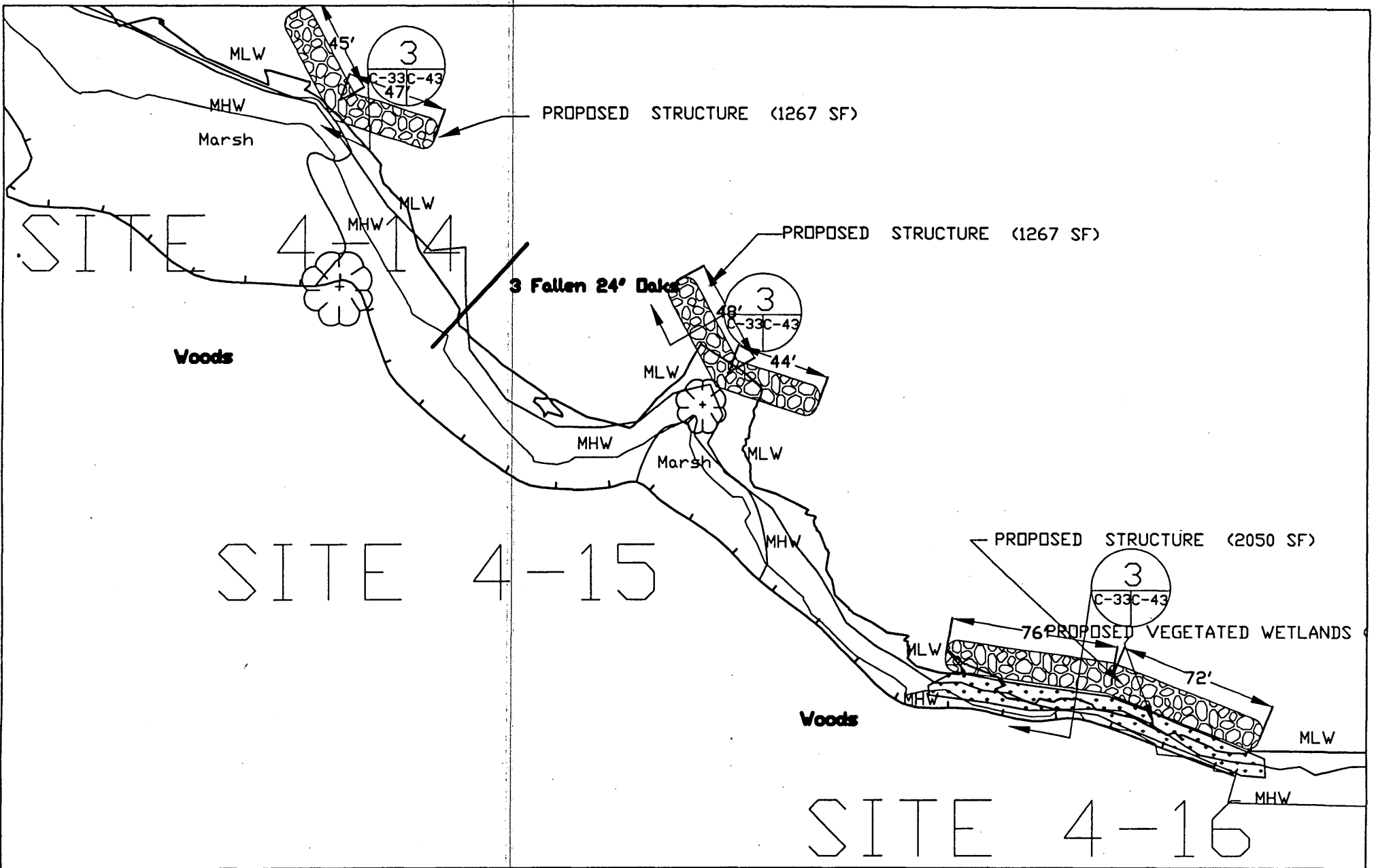
Proposed Shoreline Protection  
Jamestown Island

County of : James City County

Applicant: National Park Service

Sheet C-32

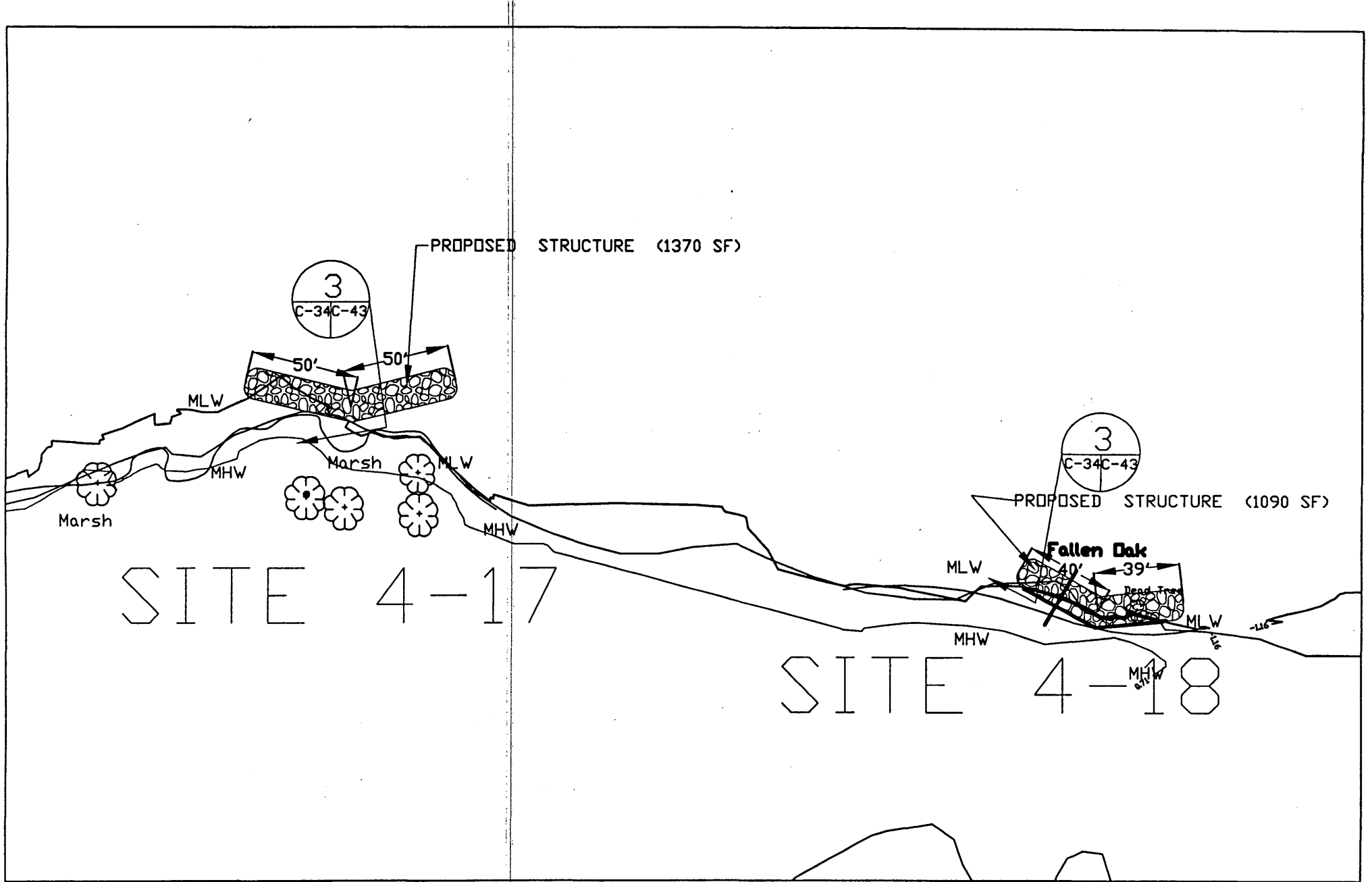
SEPT 2003



Adjacent Properties Owners:  
 APVA  
 Jamestown-Yorktown Foundation

PLAN VIEW SITES 4-14, 4-15 & 4-16  
 1" = 60'  
 Shoreline Protection  
 Jamestown Island, Virginia

Proposed Shoreline Protection  
 Jamestown Island  
 County of : James City County  
 Applicant: National Park Service  
 Sheet C-33  
 SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITES 4-17 and 4-18

1" = 60'

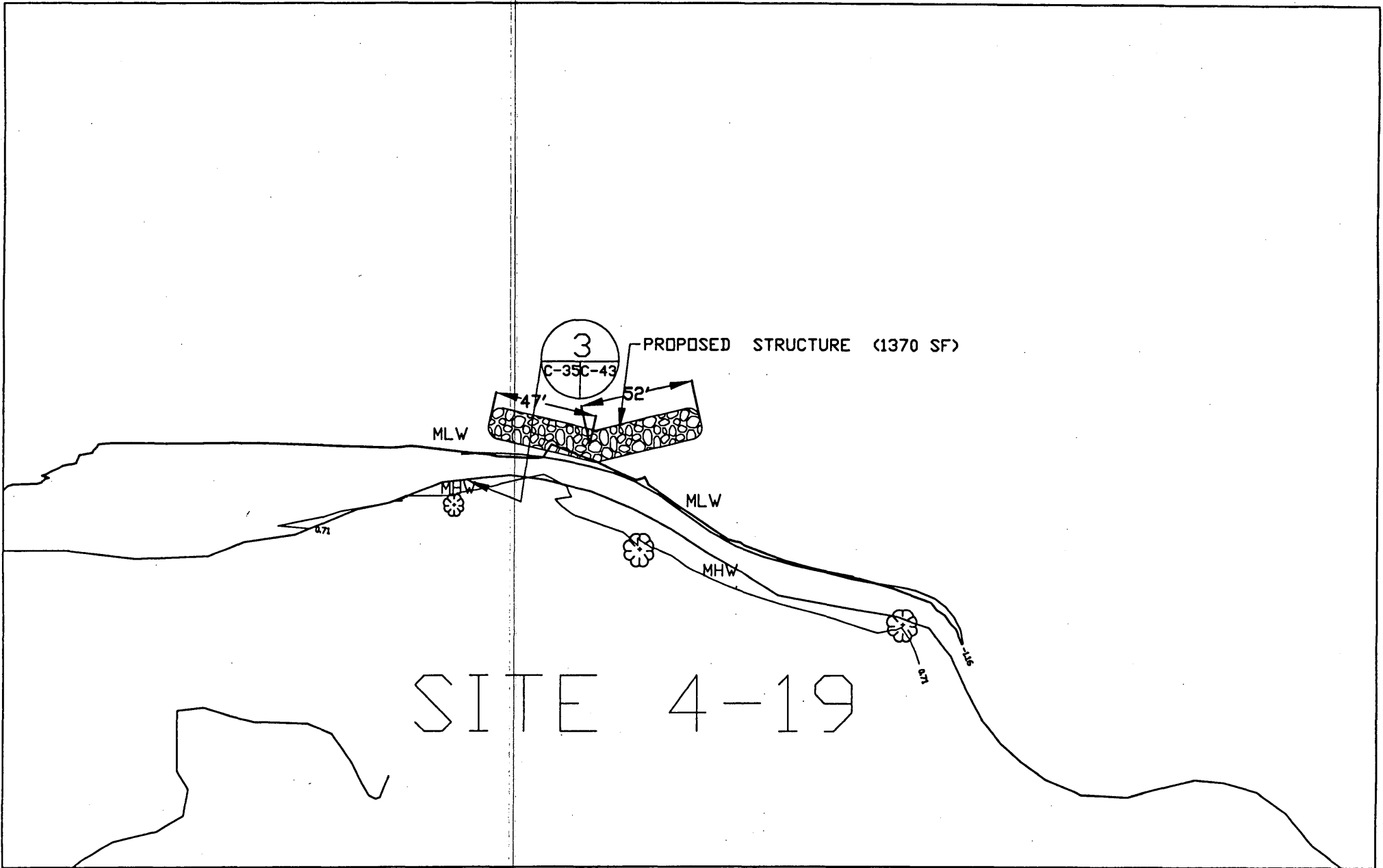
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-34

SEPT 2003



Adjacent Properties Owners:  
 APVA  
 Jamestown-Yorktown Foundation

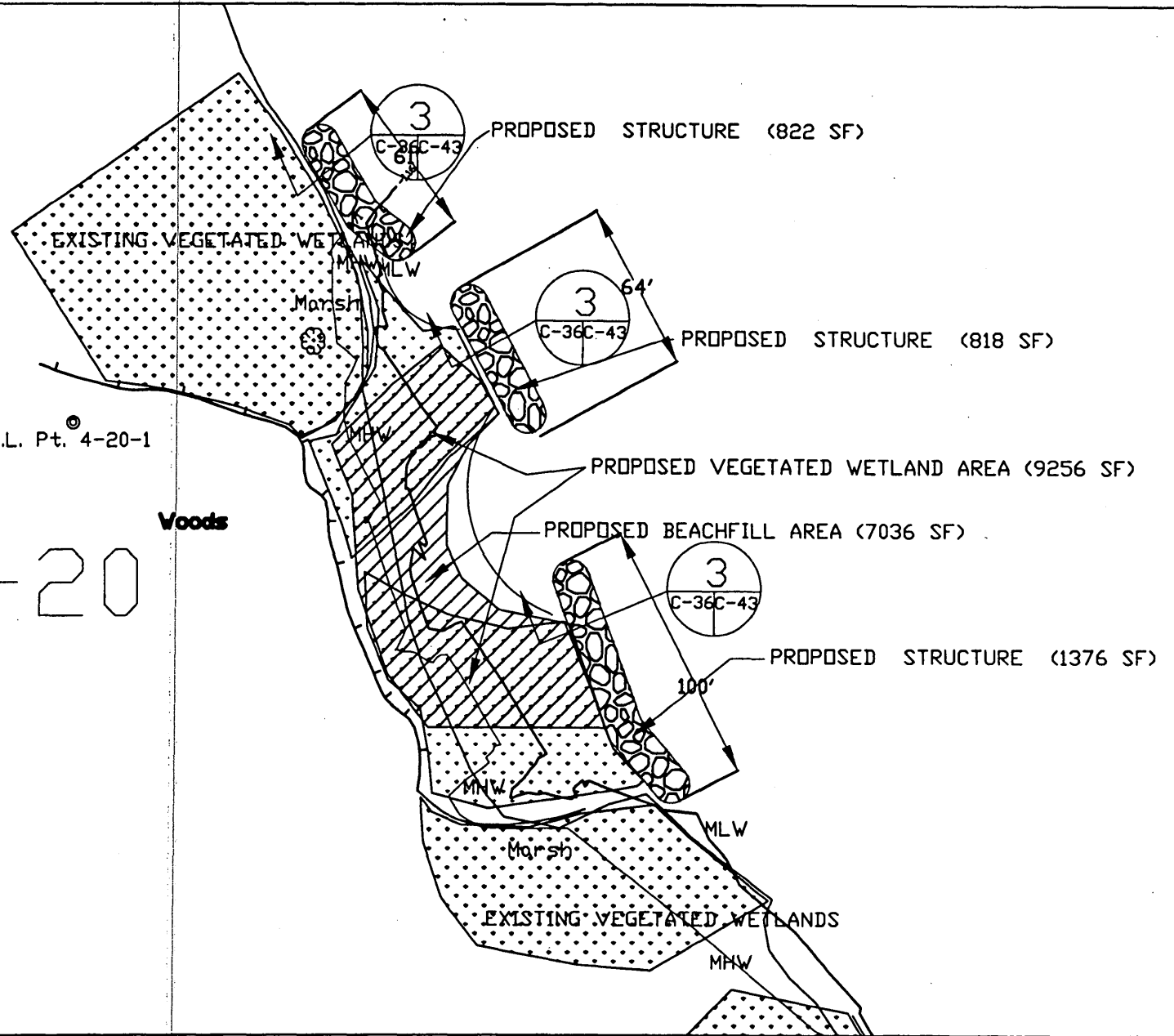
PLAN VIEW SITE 4-19  
 1" = 60'  
 Shoreline Protection  
 Jamestown Island, Virginia

Proposed Shoreline Protection  
 Jamestown Island  
 County of : James City County  
 Applicant: National Park Service  
 Sheet C-35  
 SEPT 2003

# SITE 4-20

B.L. Pt. 4-20-1

**Woods**



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 4-20

1" = 60'

**Shoreline Protection**

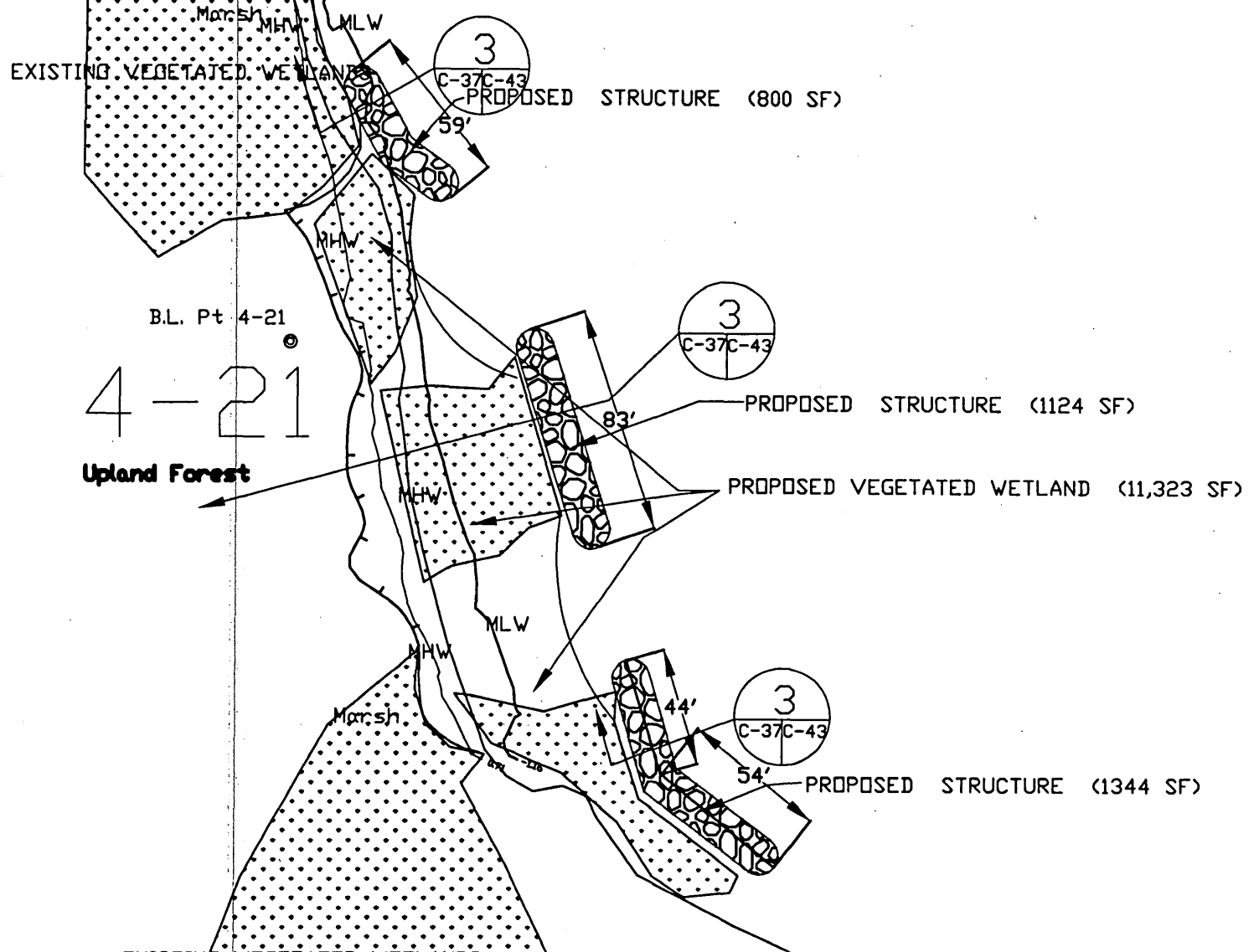
Jamestown Island, Virginia

**Proposed Shoreline Protection  
 Jamestown Island**

County of : James City County  
 Applicant: National Park Service  
 Sheet C-36

SEPT 2003

# SITE 4-21



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW SITE 4-21

1" = 60'

Shoreline Protection

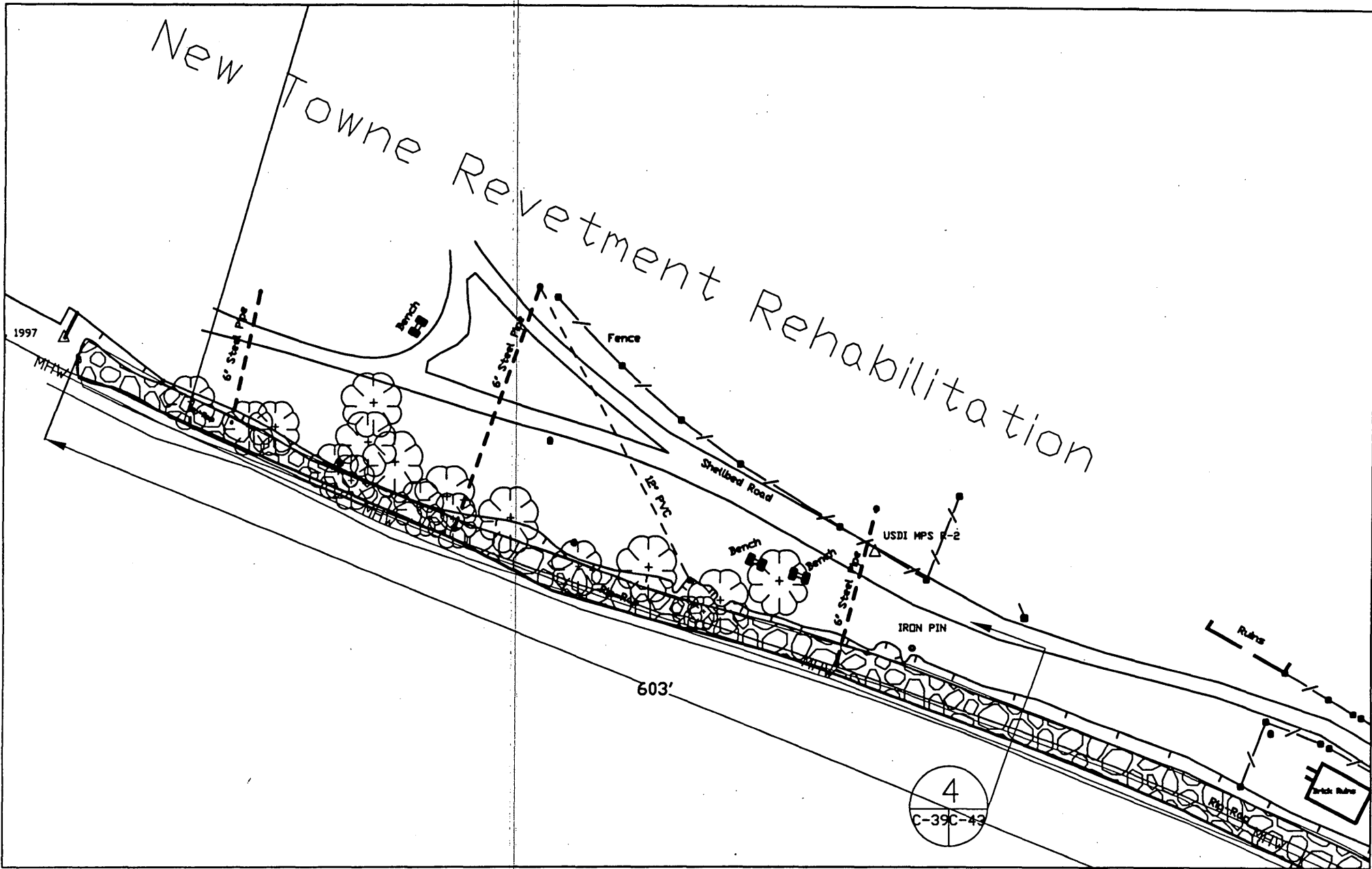
Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-37

SEPT 2003

# New Towne Revetment Rehabilitation



Adjacent Properties Owners:  
 APVA  
 Jamestown-Yorktown Foundation

PLAN VIEW New Towne Revetment Rehabilitation  
 1" = 60'

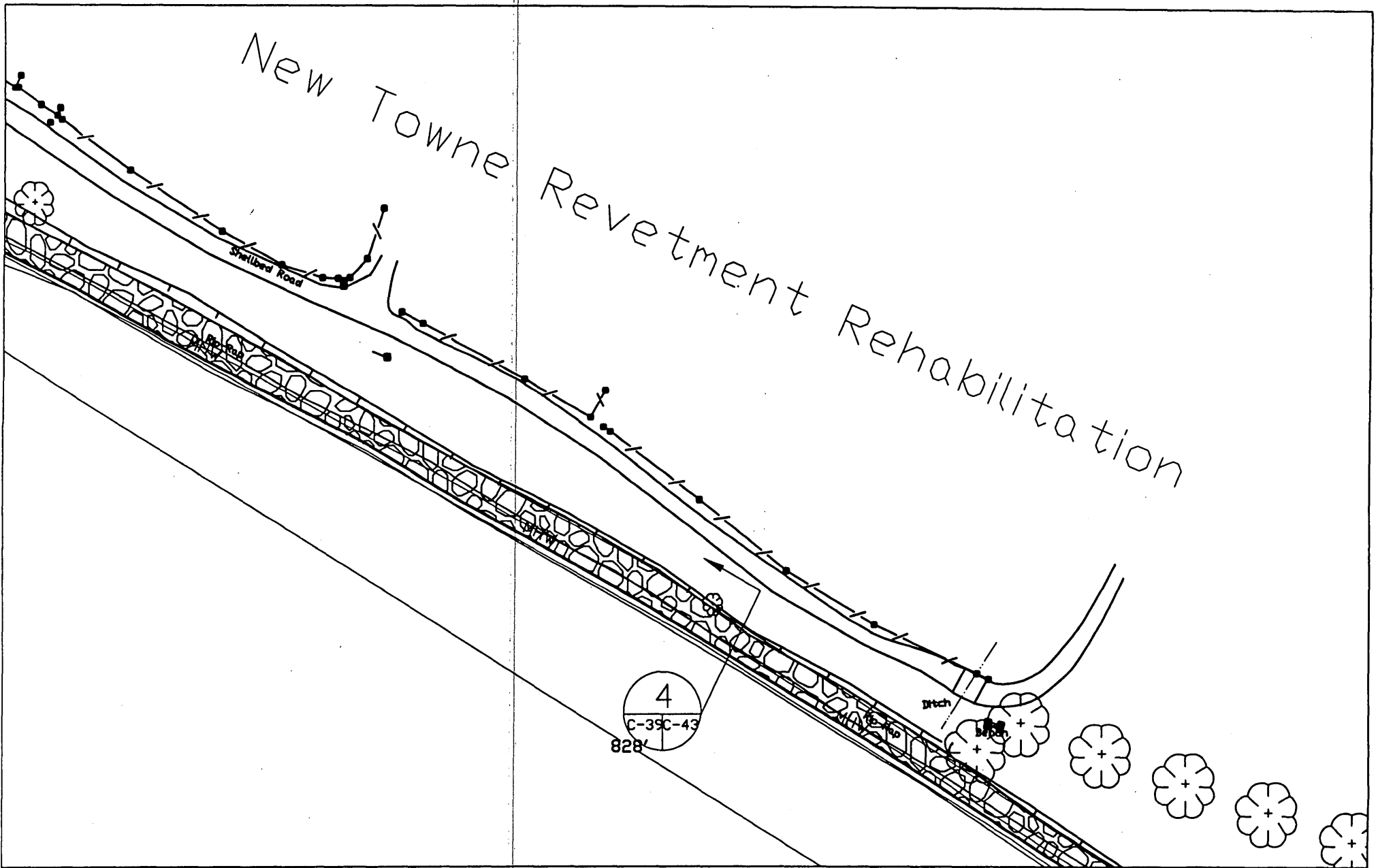
## Shoreline Protection

Jamestown Island, Virginia

## Proposed Shoreline Protection Jamestown Island

County of : James City County  
 Applicant: National Park Service  
 Sheet C-38

SEPT 2003



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW New Towne Revetment Rehabilitation

1" = 60'

Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-39

SEPT 2003

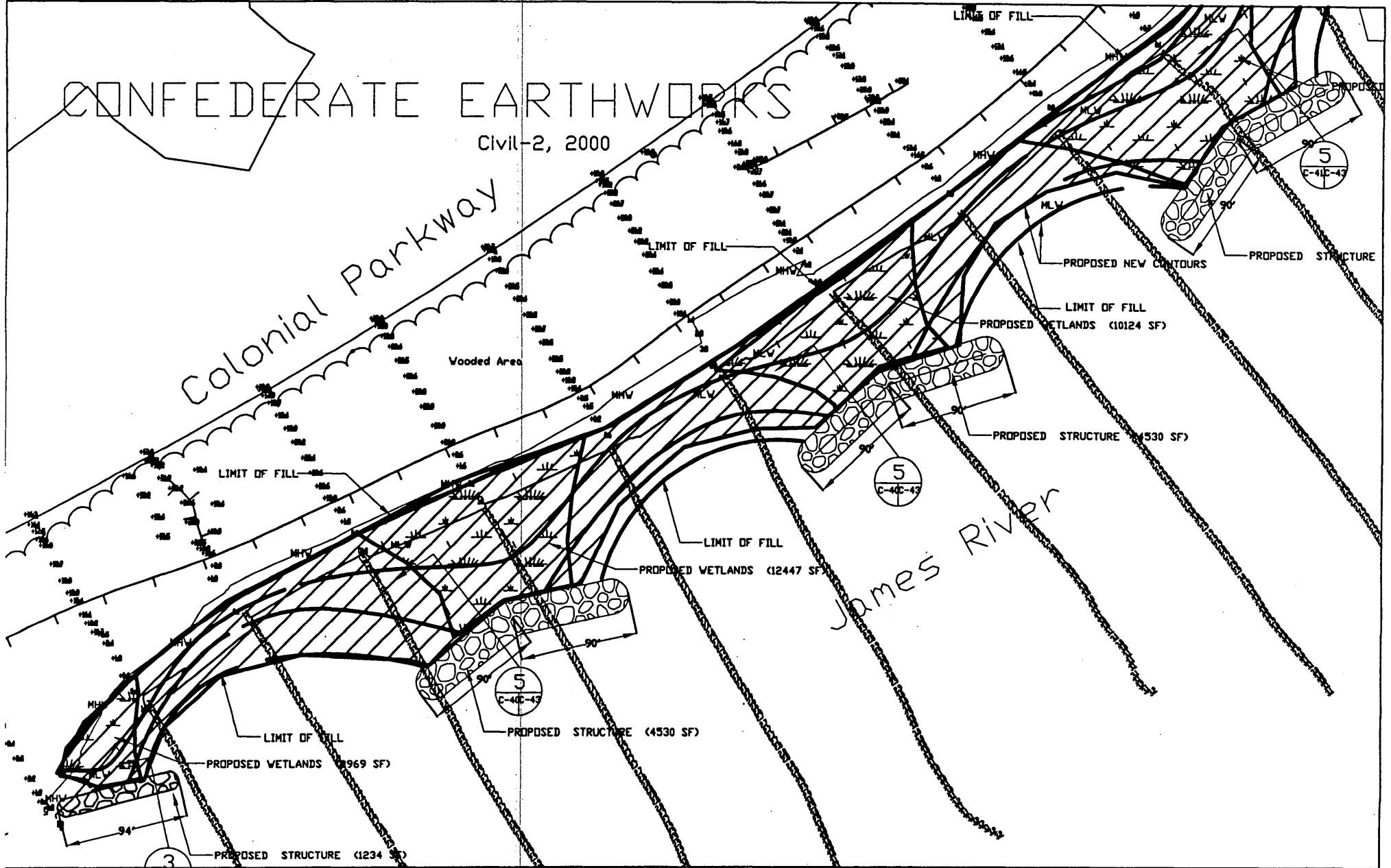
# CONFEDERATE EARTHWORKS

Civil-2, 2000

Colonial Parkway

Wooded Area

James River



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW Confederate Earthworks

1" = 100'

Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-40

SEPT 2003

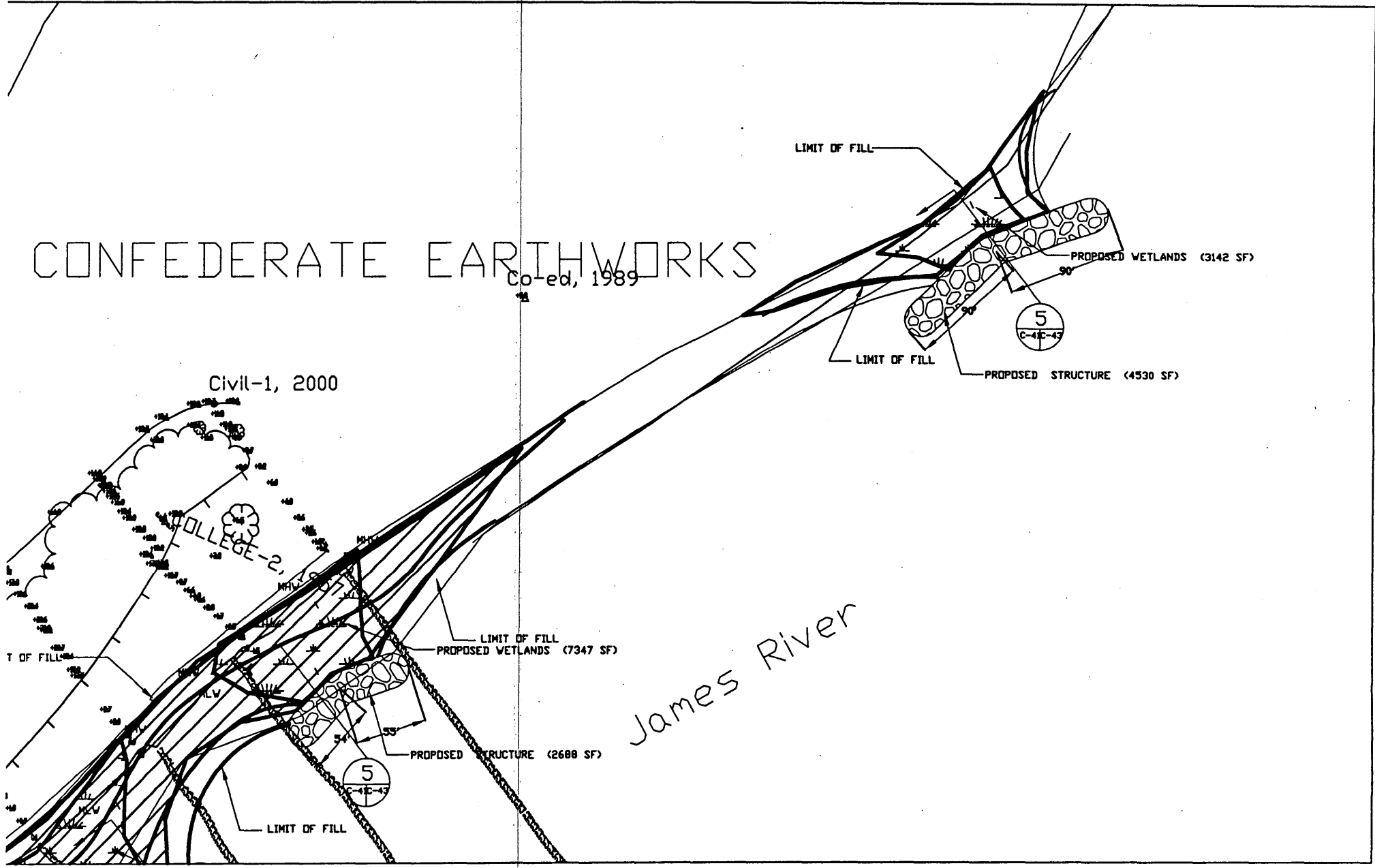
# CONFEDERATE EARTHWORKS

Co-ed, 1989

Civil-1, 2000

COLLEGE-2

James River



Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

PLAN VIEW Confederate Earthworks

1" = 100'

Shoreline Protection

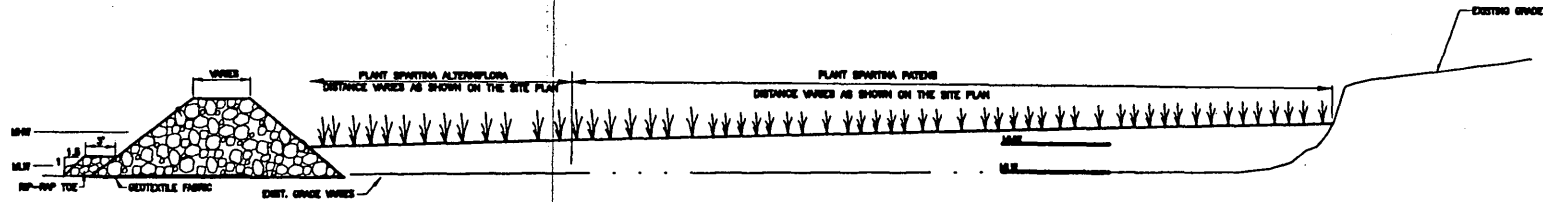
Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-41

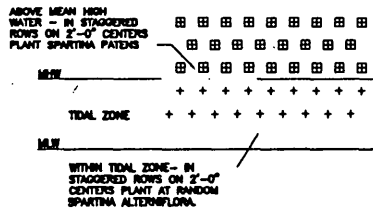
SEPT 2003

# PLANTING DETAILS

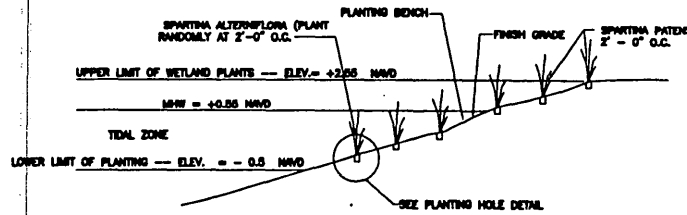


**TYPICAL SECTION**

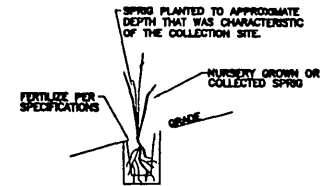
NOT TO SCALE



**PROPOSED PLANTING PLAN WITHIN AND ABOVE TIDAL ZONE**



**SECTION - PROPOSED MARSH GRASS PLANTING**



**PLANTING HOLE DETAIL**

## PLANTING DETAILS

NO SCALE

### PLANTING NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR PLANTING AND FURNISHING MARSH GRASS PLANTS.
2. THE CONTRACTOR IS RESPONSIBLE FOR PREPARING ALL PLANT BENCHES AND BEDS TO THE SLOPES SHOWN USING APPROVED SELECT MATERIALS.
3. THE CONTRACTOR SHALL NOTIFY THE C.O.R. WHEN AREAS ARE READY FOR PLANTING.
4. ALL UPLAND AREAS DISTURBED BY CONSTRUCTION SHALL BE TOPSOILED AND SEEDED PER SPECIFICATIONS.

### GENERAL NOTES:

1. ACCESS FOR EQUIPMENT AND MATERIALS SHALL BE COORDINATED WITH THE CONTRACTING OFFICER AND THE FACILITY.
2. ADEQUATE PROTECTION (SAND FENCING OR OTHER APPROVED BY THE CONTRACTING OFFICER'S REPRESENTATIVE) SHALL BE USED TO PROTECT THE EXISTING VEGETATION.
3. CONSTRUCTION EQUIPMENT AND STORAGE OF MATERIAL SHALL BE APPROVED BY THE CONTRACTING OFFICER'S REPRESENTATIVE.

Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

## PLANTING DETAILS NOT TO SCALE

Shoreline Protection

Jamestown Island, Virginia

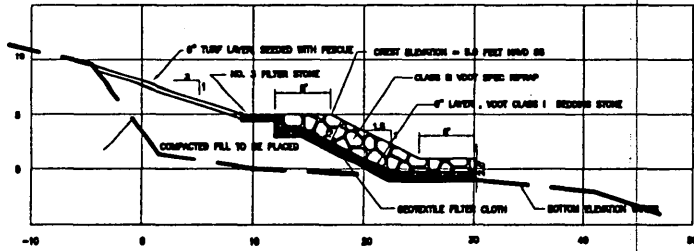
## Proposed Shoreline Protection Jamestown Island

County of: James City County

Applicant: National Park Service

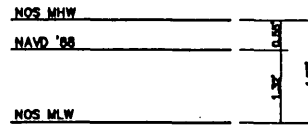
Sheet C-42

SEPT 2003



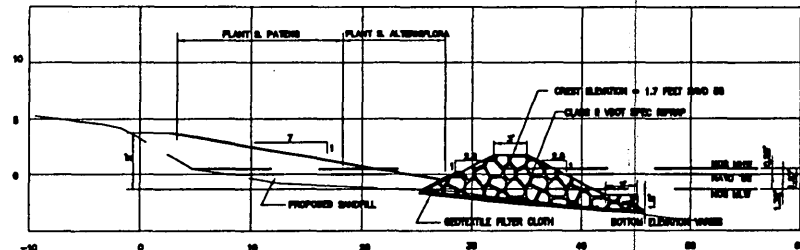
SITE 1-1 SECTION DETAIL 1

SCALE 1" = 1'



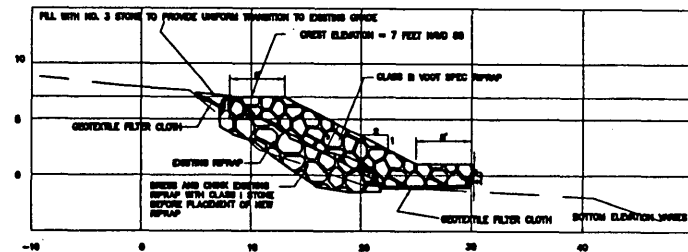
DATUM DIAGRAM

TURBIDITY CURTAIN



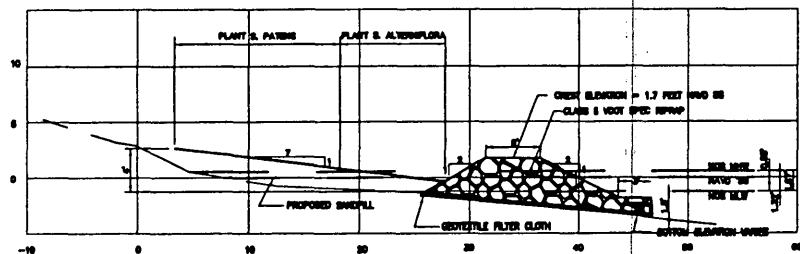
BACK RIVER SILL-SECTION DETAIL 2

SCALE 1" = 1'



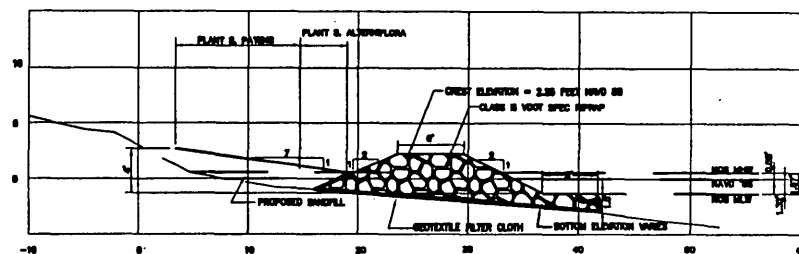
NEW TOWNE REVETMENT REHAB. DETAIL 4

SCALE 1" = 1'



THE THOROFARE BREAKWATER-SECTION DETAIL 3

SCALE 1" = 1'



JAMES RIVER BREAKWATER-SECTION DETAIL 5

SCALE 1" = 1'

Adjacent Properties Owners:

APVA

Jamestown-Yorktown Foundation

CROSS SECTIONAL VIEW  
Shoreline Protection

Jamestown Island, Virginia

Proposed Shoreline Protection  
Jamestown Island

County of : James City County  
Applicant: National Park Service  
Sheet C-43

SEPT 2003