



STATE OF MARYLAND
COASTAL NONPOINT POLLUTION
CONTROL PROGRAM

ENVIRONMENTAL ASSESSMENT

SEPTEMBER 1996

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service

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Office of Ocean and Coastal Resource Management
Coastal Programs Division
1305 East-West Highway
Silver Spring, MD 20910

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U.S. DEPARTMENT OF COMMERCE

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DESIGNATION: Environmental Assessment

TITLE: State of Maryland Coastal Nonpoint Pollution Control Program

ABSTRACT: This environmental assessment is prepared pursuant to the National Environmental Policy Act (NEPA), 42 U.S.C. 4321 et seq. to assess the environmental impacts associated with the approval and implementation of the Coastal Nonpoint Pollution Control Program (coastal nonpoint program) submitted to NOAA and EPA by the state of Maryland. Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA), 16 U.S.C. 1455b, requires states and territories with coastal zone management programs that have received approval under section 306 of the Coastal Zone Management Act to develop and implement coastal nonpoint programs.

For purposes of this environmental assessment, the proposed action is the conditional approval of the Maryland coastal nonpoint program. The Maryland program includes the implementation of management measures for agricultural, forestry, urban, marina, and hydromodification nonpoint source categories, and for wetlands, riparian areas, and vegetated treatment systems. The coastal nonpoint program will be implemented within Maryland's coastal zone. The coastal zone extends from the state's three mile jurisdiction in the Atlantic Ocean to the inland boundaries of the counties bordering the Atlantic Ocean, the Chesapeake Bay, and the Potomac River up to the District of Columbia (includes 16 counties and the City of Baltimore), including the Chesapeake Bay, the Atlantic coast, and the Coastal Bays.

NOAA and EPA find that the Maryland program meets most of the requirements of section 6217 and will approve the program with conditions. To receive final approval of its program, Maryland will need to meet the conditions, which include completing development of certain aspects of its programs addressing agricultural, urban, and marinas and recreational boating sources, as well as the protection of wetlands and riparian areas.

The conditional approval of the Maryland coastal nonpoint program will not result in any significant environmental impacts different from those analyzed in the Programmatic Environmental Impact Statement prepared for the 6217 program and will have a beneficial effect on the environment.

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MARYLAND
COASTAL NONPOINT POLLUTION CONTROL PROGRAM

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EXECUTIVE SUMMARY

The National Oceanic and Atmospheric Administration (NOAA) has prepared this environmental assessment to assess the environmental impacts associated with the approval and implementation of the coastal nonpoint pollution control program (coastal nonpoint program) submitted to NOAA and the Environmental Protection Agency (EPA) by the state of Maryland. Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA), 16 U.S.C. section 1455b, requires states and territories with coastal zone management programs that have received approval under section 306 of the Coastal Zone Management Act to develop and implement coastal nonpoint programs. These programs were required to be submitted to NOAA and EPA in July 1995. Once approved, these programs will be implemented through changes to the state nonpoint source program approved by EPA under section 319 of the Clean Water Act and through changes to the state coastal zone management program approved by NOAA under the CZMA.

For purposes of this environmental assessment, the proposed action is the conditional approval of the Maryland coastal nonpoint program. The alternatives to the proposed action are to approve the program or to deny approval of the program.

The Maryland program includes the implementation of management measures for agricultural, forestry, urban, marina, and hydromodification nonpoint source categories, and for wetlands, riparian areas, and vegetated treatment systems. The coastal nonpoint program will be implemented within Maryland's coastal zone. The coastal zone extends from the state's three mile jurisdiction in the Atlantic Ocean to the inland boundaries of the counties bordering the Atlantic Ocean, the Chesapeake Bay, and the Potomac River up to the District of Columbia (includes 16 counties and the City of Baltimore), including the Chesapeake Bay, the Atlantic coast, and the Coastal Bays.

NOAA and EPA find that the Maryland program meets most of the requirements of section 6217 and will approve the program with conditions. To receive final approval of its program, Maryland will need to meet the conditions which include completing development of certain aspects of its program addressing agricultural, urban, and marinas and recreational boating sources, as well as the protection of wetlands and riparian areas.

NOAA and EPA have determined that the conditional approval of the Maryland coastal nonpoint program will not result in any significant environmental impacts different from those analyzed in the Programmatic Environmental Impact Statement prepared for the 6217 program and will have an overall beneficial effect on the environment.

1. OVERVIEW

1.A Background

In 1990, Congress enacted section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA), entitled "Protecting Coastal Waters", to help address the problem of nonpoint source pollution and its effect on coastal waters. The purpose of the section is to strengthen the links between Federal and state coastal zone management and water quality programs in order to enhance state and local efforts to manage land use activities that degrade coastal waters and habitats. Section 6217 requires states and territories with federally approved coastal management programs to develop coastal nonpoint pollution control programs (coastal nonpoint programs) and submit them to the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency (EPA) in July 1995 for approval. Once approved, these programs will be implemented through changes to the state nonpoint pollution program approved by EPA under section 319 of the Clean Water Act (CWA) and through changes to the state or territorial coastal zone management program approved by NOAA under the CZMA.

Section 6217 utilizes a two-tiered management approach for the control of nonpoint sources of pollution. The purpose of the first tier is to protect coastal waters generally. It requires that states and territories implement, at a minimum, management measures in conformity with guidance that was developed by EPA in consultation with NOAA and other Federal agencies. The management measures developed by EPA address the nonpoint pollution source categories of urban runoff, agricultural runoff, forestry runoff, hydromodification, and marinas. Management measures must also be implemented for wetlands protection, riparian areas, and vegetated filter strips. Once the first tier of management measures are implemented to protect coastal waters generally, the state or territory will need to develop additional management measures to apply, as necessary, to meet water quality standards and protect designated uses.

1.B Purpose and Need for Action

In March 1996, NOAA published a programmatic environmental impact statement (PEIS) that assessed the environmental impacts associated with the approval of state and territory coastal nonpoint programs. The PEIS forms the basis for the environmental documents NOAA is preparing on each state and territorial coastal nonpoint program submitted for approval. In the PEIS, NOAA determined that the approval and conditional approval of coastal nonpoint programs will not result in any significant adverse environmental impacts and that these alternatives will have an overall beneficial effect on the environment. The analyses presented in the PEIS are incorporated by reference into this environmental assessment (EA).

NOAA has prepared this EA to assess the environmental impacts associated with the approval and implementation of the coastal nonpoint program submitted to NOAA and EPA by the state of Maryland on September 19, 1995. The Maryland program will be approved after a joint NOAA/EPA review if it meets all of the requirements of section 6217 as specified in

the statute and in the program guidance documents. The analysis in this EA also serves to determine whether the impacts associated with program approval are significantly different from those analyzed in the PEIS, so as to require the preparation of an environmental impact statement (EIS).

In 1978, NOAA prepared a final environmental impact statement on the Maryland coastal management program submitted for approval under the Coastal Zone Management Act of 1972. The Maryland coastal management program establishes the boundaries of the coastal area within which the program applies; describes the organizational structure to implement the program; and provides a set of statewide policies applicable to all state and Federal agencies which manage resources along the state's coastline. The information in the FEIS is relevant to this analysis because the section 6217 coastal nonpoint program is to be implemented through the Maryland coastal zone management program, as well as its section 319 Clean Water Act program. Therefore, the Maryland FEIS is incorporated by reference into this EA.

2. ALTERNATIVES

For purposes of this environmental assessment, the proposed action is the conditional approval of the Maryland coastal nonpoint program. The alternatives to the proposed action are to approve the program or to deny approval of the program. The proposed action, its alternatives, and a summary of their environmental consequences are described below.

2.A Approval of Maryland Coastal Nonpoint Program

To assist states and territories in the development of their coastal nonpoint programs, NOAA and EPA jointly published a program development and approval guidance document (NOAA/EPA, 1993). The state and territory programs will be approved after a joint NOAA/EPA review if they meet all of the requirements of section 6217 as specified in the statute and in the program guidance documents. Specifically, the Maryland program must contain the following components:

- o Coordination with Existing State Programs
- o Determination of the 6217 Management Area
- o Implementation of Management Measures in Conformity with (g) Guidance
- o Identification and Implementation of Additional Management Measures
- o Technical Assistance
- o Public Participation
- o Administrative Coordination
- o Identification of Enforceable Policies and Mechanisms

The alternative of approving the Maryland coastal nonpoint program would generally be expected to have a beneficial effect on the environment because it would help to control sources of nonpoint pollution and would result in fewer pollutants reaching the state's coastal waters. For example, the nonpoint program will help to control agricultural runoff of sediment, nutrient-rich fertilizers, and pesticides that hinder growth of submerged aquatic vegetation and other critical habitat in the Chesapeake Bay and Maryland Coastal Bays. The program will help to control stormwater runoff and leakage from failed septic systems that add pollutants, including fecal coliform bacteria, to coastal waters adjacent to rural and urbanizing lands on the Eastern Shore, Southern Maryland, and other areas. The coastal nonpoint program will also make existing programs more effective by strengthening the link between Federal and Maryland State coastal zone management and water quality programs. In their review of the Maryland program, NOAA and EPA have found that the program does not meet all of the requirements of section 6217. Therefore, full approval of the Maryland coastal nonpoint program is not a feasible alternative. The rationale for this decision is discussed below under the conditional approval alternative. However, as discussed below, the conditional approval alternative is expected to result in the same environmental benefits as the approval alternative, provided Maryland satisfies the conditions.

2.B Conditional Approval of Maryland Coastal Nonpoint Program [Preferred Alternative]

NOAA and EPA expect the coastal nonpoint programs submitted for approval to meet all of the requirements of section 6217. NOAA and EPA realize that in some situations, a program may require changes before final approval can be granted. In these situations, NOAA and EPA will grant conditional approval in order to provide states and territories an opportunity to make necessary changes. Conditional approvals are intended primarily to provide additional time to:

- (1) address identified gaps, including obtaining new statutory or regulatory authority, if necessary;
- (2) demonstrate that existing authorities are adequate for ensuring implementation of the management measures; and,
- (3) develop other incomplete program components.

NOAA and EPA will provide up to five years from the time of conditional approval for completion of a coastal nonpoint program. The length of the conditional approval will depend on which program components are subject to conditions and how long it will take to finalize those components.

NOAA and EPA find that the Maryland coastal nonpoint program meets most of the section 6217 requirements and adequately addresses all program components with the exception of the following components. The state will be able to receive final approval of these components by meeting the conditions described below for each component:

- (1) *Agricultural runoff - confined animal facilities, nutrient management, pesticide management, and grazing management measures*

These management measures are in conformity with the (g) guidance but Maryland has not demonstrated that authorities are adequate to ensure implementation. In order to receive final approval, the program must meet the following condition:

- Within one year, Maryland will develop a strategy to implement the confined animal facilities, nutrient management, pesticide management, and grazing management measures throughout the 6217 management area.

- (2) *Urban Runoff - Onsite Disposal System Management Measures*

These management measures are in conformity with the guidance, except measures to limit nitrogen loadings from new OSDS near nitrogen-limited waters and measures to cover inspection and maintenance for existing OSDS. Maryland includes enforceable policies and mechanisms to ensure implementation of the measures throughout the management area. In order to receive final approval, the program must meet the following condition:

- Within three years, Maryland will include in its program management measures to protect nitrogen-limited surface waters and include management measures for inspection and maintenance, in conformity with the 6217(g) guidance.

(3) Marinas and Recreational Boating - Fish Waste, Liquid Material, Petroleum Control, and Boat Cleaning Management Measures

These management measures are in conformity with the guidance but do not include enforceable policies and mechanisms to ensure implementation of the measures throughout the management area. In order to receive final approval, the program must meet the following condition:

- Within one year, Maryland will develop a strategy to implement the fish waste, liquid material, petroleum control, and boat cleaning management measures throughout the 6217 management area.

(4) Wetlands and Riparian Areas

These management measures are in conformity with the 6217(g) guidance, and include enforceable policies and mechanisms to ensure implementation, except that the Maryland program does not apply management measures to existing activities within wetlands and existing activities affecting wetlands. In order to receive final approval, the program must meet the following condition:

- Within three years, Maryland will include in its program management measures for the protection of wetlands and riparian areas that address existing activities within and affecting wetlands and riparian areas that are not currently reviewed under existing permit authorities.

The alternative of conditionally approving the Maryland coastal nonpoint program is expected to have the same beneficial results as would full approval and will avoid the adverse impacts associated with denial of approval, provided Maryland satisfies the conditions. The immediate implementation of the completed portions of the program will begin to fulfill the intent of section 6217 by helping to control sources of nonpoint pollution thus resulting in fewer pollutants reaching coastal waters. Positive socioeconomic benefits will accrue as improvements in coastal water quality resulting from controlling nonpoint pollution increase the aesthetic value of coastal areas thereby benefitting tourism and providing enhanced opportunities for boating and swimming and other water related activities. Improvements in water quality area also likely to improve shellfish harvesting and fisheries. There may be some slight and localized socioeconomic impacts from implementation of management measures and because of restrictions that may result from designation of critical coastal areas.

2.C Deny Approval of Maryland Coastal Nonpoint Program [No Action]

The decision to deny approval of a coastal nonpoint program has the same effect as the "no action" alternative under the National Environmental Policy Act. Although section 6217

requires states to develop and implement coastal nonpoint programs, approval of the programs is not assured until NOAA and EPA find that all the requirements of section 6217 have been met. Denial of approval of a program will have the effect of relying on existing nonpoint control efforts and levying financial penalties on both the state's coastal zone management program and the state's nonpoint pollution program under section 319 of the Clean Water Act. The schedule for such penalties are stipulated in section 6217(c) of the CZARA. The denial of program approval and the imposition of financial penalties may have an adverse environmental effect because it may cause Maryland not to implement management measures that are meant to control coastal nonpoint pollution, restore degraded waters, and protect critical coastal areas.

There are many specific examples of how nonpoint pollution has caused significant water quality problems in the Chesapeake Bay and other Maryland coastal waters. Only 3.7 percent of Maryland's 2,522 square miles of estuarine waters met their designated uses during 1989-1991 (MDE, 1993). All of these waters are classified as "threatened." Excessive nutrients were the primary cause of water quality problems, with elevated bacteria levels and sedimentation also responsible. Nonpoint sources were found to be the cause of virtually all estuarine water pollution. Low dissolved oxygen conditions, or hypoxia, occur in the central channel of the middle and lower Chesapeake Bay, Baltimore Harbor, and the lower to middle Potomac River, while algal blooms have a direct impact on water quality conditions in several Chesapeake Bay tributaries and Eastern Shore coastal lagoons. Several square miles of shellfish harvesting areas are restricted in Chesapeake Bay tributaries and Isle of Wight Bay due to stormwater runoff, boating activity, seafood processing, and animal waste, combined with poor flushing of the estuarine waters.

NOAA and EPA have reviewed the Maryland coastal nonpoint program and found that the program meets most of the requirements of section 6217. Therefore, denying approval is not the preferred alternative.

3. AFFECTED ENVIRONMENT

As required by section 6217(a), the geographic scope of each coastal nonpoint program must be sufficient to ensure implementation of management measures to "restore and protect coastal waters." Pursuant to section 6217(e), NOAA, in consultation with EPA, made recommendations to each state and territory on the geographic scope of its program (also known as the "6217 management area"). This recommendation was based on the extent of coastal watersheds in each state and territory. A state or territory was not required to adopt NOAA's exact boundary recommendation; they could propose an alternative 6217 management area at the time of program submission.

The boundary of the 6217 management area proposed by Maryland is identical to the state's existing coastal zone and extends from the state's three mile jurisdiction in the Atlantic Ocean to the inland boundaries of the counties bordering the Atlantic Ocean, the Chesapeake Bay, and the Potomac River up to the District of Columbia (includes 16 counties and the City of Baltimore). Maryland's 6217 management area includes the Chesapeake Bay, the Atlantic coast, and the Coastal Bays (See Figure 1).

Because the actual geographic scope of each coastal nonpoint program was unknown during the preparation of the PEIS, that document used NOAA's original recommendation - coastal watersheds - for purposes of generally describing the environment to be affected. The description of the environment in the PEIS was of a general nature because of the widely diverse areas encountered across all of the twenty-nine states and territories that were expected to submit coastal nonpoint programs. The description of the environment in the Maryland 6217 management area is based on the PEIS, the EIS prepared by NOAA during approval of Maryland's coastal zone management program, and the Maryland coastal nonpoint program submission.

3.A The Physical Environment

1. The Maryland 6217 Management Area

As stated above, NOAA selected coastal watersheds as its basic recommendation for all state and territory 6217 management areas. After evaluating all coastal watersheds in Maryland for significant indicators of pollution potential, NOAA and EPA recommended to Maryland that a 6217 management area which encompasses the coastal watersheds is necessary "to control sources of pollution that, individually or cumulatively, significantly impact the state's coastal waters." Maryland presented data showing that the state's existing coastal zone covers an area extensive enough to control such sources of nonpoint pollution. NOAA and EPA have accepted Maryland's alternative 6217 management area. Thus, the Maryland 6217 management area encompasses the existing coastal zone, approximately 66 percent of the state's land area.

Maryland

Major Watersheds

Watersheds draining entirely or partially to state coastal waters:

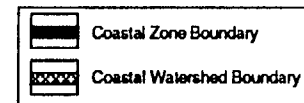
Coastal Drainage Area	M105 (shared with DE)
Chincoteague Bay	M110 (shared with VA)
Chesapeake Bay (Patuxent River)	M120a
Chesapeake Bay (Potomac River)	M120b (shared with VA and DC)
Chesapeake Bay (Chester River)	M120f
Chesapeake Bay (Choptank River)	M120g
Chesapeake Bay (Tangier/Pocomoke Sounds)	M120h (shared with VA)
Chesapeake Bay (other than subsystems)	M120z (shared with VA)

Watersheds draining to coastal waters of another state:

Mississippi River	G180
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The Coastal Zone (CZ) in Maryland is defined by the following coastal counties: Cecil, Harford, Baltimore, Baltimore City, Anne Arundel, Prince Georges, Charles, Calvert, St. Marys, and all eastern shore counties.

The Coastal Watershed (CW) is a hydrologically defined area considered for analysis purposes as an alternative to the existing coastal zone. The boundary of the CW is defined by the inland extent of U.S. Geological Survey hydrologic cataloging units that contain the upstream extent of tidal influence or, in the Great Lakes region, are located adjacent to the coast (see discussion of Method enclosed for more detail on the CW).



Note: Italicized code indicates a Coastal Drainage Area (CDA)

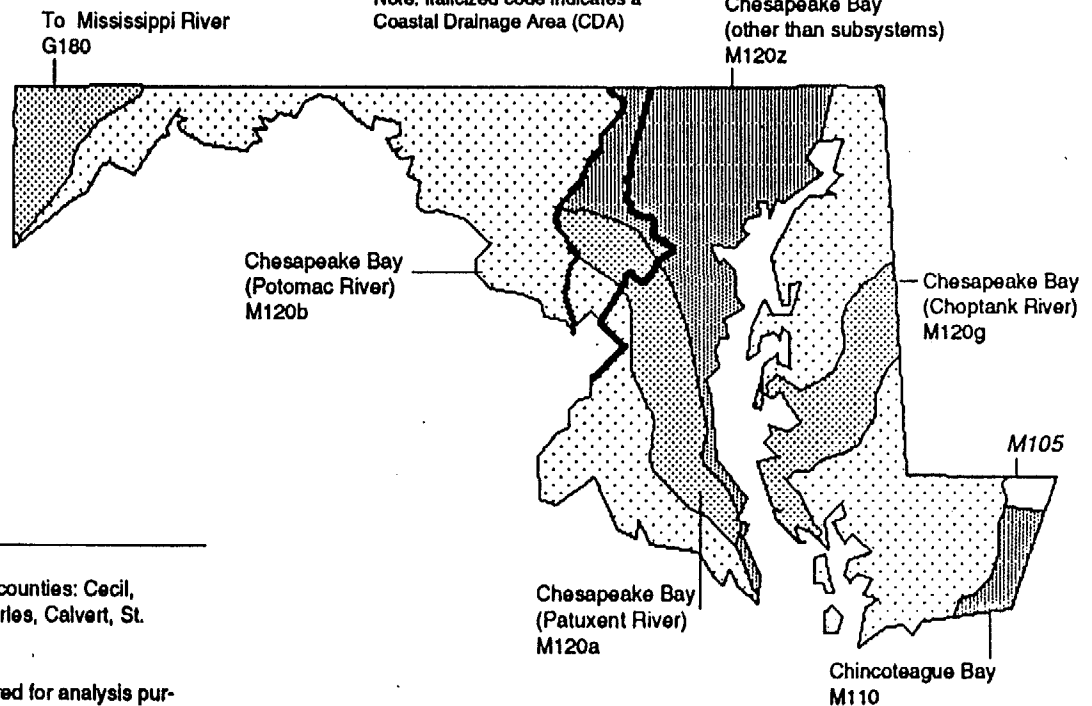


Figure 1. Coastal Watersheds, Coastal Watershed Boundary, and Coastal Zone Boundary for Maryland (NOAA, 1992).

2. Coastal Environment

Maryland's coastal zone extends from the state's three mile jurisdiction in the Atlantic Ocean to the inland boundaries of the counties bordering the Atlantic Ocean, the Chesapeake Bay, and the Potomac River up to the District of Columbia (includes 16 counties and the City of Baltimore). Maryland's coastal zone includes the Chesapeake Bay, the Atlantic coast, and the Coastal Bays.

a. Aquatic Resources

Aquatic resources within Maryland's 6217 management area are found in three distinct areas: the Chesapeake Bay; Atlantic Coastal Bays; and the three-mile extent of the state's coastal ocean boundary. Although some flora and fauna are common to more than one area, the community dynamics and biotic conditions of the three areas are different.

The Chesapeake Bay is the nation's largest estuary. The Bay and the land directly bordering it owe their origin to fluctuating sea levels during the Pleistocene period. The Bay is at most 10,000 years old, and much of it may be very much younger. Despite its comparative youth, the Bay is of impressive dimensions. The main stem of the Bay covers 1,310 miles in length and has a mean width of 15 miles. It has over 3,000 miles of greatly indented shoreline. The Bay's watershed is 64,000 square miles (over 28 times larger than the surface area of the Bay) and includes land in six states and the District of Columbia. Ninety-four percent of Maryland's land area drains into the Chesapeake Bay.

Over half the fresh water contributed to the Chesapeake Bay is from the Susquehanna River. Other major sources are the Potomac, Rappahannock, and James Rivers. A 1968 study also found the Susquehanna also contributes 600,000 tons of sediment per day to the upper bay, consisting primarily of silt and clay particles. Along with sedimentation, the Bay must cope with erosion. Thousands of miles of shoreline are subject to the effects of wind and waves. In some places the shoreline has receded over 2,000 feet in a 90-year period.

The salt content of the Bay varies from nearly full sea water at the mouth of the Bay to that of the inflowing fresh water of the Susquehanna River at the head of the Bay. The western side of the Bay also has a lower salinity level than the east.

The Chesapeake Bay has an extremely varied biota. Freshwater and estuarine resident species of flora and fauna are complemented by transitory marine species. These additions, usually seasonal, add to the overall diversity and dynamics of the Bay. Well-known for its commercially harvested shellfish such as blue crab and oysters, the Bay's habitat supports about 2,700 plant and animal species. Migratory birds and waterfowl use the Bay as a stop on the Atlantic Flyway. Canada geese and whistling swans winter on the Bay, which also provides habitat for bald eagles and osprey. The tributaries of the Bay are spawning and nursery sites for several important species of salt water fish, including white perch, striped bass, and shad. Much has been written on the Chesapeake Bay. For more information on the Bay, the following reports are suggested: *Chesapeake Bay: Introduction to An Ecosystem* (EPA June 1989), *Chesapeake Bay Program Technical Studies: A Synthesis* (EPA September 1982), *Habitat Requirements For Chesapeake Bay Living Resources* (2nd Edition, June 1991. Edited by Steve Funderburk et al. Prepared by the Chesapeake Research Consortium for the Chesapeake Bay Program), and the

Environmental Atlas of the Potomac Estuary (Alice Lippman et al. Prepared for Maryland Department of Natural Resources).

Maryland has a 31-mile Atlantic Ocean coastline consisting of the barrier islands of Assateague and Fenwick. The formation of barrier islands has led to the development of a series of estuaries. The islands shelter Assawoman, Isle of Wight, Sinexent, and Chincoteague Bays, known as the Maryland Coastal Bays. The length of the Coastal Bays system is approximately 44 miles, from the Maryland-Delaware boundary to the Chincoteague Inlet. In width, however, the system varies from four miles to only 0.25 mile. The Coastal Bays are shallow and quite saline. Maryland's portion of the Coastal Bays watershed is 174.6 square miles, or about 1.7 times the surface area of the bays. Additional information on the Coastal Bays is available in the report *Maryland's Coastal Bays -- An Assessment of Aquatic Ecosystems, Pollutant Loadings, and Management Options*, prepared in 1993 by the University of Maryland's Center for Environmental and Estuarine Studies.

The biota of Maryland's nearshore coastal ocean are marine species common to the Atlantic Ocean. Benthos invertebrates are extremely diverse and abundant, and a variety of mollusks are found in or adjacent to Maryland's three-mile area of jurisdiction. Finfish populations consist primarily of species common to the mid-Atlantic area.

3.B Terrestrial Environment and Land and Water Uses

This section provides a description of the terrestrial environment and the land and water users and uses in the Maryland 6217 management area. The Maryland coastal zone supports extensive and varied commercial and recreational activities. The intensity and nature of land and water uses in many areas has threatened and degraded coastal water quality.

1. Land Resources

Maryland spans three physiographic provinces known as the Coastal Plain, Piedmont Plateau, and the Appalachian Provinces. They parallel the Atlantic shoreline in belts of varying width from New England to Florida. These provinces are underlain by rock strata of different types and geologic ages.

The boundary between Maryland's Coastal Plain and Piedmont Plateau Province is evident in stream valleys where the softer cretaceous formations of the Coastal Plain are more easily eroded than the hard crystalline rock of the Piedmont Plateau, resulting in the formation of rapids and spectacular waterfalls. This boundary has had historical and social significance since it marked the head of navigation (e.g., Port of Baltimore) and furnished water power for mills and other industry.

Maryland's Coastal Plain falls within the northern embayed portion of the Atlantic Coastal Plain physiographic province. This area is characterized by drowned river systems and barrier beaches. At the end of the last ice age (Pleistocene), the melting of the glaciers caused sea level to rise, flooding river valleys all along the Atlantic coast. The Coastal Plain slopes gently seaward from the boundary between it and the Piedmont Province and continues off Maryland's coast for approximately 100 miles. Maryland's Coastal Plain in general is

characterized by sedimentary deposits of low topographic relief ranging in age from present day sediments to sediments of approximately 140 million years ago.

Maryland's Coastal Plain can be broken in two distinct subdivisions; the Eastern and Western Shores of the Chesapeake. The Western Shore is characterized by rolling uplands (four times the elevation of the Eastern Shore) bound by deep stream valleys. The Western shoreline often takes the form of steep bluffs or cliffs with narrow beaches at the base. The Eastern Shore, on the other hand, is a flat almost featureless plain whose shoreline gradually grades into marshes in the southern portion. Bluffs are common in the northern portion of the Eastern Shore as well as in the Western Shore counties.

The bedrock of the Coastal Plain is composed of layers of relatively unconsolidated sand and clay with small amounts of gravel. Mineral resources include iron ore (at least "carbonaceous ore", an early source of iron), mineral earth pigments, clay (for brick) and sand and gravel. Maryland's Coastal Plain soils, east of Chesapeake Bay, consist of interstratified, sandy, silty, clay, or gravel sediments. West of the Bay the surface sediments are older, more dissected, and more severely eroded. The nearly level to gently rolling features of the Coastal Plain make it well suited for agriculture. The Coastal Plain sediments are naturally acidic, but may be only slightly acidic or neutral where they have been farmed extensively and limed frequently. Approximately 120 soil series and 300 soil types are found in the Coastal Plain. In general, the soils of the Coastal Plain have more marked contrasts between well and poorly drained profiles than do the soils of the Piedmont and Appalachian provinces. The average growing season is 200 days. Maryland averages 41" of precipitation per year, with average monthly precipitation ranging from 2.0" in the winter to 4.4" in the summer. Long droughts are rare; short droughts of little significance to agriculture are common. Prevailing winds are from the NW from October-April and from the S and SW from May-September.

2. Living Resources - Land

The variety of vegetative communities found in the 6217 management area range from typical dune and maritime forest communities on Maryland's barrier islands to the freshwater marshes and oak-hickory forests bordering the northern portions of Chesapeake Bay. Over 300,000 acres of tidal marsh, divided among 30 community types, are still found in Maryland.

Maryland's Atlantic coast is bounded by barrier islands where typical dune communities are found. Beach grasses grade into dense shrub thickets backed by forests of loblolly pine and pitch pine. The marsh communities also occupy extensive areas in the southern counties bordering Chesapeake Bay. Other marsh species such as salt grass (*Distichlis* sp.) and black needlerush (*Juncus* sp.) are intermixed with cordgrass. The composition of Maryland's tidal marsh communities varies both from mouths to the headwaters of the tributaries and from southern to northern portions of the Bay. The differences are primarily due to the progressive lessening of salt content in the water farther away from the ocean.

Along the streams of the lower Eastern Shore, the tidal marshes grade into upland swamps. Typically red maple, blackgum, and sweetgum dominate these areas. Along the Pocomoke River, large stands of cypress swamp can be found. In these areas bald cypress and blackgum predominate with green ash and, rarely, Atlantic white cedar as associate species.

The upland forests of the Lower Eastern Shore are dominated by two species, loblolly pine and Virginia pine. This southern pine forest association is most common in the southern Eastern Shore counties.

Along the borders of the northern counties, the marshes are typically dominated by salt meadow (*Spartina patens*) cordgrass which quickly grades into cattails and sedges. The upland forests are predominantly mixed hardwoods with oaks, hickory and sweetgum being the dominant species. Oak-pine forests are also scattered throughout.

Maryland's coastal areas provide a wide variety of wildlife habitat for both game and non-game species, from the ocean and barrier islands to freshwater marsh and upland forest. Maryland's wetlands support a wide array of wildlife, including Canada geese and ducks which use the marshes and estuaries of the Chesapeake Bay for resting and wintering. The marshes are also valuable as breeding and brood-rearing areas for waterfowl such as black ducks, mallard, and bluewinged teal. Large numbers of sandpipers, plovers, and other shorebirds use the marshes during their migration.

The endangered Bald Eagle is dependent on Maryland's wetlands. The largest breeding population of eagles in the eastern U.S. north of Florida occurs in the Chesapeake Bay region, and Maryland contains the majority of active nests. The Bay region also contains the highest breeding concentration of Ospreys in the United States. Many species of songbirds also use Maryland's wetlands, including the rare Swainsons Warbler which nests in the Pocomoke Swamp.

Numerous fur-bearing animals, such as muskrat, river otter, raccoon, and mink are found in the wetlands of the Coastal Plain. Upland wildlife such as deer, rabbits, and bobwhite quail frequently enter wetlands for cover and food.

Chincoteague and Sinepuxent Bays, behind the barrier islands, are bordered by large expanses of salt marsh dominated by the salt marsh meadow cordgrasses (*Spartina* sp.). These marshes are typically backed by shrub communities of marsh eider and high tide bush (*Ira* sp. and *Bacharis* sp.).

The diversity of upland wildlife habitats of Maryland's Coastal Plain supports many species of upland wildlife. Bald eagles use extensive pine-oak forest adjacent to marshes and open water for nest sites. On the Eastern Shore, the forests support the entire population of the endangered Delmarva Fox Squirrel. Deer are common throughout the Coastal Plain and the old fields and hedgerows of the Eastern Shore produce large numbers of bobwhite quail. Many species of songbirds are found in the various upland habitats, and several of them approach the northern limits of their range in Maryland.

3. Population

The Chesapeake Bay watershed is home to over 15 million people; and over 4.7 million people reside in Maryland's portion of the watershed. The state's population is expected to increase by 28 percent between 1990 and 2020. Most of the population is concentrated around Baltimore City and Washington, D.C. Coastal population density is projected to increase from 507 persons per square mile in 1990 to 562 in 2010, a level higher than the statewide average (NOAA, 1990b). Anne Arundel, Charles, and Calvert Counties will be among the fastest growing coastal counties in the Northeast between 1990 and 2010.

The Coastal Bays are located within Worcester County (total population 35,000). The county's population is projected to increase by about 20% by the year 2000. The land use around the lower bays is primarily agricultural; developed land is mainly confined to the upper bays.

4. Social and Economic Activities

The type and extent of land and water uses in the 6217 management area is an indication of the pollutants entering Maryland coastal waters and the extent to which the environment of the surrounding watershed has been altered. Agriculture and urban development generate most of the pollutants entering coastal waters.

a. Agriculture

Despite considerable conversion of coastal farmland to residential and commercial uses, agriculture continues as an important economic activity in Maryland. According to 1987 data from the Maryland Office of Planning, close to 41 percent of the State's land is devoted to agriculture (MDE, 1993). There are 7,529 farms in Maryland's 6217 management area, consisting of more than 1.1 million acres of agricultural land (1992 Agricultural Census for Maryland).

The largest crops in Maryland's 6217 management area by harvested acreage are: soybeans (495,800 acres), grain corn (320,600), and wheat (185,700). Corn grain yielded 37.8 million bushels in 1990, soybeans yielded 16.1 million bushels, wheat yielded 7.9 million bushels, and tobacco yielded 9.6 million pounds (MDA, 1990a, 1994).

b. Forestry

Approximately 44 percent of Maryland's coastal plain is forested (MDE, 1993). The upland forests are predominantly mixed hardwoods with oaks, hickory, and sweetgum being the dominant species. Oak-pine forests are also scattered throughout. The upland forests of the lower Eastern Shore are dominated by two species; loblolly pine and Virginia pine. This southern pine forest association is most common in the southern Eastern Shore counties.

Maryland's forest industry is the fifth largest in the State. In the western counties, it is the single largest industry, and on the Eastern Shore it is second behind agriculture. The industry directly employs more than 15,000 workers and in total supports some 40,500 jobs. The economic impact of forest products equates to \$421 million in payroll with the indirect effect topping \$1 billion (Maryland Department of Business and Economic Development, 1994). Most of the harvesting and primary manufacturing occurs in western Maryland and the Eastern Shore, while most of the secondary manufacturing is found in the central, more populated areas of the State.

About 90 percent of Maryland's forests are classified as timberland, defined by the U.S. Forest Service as capable of producing a commercial stand and is available for harvesting. The ten percent not classified as timberland is made up of forests found in state parks, wildlands, urban forest, and Christmas tree plantations. Of all timberland in Maryland, about 90 percent is owned by private citizens (U.S.D.A. Forest Service, Forest Statistics for Maryland - 1976 and 1986, 1988).

In 1988, 85 million board feet of pine and other softwoods and 100 million board feet of hardwoods were reported as harvested in Maryland. In 1986, 62.5 million cubic feet or 781,250 cords of firewood were harvested. Generally, growing stock growth exceeded harvests across the State by nearly 70 percent. The exception was the lower Eastern Shore where pine growing stock removals were more than double growth and hardwoods growing stock removals were about five percent over growth (U.S.D.A., 1988)

c. Urban

Maryland had a 1990 population of more than 4.7 million people, with a projected growth of 28 percent by 2020. Maryland's population density is 428 people per square mile, sixth-largest in the United States (Boyd, 1987). Coastal population density is 507 people per square mile (NOAA, 1990b). Due to this fact and the continuing conversion of agricultural and forested lands into residential and commercial land uses, urban runoff is a major source of nonpoint pollution to Maryland's coastal waters. In 1987, developed land comprised more than 11 percent of the State's land area (MDE, 1993).

The center of population is in Baltimore City and the Baltimore/Washington suburbs; the fastest growth is occurring in the coastal "exurban" counties of this major metropolitan area. Of the 16 counties in Maryland's 6217 management area, ten saw their population double between 1950 and 1986 (Lott, 1992). Anne Arundel, Calvert, Charles, Harford, and Prince George's Counties all grew by more than 200 percent during this period. Between 1970 and 1989, Maryland coastal localities issued more than 440,000 building permits, and Worcester County - home to the resort of Ocean City and Maryland's Coastal Bays - led the nation in new multi-unit homes per capita

Not only is the population of Maryland's coastal areas increasing, but urban development is continuing to disperse. In just the seven years from 1978 through 1985, the amount of land devoted to urban uses grew by 80 percent in Calvert County, and by 19, 16, and 13 percent in Prince George's, Anne Arundel, and Baltimore Counties, respectively (Lott, 1992). Dispersed, low to medium density "sprawl" development will increase nonpoint source pollution to Maryland's coastal waters. The Maryland Office of Planning has estimated that current trends of population growth and development will result in the conversion of 695,000 acres of forest and farmland, and production of an additional 4.1 million tons of sedimentation and 100,000 tons of nitrous oxides by the year 2020. Costs to local governments associated with this development, including roads, schools, utilities, and other infrastructure, are \$7.7 billion (Governor's Commission on Growth in the Chesapeake Bay Region, 1991a, 1991b, 1991c).

d. Marinas

Recreational boating activities are a major use of Maryland's coastal waters. In 1989 Maryland boaters spent over \$324 million to purchase and keep their craft afloat. In 1990 there were over 177,000 boats registered in Maryland. The state has 302 marinas with over 30,000 slips, and approximately 12,000 dry storage areas, more than any other northeastern state. In addition, Maryland has 1,547 moorings and 170 boat ramps (COPR, 1992).

TABLE 1 Type of Marina Facilities in Maryland

Marinas	302
Slips	30,741
Drybays	11,941
Moorings	1,547
Launching Ramps	170 (COPR, 1992)

e. Fisheries

Commercial fishing is an important economic and cultural activity in Maryland. Chesapeake Bay watermen plying their trade are a potent symbol of Maryland's identity. In 1993, close to 85 million pounds of seafood worth over \$53 million were caught in Maryland waters. That includes the 25 million pounds of crabs (worth \$5.5 million) and the 2 million pounds of oyster meat brought in annually by Maryland's 4,000 licensed crabbers and oystermen. In addition, Maryland fishermen brought in 20,000 pounds of scallops and 8.4 million pounds of clams in 1989 (COPR, 1992).

4. ENVIRONMENTAL CONSEQUENCES

Management measures are defined in section 6217 as economically achievable measures to control the addition of pollution to coastal waters, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives. As required by the statute, EPA developed guidance (USEPA, 1993) specifying management measures for the following nonpoint pollution source categories: agricultural runoff, urban runoff, forestry runoff, marinas, hydromodification, and wetlands, riparian areas, and vegetated treatment systems. Coastal nonpoint programs must provide for the implementation of management measures that are in conformity with this guidance. The guidance also lists and describes management practices that EPA has found to be representative of the types of practices that can be applied successfully to achieve the management measures. State and territory programs are not required to specify practices, but must include a process for selection of practices that will achieve the measures.

NOAA's PEIS discussed the fifty-six management measures and their function in preventing environmental degradation caused by the pollutants associated with each nonpoint source category. Each coastal nonpoint program must address each of the management measures by either: (1) providing for the implementation of that measure or an alternative as effective; or (2) justifying why the management measure is not included in the program. States and territories may exclude nonpoint source categories or subcategories where the sources do not exist or do not, individually or cumulatively, present significant impacts to coastal waters.

4.A MANAGEMENT MEASURES IMPLEMENTATION

1. ENVIRONMENTAL IMPACTS

The Maryland coastal nonpoint program provides for the implementation of management measures for agriculture, forestry, urban, marina, and hydromodification nonpoint source categories, and for wetlands, riparian areas, and vegetated treatment systems. The full text of all management measures and a statement of their applicability can be found in Appendix A.

a. Agricultural Nonpoint Pollution Source Category

Agriculture makes up close to 40 percent of Maryland's land (MDE, 1993). There are 7,529 farms in Maryland's 6217 management area, consisting of more than 1.1 million acres of agricultural land (1992 Agricultural Census for Maryland).

The largest crops in Maryland's 6217 management area by harvested acreage are: soybeans (495,800 acres), grain corn (320,600), and wheat (185,700). Corn grain yielded 37.8 million bushels in 1990, soybeans yielded 16.1 million bushels, wheat yielded 7.9 million bushels, and tobacco yielded 9.6 million pounds (MDA, 1990a, 1994).

Agriculture is the primary source of excess nutrients (nitrogen and phosphorus) and sediments entering the Chesapeake Bay. In 1985, of the 44.95 million pounds per year of nitrogen entering the Bay through nonpoint sources, 27.94 million lbs/yr were from agricultural operations (63 percent). For phosphorus, agriculture contributed 77 percent of the nonpoint source loadings (MDE, 1995). In addition, Maryland's 1994 305(b) report has identified 947 miles of rivers/streams as impaired due to agriculture (MDE, 1995).

A 1988 survey of pesticide use in Maryland conducted by the State's Department of Agriculture shows the herbicides metolachlor (1,810,000 pounds of active ingredient applied during the year) and atrazine (1,170,000 pounds) to be the most common pesticides used in Maryland. The most common insecticide is chlorpyrifos (318,000 pounds) (MDA, 1990b).

In the State's coastal nonpoint program submittal, Maryland proposed an exclusion of the Irrigation Water Management measure. There are 874 farms in Maryland's 6217 management area with irrigated land, with a total of 53,949 irrigated acres. Approximately 4.4 percent of total cropland and 5 percent of harvested cropland in the management area is irrigated (1992 Census of Agriculture). According to the Maryland Department of Agriculture, irrigated land contributes no more than two to three percent of nutrient loadings to coastal waters. There are only three farms in the 6217 management area using chemigation, and all use anti-backflow devices. The State has presented sufficient justification to indicate that nonpoint pollution from irrigation does not and is not reasonably expected to have significant adverse impacts on the State's coastal waters.

Management measures for the following five subcategories of sources of agricultural nonpoint pollution that affect Maryland's coastal waters will be implemented as part of the State's coastal nonpoint program:

- o Erosion and sedimentation
- o Confined animal facilities
- o The application of nutrients
- o The application of pesticides
- o Grazing

The Environmental Consequences section of the PEIS contains a description of the primary pollutants in agricultural runoff and an analysis of the impacts of these pollutants on water quality. The management measures are designed to prevent the environmental degradation caused by these pollutants.

The implementation of agricultural management measures will reduce the generation of nonpoint source pollutants from agricultural activities and minimize the delivery of pollutants from agricultural lands to surface and ground waters. Agricultural management measures emphasize the control and removal of the sediment, nutrients, and pesticides entrained in runoff before they enter coastal waters. The management measures for confined animal facilities are intended to eliminate the pollutants leaving a facility by storing runoff and

reducing the amount of facility wastewater and manure reaching a waterbody. The nutrient and pesticide management measures will promote a more efficient use of fertilizers and pesticides by limiting the amount of nitrogen, phosphorus, and chemicals applied to agricultural lands thereby reducing their runoff and leaching into surface and ground waters. management measures for grazing and irrigation will protect sensitive areas such as streambanks and wetlands from damage by grazing of domestic livestock and promotes the more efficient use of irrigation water. This will improve aquatic habitat and reduce the total pollutant discharge from irrigation systems.

The environmental benefits that result from the implementation of management measures for agricultural runoff based on the existing State programs and authorities discussed below will be enhanced by fulfillment of the conditions listed in Section 2.B. of this Environmental Assessment. Implementation of the coastal nonpoint program will be aided by Maryland's certification program for private nutrient management consultants.

Management Measures for Agricultural Sources

1. Management Measure for Erosion and Sediment Control

This management measure is intended to be applied to activities that cause erosion on agricultural land and on land that is converted from other land uses to agricultural lands. Agricultural lands include:

- Cropland;
- Irrigated cropland;
- Range and pasture;
- Orchards;
- Permanent hayland;
- Specialty crop production; and
- Nursery crop production.

The management measure for erosion and sediment control will be implemented by the following programs:

- The development of Soil Conservation and Water Quality (SCWQ) plans. SCWQ plans address all agricultural nonpoint source pollution on farms, including sediment. SCWQ plans call for the implementation of Best Management Practices (BMPs). BMPs are used to control erosion in accordance with the erosion component of a Conservation Management System as defined in the Field Office Technical Guide of Natural Resources Conservation Service (NRCS). BMPs are recommended by Soil Conservation District (SCD) personnel and implemented to prevent long-term soil degradation, resolve existing or potential off site deposition problems and minimize contamination of receiving waters. Typically, the Maryland Department of Agriculture (MDA) enters into an agreement with each SCD. The State provides funding and personnel resources to the SCDs and the State and SCDs agree to cooperate in order to achieve specific nonpoint source goals.

- The state Nontidal Wetlands law requires landowners conducting non-exempt agricultural activities that adversely impact nontidal wetlands, to implement BMPs through a SCWQ plan. The law states that the intent of the BMPs will include control of soil loss and minimization of sediment deposition in wetlands and practices may include conservation tillage and filter strips.

- The Agricultural Land Preservation Program requires all farms to have a SCWQ plan in order to be eligible to participate in the program.

- The Chesapeake Bay Critical Area Program requires all agricultural land in the Critical Area to have a SCWQ plan. Approximately 13% of the coastal zone is covered by the Critical Area. SCWQ planning is typically done on the entire farm, not just the portion within the 1000-foot Critical Area. Since farm property boundaries generally exceed the Critical Area boundary, a much higher percentage of farm land is planned than is required. An average of 34% of land in the coastal zone, and as much as 69% of the land in an individual county actually have SCWQ plans in place as a result.

- The Agricultural Water Management Program regulates agricultural public drainage facilities and applies to over 800 miles of drainage ditches in the coastal zone. The state's Public Drainage Regulations mandate that agricultural land benefitted by the facilities have a SCWQ plan. Approximately 62,225 acres of cropland is benefitted by public drainage facilities in Maryland.

- The Agricultural Sediment Control Law and Regulations require a Corrective Action Water Quality Plan or an adjustment to an existing SCWQ plan to correct identified erosion problems.

- The Maryland Agricultural Water Quality Cost Share Program (MACS) provides financial incentives to farmers to implement BMPs in accordance with the erosion component of a conservation management system to control erosion for water quality protection. The MACS program provides up to 87.5% of the cost of installing eligible BMPs to protect water quality.

- Implementation of the Chesapeake Bay Tributary Strategies is expected to increase compliance with the management measure. Implementation teams established for each tributary are monitoring the progress of BMP application. In 1997, the teams will have the authority to recommend additional actions if the goals of the strategies are not being met.

2. Management Measure for Facility Wastewater and Runoff from Confined Animal Facility-Management (Large and Small Units)

These management measures are intended to be applied to confined animal facilities. Application of these measures will reduce the volume of runoff, manure, and facility wastewater reaching a waterbody.

Management measures for large and small confined animal facilities will be implemented by the following programs:

- Soil Conservation and Water Quality Planning (SCWQ) addresses all agricultural nonpoint source pollution on farms, including animal waste. SCWQ planning can be applied to all aspects of this management measure through the use of BMPs. BMPs that

address runoff and waste from confined facilities are implemented individually or as part of a waste management system. A system may address roof runoff, barnyard management, manure management and storage, and/or nutrient management depending on site specific needs. SCWQ planning is accomplished through voluntary efforts. Maryland targets resources to farms with concentrated animal populations.

- The Agricultural Land Preservation Program requires all farms to have a SCWQ plan in order to be eligible to participate in the program.

- The Chesapeake Bay Critical Area Program requires all farms to have a SCWQ plan. (see description under the Erosion and Sediment management measure). SCDs are responsible, under mandated local protection programs, for assuring that all agricultural activity permitted within the Chesapeake Bay Critical Area use BMPs to control nutrient runoff in accordance with a SCWQ plan. SCDs must assure that animal feeding operations, including retention and storage ponds, feed lot waste storage and manure storage minimize the contamination of water bodies.

- Maryland's Nutrient Management Program helps farmers to utilize all nutrient sources such as commercial fertilizer, sewage sludge and animal waste effectively. Nutrient management technical assistance and information is provided by nutrient management consultants. Through a contractual agreement between the University of Maryland Cooperative Extension Service (CES), and MDA, 23 nutrient management consultants are supported to provide this assistance. All counties in the coastal zone have one or more of these consultants assigned to them. In 1992, MDA established a Nutrient Management Certification Program. Professionals in public or private sector that meet established qualifications and pass a certification exam are eligible to become nutrient management consultants. There are regulatory standards and plan content requirements that certified nutrient management consultants must use in the development of a nutrient management plan

- Maryland Agricultural Water Quality Cost Share Program (MACS) provides financial incentives for farmers to implement BMPs that store confined animal facility waste water and solids and reduce facility runoff. The MACS program provides up to 87.5% of the cost of installing eligible BMPs to protect water quality and up to \$35,000 for waste storage facilities. Since 1990, waste management plans must include a nutrient management plan component in order to receive MACS for proper waste utilization.

3. Nutrient Management Measure

This management measure is intended to be applied to activities associated with the application of nutrients to agricultural lands. Application of this measure will reduce the amount of nutrients entering both ground and surface waters.

The management measure for the application of nutrients will be implemented by the following programs:

- Soil Conservation and Water Quality Planning (SCWQ) addresses all agricultural nonpoint source pollution on farms, including nutrients.

- Farmers seeking use of state funds for certain practices under the Maryland Agricultural Water Quality Cost Share Program are required to develop and implement a

nutrient management plan addressing all farm nutrient use as a condition for grant eligibility. Nutrient management plans are an eligibility requirement for cost sharing construction of animal waste storage facilities and poultry mortality composters.

- The Chesapeake Bay Critical Area regulations require farms in the Critical Area to be managed under a SCWQ plan. Several resource issues, including nutrient management, are singled out under this regulation for attention. These regulations are implemented through local Critical Area Programs. The Soil Conservation Districts (SCDs) are responsible for providing technical assistance to farmers and approving the SCWQ plans.

- Through a policy agreement among MDE, MDA, USDA Natural Resources Conservation Service (NRCS) and the Maryland Cooperative Extension Service (CES), agricultural landowners found in violation of water quality regulations because of polluting conditions caused by animal waste may be required to obtain a nutrient management plan as part of the corrective action required.

- In addition, MDE requires that the rates of sludge application be calculated to provide proper nutrient management in accordance with the requirements of MD. REGS. CODE tit.15 §15.20.04 (Nutrient Management Certification and Licensing). All sewage sludge applications on agricultural land require a permit issued by MDE. The permit requires the submission of documentation on the application site, including the field locations, slopes, water bodies, plus the physical and chemical characterization of the soils and sludge, and contains restrictions on the application of the sludge for environmental protection. All farms permitted to receive sewage sludge are to be covered by a nutrient management plan by the 1995 growing season.

- Maryland's program includes the participation of private nutrient management consultants as part of its service delivery network and through certification and licensing has added over 170 people to its public sector team, totaling 285 people with the expertise to provide these services.

- The Chesapeake Bay Tributary Strategies rely heavily on the implementation of agricultural nutrient management plans. Draft goals have been set by watershed to achieve required nutrient reductions.

4. Pesticide Management Measure

This management measure is intended to be applied to activities associated with the application of pesticides to agricultural lands. Application of this measure will reduce the amount of pesticides entering both ground and surface waters.

The management measure for the application of pesticides will be implemented by the following programs:

- The Maryland Pesticide Applicators Law and Regulations provides state authority to MDA to enforce pesticide regulations within Maryland. MDA must, as state lead agency for the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) in Maryland, ensure that all pesticides are used according to their label directions by all individuals. This is done through compliance monitoring activities (routine inspections, use observations, and incident and misuse complaints). A licensed company or public agency must register with

MDA, each employee who performs pest control. Each registered employee is trained in all aspects of pesticide application including pesticide handling and storage and must pass a closed book exam to become certified as a pesticide applicator.

5. Grazing Management Measure

This management measure is intended to be applied to activities on range, irrigated and nonirrigated pasture, and other grazing lands used by domestic livestock. Its focus is on the riparian zone, but this measure also encourages the control of erosion from range, pasture, and other grazing lands above the riparian zone. Application of this management measure will improve aquatic habitat by reducing the amount of pollutants entering waters through proper livestock management.

The management measure for grazing will be implemented by the following programs:

- Please refer to the management measures for erosion and sediment control and nutrient management.

Condition

The confined animal facility (large and small units), nutrient management, pesticide management, and grazing measures are approved subject to the following condition:

- Within one year, Maryland will develop a strategy to implement the confined animal facilities, nutrient management, pesticide management, and grazing management measures throughout the 6217 management area.

b. Forestry Nonpoint Pollution Source Category

Forest lands make up more than 43 percent of Maryland's land area (MDE, 1993). Forest lands continue to be developed into residential and commercial land uses wherever forests are found in Maryland's 6217 management area.

Maryland's forest industry is the fifth largest in the State. In the western counties, it is the single largest industry, and on the Eastern Shore it is second behind agriculture. The industry directly employs more than 15,000 workers and in total supports some 40,500 jobs. The economic impact of forest products equates to \$421 million in payroll with the indirect effect topping \$1 billion (Maryland Department of Business and Economic Development, 1994). Most of the harvesting and primary manufacturing occurs in western Maryland and the Eastern Shore, while most of the secondary manufacturing is found in the central, more populated areas of the State.

About 90 percent of Maryland's forests are classified as timberland, defined by the U.S. Forest Service as capable of producing a commercial stand and is available for harvesting. The ten percent not classified as timberland is made up of forests found in state parks, wildlands, urban forest, and Christmas tree plantations. Of all timberland in Maryland, about 90 percent is owned by private citizens (U.S.D.A. Forest Service, Forest Statistics for Maryland - 1976 and 1986, 1988).

In 1988, 85 million board feet of pine and other softwoods and 100 million board feet of hardwoods were reported as harvested in Maryland. In 1986, 62.5 million cubic feet or

781,250 cords of firewood were harvested. Generally, growing stock growth exceeded harvests across the State by nearly 70 percent. The exception was the lower Eastern Shore where pine growing stock removals were more than double growth and hardwoods growing stock removals were about five percent over growth (U.S.D.A., 1988)

Management measures have been developed for the following six subcategories of sources of forestry nonpoint pollution that affect coastal waters:

- o Road construction and use
- o Timber harvesting
- o Regeneration methods
- o Prescribed burning
- o Application of forest chemicals

The Environmental Consequences section of the PEIS contains an analysis of the impacts of these pollutants on water quality. The management measures are designed to prevent the environmental degradation caused by these pollutants.

Forestry activities have been identified as nonpoint pollution sources in coastal area water quality assessments and control programs. On a national level, silviculture contributes about 3 to 9 percent of nonpoint source pollution to United States waters (Neary et al., 1989; USEPA, 1992a). Environmental impacts depend on site characteristics, climatic conditions, and the forest practices employed. According to the Maryland 1989-1991 305(b) Water Quality Inventory report (July 1993), forestry activities are not listed as a source of water quality problems that impair designated uses of any of the State's rivers, streams, lakes, ponds, or estuarine waters.

The implementation of forestry management measures will reduce the runoff of pollutants to surface waters and mitigate the impacts associated with forestry activities. The forestry management measures emphasize advanced planning for forest harvesting and for locating, designing, and managing forest road systems. The management measures provide for the establishment of streamside management areas along surface waters to buffer against detrimental changes to the streams caused by sediment and loss of canopy species. The management measures for road construction and road management will reduce erosion and runoff of sediment by minimizing the disturbance of soils and by maintaining road stability. Management measures for site preparation, forest regeneration, and revegetation of disturbed areas will help to stabilize disturbed soils, control erosion, increase rainfall infiltration, and prevent sediment and associated pollutants from entering nearby surface waters. Implementation of the forest chemical management measure will ensure that the application of fertilizers and pesticides during forestry operations will not adversely affect water quality. The management measure for wetlands forests addresses the special operating circumstances and management practices appropriate for forested wetlands in order to maintain their ability to alter floodflow, remove nutrients, and provide habitat.

The coordinated implementation of management measures for forestry nonpoint pollution, based on the existing State programs and authorities discussed below will result in

broad implementation of the management measures with the resulting environmental benefits associated with a reduction in forestry nonpoint pollution. In particular the management measures should result in a decrease in nonpoint pollution from erosion. Revision of Maryland's Operation Order for prescribed burns will decrease erosion resulting from prescribed burns. Maintaining high infiltration rates on the forest floor will result in reduced sediment delivery to streams. In addition to limiting the amount of soil exposed, reductions in sediment delivery will result from reducing the length of the exposure to runoff and controlling the proximity to waterways.

Management Measures for Forestry

1. Preharvest Planning

This management measure pertains to lands where silvicultural or forestry operations are planned or conducted. The planning process components of this management measure are intended to apply to commercial harvesting on areas greater than 5 acres and any associated road system construction or reconstruction conducted as part of normal silvicultural activities. Through its advance planning process, this measure will ensure that silvicultural activities, including timber harvesting, site preparation, and associated road construction, are conducted without significant nonpoint source pollution delivery to streams and coastal areas.

The management measure for preharvest planning will be implemented by the following programs:

- Maryland's Sediment Control Law and Regulations, administered by MDE, require that a sediment control plan must be developed and approved before undertaking any earth disturbing activity in excess of 5,000 square feet (or 100 cubic yards). For forest harvests meeting certain conditions, the "Standard Erosion and Sediment Control Plan for Forest Harvest Operations in Maryland" (Standard Plan) is used. This plan lists general sediment control requirements for each harvest. There are instances where a Standard Plan is not adequate and it is necessary to have a Custom Plan prepared by a licensed forester and approved by the Soil Conservation District. The "Soil Erosion and Sediment Control Guidelines for Forest Harvest Operations in Maryland" (Guidelines) contain additional practices for preharvest planning which may be required in a Custom Plan. In addition, a nontidal wetland and waterway permit is required for certain stream crossings. The BMPs included in the Standard Plan and Guidelines are sufficient in scope to meet most of the forestry management measures.

2. Streamside Management Areas (SMAs)

This management measure pertains to lands where silvicultural or forestry operations are planned or conducted. It is intended to apply to surface waters bordering or within the area of operations. The vegetation in SMAs will protect water quality and aquatic habitat by reducing runoff and trapping sediment and nutrients before they reach surface waters.

Canopy species serve to moderate water temperatures by providing shade. They also provide the detritus for the detrital food chain, stabilize stream banks, and provide habitat for aquatic and terrestrial organisms.

The management measure for streamside management areas will be implemented by the following programs:

- Please refer to the management measure for preharvest planning.

3. Road Construction/Reconstruction

This management measure is intended for application on lands where silvicultural or forestry operations are planned or conducted. It applies to the clearing, pioneering, construction, and surfacing phases of road development. This management measure will reduce erosion and the runoff of sediment to surface waters by minimizing the disturbance of soil and rock during road development.

The management measure for road construction/reconstruction will be implemented by the following programs:

- Please refer to the management measure for preharvest planning.

4. Road Management

This management measure pertains to lands where silvicultural or forestry operations are planned or conducted. It applies to active and inactive roads constructed or used for silvicultural activities. This management measure will protect water quality by managing existing roads to maintain stability and utility in order to minimize sedimentation and pollution from runoff-transported materials.

The management measure for road management will be implemented by the following programs:

- Please refer to the management measure for preharvest planning.

5. Timber Harvesting

This management measure pertains to lands where silvicultural or forestry operations are planned or conducted. It is intended to apply to all harvesting, yarding, and hauling conducted as part of normal silvicultural activities on harvest units larger than 5 acres. This management measure will protect water quality by locating landings according to preharvest planning thus minimizing sedimentation resulting from the siting and harvesting of timber, and by properly managing petroleum products.

The management measure for timber harvesting will be implemented by the following programs:

- Please refer to the management measure for preharvest planning.
- Critical Area Timber Harvest Plan (Chesapeake Bay Critical Area law)

6. Site Preparation and Forest Regeneration

This management measure pertains to lands where silvicultural or forestry operations are planned or conducted. It is intended to apply to all site preparation and regeneration activities conducted as part of normal silvicultural activities on harvested units larger than 5 acres. Regeneration of harvested forest lands provides water quality protection by stabilizing disturbed soils. Tree roots hold soil in place and aid soil aggregation, decreasing the potential for slope failure. Vegetation decreases erosion by slowing storm runoff. Maintenance of an unbroken forest litter layer prevents raindrop detachment, maintains infiltration, and slows runoff. This management measure does not apply in Maryland's 6217 management area since site preparation and forest regeneration are not a significant cause of nonpoint source pollution to Maryland's coastal waters.

7. Fire Management

This management measure pertains to lands where silvicultural or forestry operations are planned or conducted. It is intended to apply to all prescribed burning conducted as part of normal silvicultural activities on harvested units larger than 5 acres and for wildfire suppression and rehabilitation on forest lands. This management measure will minimize potential nonpoint source pollution by reducing erosion and sedimentation resulting from these operations.

The management measure for fire management will be implemented by the following programs:

- Please refer to the management measure for preharvest planning.
- DNR has issued an Operation Order which requires that a prescribed burn plan be submitted and approved prior to any prescribed burn.

8. Revegetation of Disturbed Areas

This management measure pertains to lands where silvicultural or forestry operations are planned or conducted. It is intended to apply to all disturbed areas resulting from harvesting, road building, and site preparation conducted as part of normal silvicultural activities. Disturbed areas are those localized areas within harvest units or road systems where mineral soil is exposed or agitated (e.g., road cuts, fill slopes, landing surfaces, cable corridors, or skid trail ruts). Revegetation of disturbed areas will prevent sediment and associated pollutants from entering nearby surface waters. Vegetation controls erosion by dissipating the erosive forces of raindrops, reducing the velocity of runoff, stabilizing soil particles, and increasing soil infiltration rates.

The management measure for revegetation of disturbed areas will be implemented by the following programs:

- Please refer to the management measure for preharvest planning.

9. *Forest Chemical Management*

This management measure pertains to lands where silvicultural or forestry operations are planned or conducted. It is intended to apply to all fertilizer and pesticide applications (including biological agents) conducted as part of normal silvicultural activities. Chemicals can directly enter surface waters through five major pathways: direct application, drift, mobilization in ephemeral streams, overland flow, and leaching. Direct application is the most important pathway and is one of the most easily prevented by this management measure. Providing buffer areas around streams and waterbodies is an example of an effective method of preventing the chemicals from adversely affecting water quality.

The management measure for forest chemical management will be implemented by the following programs:

- Please refer to the management measure for preharvest planning.
- Please refer to the management measure for agricultural pesticide management.

10. *Wetlands Forest*

This management measure is intended for forested wetlands where silvicultural or forestry activities are planned or conducted. It is intended to apply specifically to forest management activities in forested wetlands and to supplement the previous management measures by addressing the operational circumstances and management practices appropriate for forested wetlands. This management measure will help to reduce incidental or indirect effects on forested wetlands whose beneficial functions include floodflow alteration, sediment trapping, nutrient retention and removal, and provision of habitat.

The management measure for wetlands forest will be implemented by the following programs:

- Please refer to the management measure for preharvest planning.
- Nontidal Wetlands Protection Act

c. Urban Nonpoint Pollution Source Category

Maryland's population density is 428 people per square mile, sixth-largest in the United States (Boyd, 1987). Due to this fact and the continuing conversion of agricultural and forested lands into residential and commercial land uses, urban runoff is a major source of nonpoint pollution to Maryland's coastal waters. Section 3.B.4.c of this EA provides information on the population and growth patterns in Maryland.

Of the 16 counties in Maryland's 6217 management area, ten saw their population double between 1950 and 1986 (Lott, 1992). Anne Arundel, Calvert, Charles, Harford, and Prince George's Counties all grew by more than 200 percent during this period. Future population growth is expected to be swift in Maryland's 6217 management area: southern Maryland will increase by 59 percent between 1990 and 2020, while the upper Eastern Shore will see 32 percent growth (Governor's Commission on Growth in the Chesapeake Bay Region, 1991c).

Not only is the population of Maryland's coastal areas increasing, but urban development is continuing to disperse. In just the seven years from 1978 through 1985, the amount of land devoted to urban uses grew by 80 percent in Calvert County, and by 19, 16, and 13 percent in Prince George's, Anne Arundel, and Baltimore Counties, respectively (Lott, 1992). A doubling of Maryland's daily vehicle miles traveled between 1966 and 1989 and a 372 percent rise in the State's automobile ownership rate from 1950 to 1985, greater than the population increase, provide further evidence of the dispersion of Maryland's population. Maryland's ratio of persons per vehicle has fallen from 2.5 to 1 in 1950 to 1.07 to 1 in 1985 (Lott, 1992).

Dispersed, low to medium density "sprawl" development increases nonpoint source pollution to Maryland's coastal waters. The Maryland Office of Planning has estimated that current trends of population growth and development will result in the conversion of 695,000 acres of forest and farmland (Governor's Commission on Growth in the Chesapeake Bay Region, 1991b), and production of an additional 4.1 million tons of sedimentation, 100,000 tons of nitrous oxides, and 35,000 pounds of particulates by the year 2020 (Year 2020 Panel of the Chesapeake Bay Program, 1988). Costs to local governments associated with this development, including roads, schools, utilities, and other infrastructure, are \$7.7 billion (Year 2020 Panel of the Chesapeake Bay Program, 1988). Specific examples of nonpoint pollution identified in Maryland's 305(b) report include elevated bacteria, nutrient, and suspended sediment levels in the Upper and Middle Chesapeake Bay, Assawoman Bay, Isle of Wight Bay, Sinepuxent Bay, the Severn River, and the lower Patapsco River watershed.

Management measures have been developed for the following six subcategories of sources of urban nonpoint pollution that affect Maryland's coastal waters:

- o Runoff from developing areas
- o Runoff from construction sites
- o Runoff from existing development
- o On-site disposal systems
- o General sources (households, commercial, and landscaping)
- o Roads, highways, and bridges

The Environmental Consequences section of the PEIS contains a description of the primary pollutants in urban runoff and an analysis of the impacts on water quality. The management measures are designed to prevent the environmental degradation caused by these pollutants.

The implementation of management measures for urban runoff will reduce the generation of nonpoint source pollutants from existing development and control runoff and treat pollutants associated with new development and redevelopment. The measures emphasize the control and removal of sediment and other suspended solids and pollutants entrained in runoff. The measures will minimize the transport of sediment and other pollutants (pesticides, fertilizers, petrochemicals, road salt, wood, garbage, paints and sealers) from new and existing development. The management measures pertaining to new and existing OSDS will reduce nutrient and pathogen loadings by: preventing the installation of conventional OSDS in areas where soil absorption systems will not provide adequate treatment of effluents; and, requiring

that existing OSDS be modified, operated, repaired, and maintained to reduce pollutant loadings. The measures will require that roads, highways, and bridges are sited, constructed, operated, and maintained in order to protect sensitive ecosystems and reduce the generation and runoff of sediment, road salt, and other pollutants.

The environmental benefits that result from the implementation of management measures for urban development based on the existing State programs and authorities discussed below will be enhanced by fulfillment of the conditions listed in Section 2.B. of this Environmental Assessment. In addition, Maryland is developing a *State Stormwater Design Manual* to improve the management practices associated with the stormwater management program, making it easier for localities to achieve the Total Suspended Solids (TSS) loading standards of the new development measure. The stormwater management regulations will be amended to reflect the practices in the manual. The State is also developing a BMP manual which discusses construction and use of innovative onsite disposal systems. Also, in certain "Areas of Special Concern," Maryland will require that OSDS installation be subject to a management plan which could include specific design standards. Increased environmental protection from road, highway, and bridge projects will result from the Federal Highway Administration Final Rule on sediment and erosion control as required under the Intermodal Surface Transportation Efficiency Act of 1991 that requires highway projects in coastal states to utilize the 6217(g) management measures for design of projects within their coastal areas.

Management Measures for Urban Areas

1. New Development Management Measure

This management measure is intended to be applied to control urban runoff and treat associated pollutants generated from new development, redevelopment, and new and relocated roads, highways, and bridges. The net result of this management measure will be increased watershed protection and a reduction in the erosion, flooding, and pollutants associated with poorly planned development.

The new development management measure will be implemented by the following programs:

- **Stormwater Management Program.** The Maryland Department of the Environment (MDE) and local governments implement the program. Regulations establish minimum requirements which local governments must include in their programs and the regulations must comply with flood management plans under the Flood Hazard Management Act of 1976. Specific design criteria must be included in all local ordinances. Operation and maintenance plans are required as part of the stormwater plan approval. MDE evaluates each local program on a triennial basis.

2. Watershed Protection Management Measure

This management measure is intended to be applied to new development or redevelopment including construction of new and relocated roads, highways, and bridges that generate nonpoint source pollutants. Application of this management measure will reduce the generation of nonpoint source pollutants and mitigate the impacts of urban runoff.

The watershed protection management measure will be implemented by the following programs:

- The Economic Growth, Resource Protection, and Planning Act of 1992 requires all jurisdictions to direct growth to suitable areas and protect sensitive areas. Localities are to revise their comprehensive plans and zoning and subdivision ordinances by 1997. An Executive Order establishes procedures to ensure that state plans, programs, and projects which affect the timing, type, and location of development (including state investments in infrastructure and resource protection) are consistent with the Act.

- Maryland's Sediment Control Law and Regulations require that plans include practices consistent with the intent of this management measure. The 1991 Maryland Standards for Soil Erosion and Sediment Control, incorporated in regulation, include the goals stated in the management measure. Erosion and sediment control plans must consider the preservation of natural vegetation, sensitive features, and the utilization of existing contours. Sensitive areas include: areas within the state's designated Critical Area, trout streams, non-tidal wetlands, and steep slopes. Additional practices may be required to protect these sensitive resources.

- The Forest Conservation Act requires that local jurisdictions adopt Forest Conservation Programs which address (through adopted ordinances and policies) how forests will be retained or planted during development. All applications for subdivision, grading, or sediment and erosion control on land parcels greater than 40,000 sq ft. must include a site inventory for review and approval which delineates streams, steep slopes, soils, and other criteria. Applicants must also submit a plan for protection and retention of forest and if applicable, a planting plan when reforestation or afforestation apply.

- The Nontidal Wetland Program protects existing natural drainageways and riparian corridors. The permitting process is sequential in nature, evaluating the feasibility of total avoidance of impact first, possible impact minimization alternatives second, and appropriate mitigating measures to offset necessary and unavoidable impacts last. Mitigation is always required when impacts are authorized.

- The Chesapeake Bay Critical Area Program discourages development in conservation areas by imposing a maximum housing density of one house per 20 acres. Local jurisdictions must identify, inventory, map, and develop resource protection plans for all significant plant and wildlife habitat areas. New development must maximize the site's habitat potential through clustering, incorporating a wildlife corridor system, and limiting the clearing of existing vegetation. In addition, new development must provide 100-foot natural vegetation buffers along tidal waters, tidal wetlands, and perennial and intermittent tributary streams.

3. Site Development Management Measure

This management measure is intended to be applied to all site development activities including those associated with roads, highways, and bridges. Application of this management measure will reduce the generation of nonpoint source pollution and mitigate the impacts of urban runoff through proper design and development of individual sites.

This management measure is or will be implemented by the following programs:

- Refer to programs listed above for watershed protection.

4. Construction Site Erosion and Sediment Control Management Measure

This management measure is intended to be applied to all construction activities on sites less than five acres in areas that do not have an NPDES permit in order to control erosion and sediment loss from those sites. This measure does not apply to: (1) construction of a detached single family home on a site of one-half acre or more or (2) construction that does not disturb over 5,000 square feet of land on a site. Application of this management measure will minimize the sediment being transported outside the perimeter of a construction site by reducing erosion and retaining sediment onsite.

This management measure is or will be implemented by the following programs:

- The Maryland Erosion and Sediment Control Program requires erosion and sediment controls for clearing and grading activities. MDE is the lead state agency for enforcement of the Erosion and Sediment Control Program, except where authority has been delegated to local jurisdictions. The local Soil Conservation Districts review and approve erosion and sediment control plans for all non-public land disturbances. State and federal projects are referred to MDE.

5. Construction Site Chemical Control Management Measure

This management measure is intended to be applied to all construction sites less than five acres in area and to new, resurfaced, restored, and reconstructed road, highway, and bridge construction projects. This management measure does not apply to: (1) construction of a detached single family home on a site of one-half acre or more or (2) construction that does not disturb over 5,000 square feet of land on a site. Application of this management measure will prevent the generation of these pollutants at construction sites due to improper handling and usage, and prevent their movement from the construction site.

This management measure is or will be implemented by the following programs:

- Oil Control Regulations administered by MDE address the storage and handling of petroleum products, including those activities at construction sites. A general permit applies to all oil handlers with less than 50,000 gallons. In addition, the state has adopted the federal hazardous materials transportation regulations, which include petroleum products.
- Pesticide Regulations. Refer to pesticide measure.
- The Erosion and Sediment Control Program specifies allowable fertilizers rates for vegetative stabilization of construction sites.

- The Maryland Occupational Safety and Health (MOSH) Law, administered by the Department of Labor, Licensing and Regulation. This requires employers to comply with OSHA's "Hazardous Communication Standard," requiring employers to provide training to employees, label hazardous materials, maintain on site standard information on the hazards of the chemicals used, develop and maintain a written hazard communication program, and provide to MDE a list of chemicals used.

6. Existing Development Management Measure

This management measure is intended to be applied to all urban areas and existing development in order to reduce surface water runoff pollutant loadings from such areas. Application of this measure will protect or improve surface water quality by developing and implementing watershed management programs.

This management measure is or will be implemented by the following programs:

- MDE's Stormwater Management Cost-share Program offers financial assistance to local governments for the installation of stormwater BMPs in existing urban areas. A proposed project must be able to demonstrate that it will provide water quality benefits.
- MDE's Water Quality Revolving Loan Fund is a source of low interest loans for publicly owned waste water facilities and nonpoint pollution control projects. The provision of water quality benefits is the single most important factor in project qualification.
- MDE's Small Creek and Estuary Cost-share Program is a source of funding for nonpoint source pollution control projects, including stream habitat restoration and protection which is not covered under other traditional state or federal programs.

7. New and Operating Onsite Disposal Systems Management Measures

The two management measures pertaining to OSDS are discussed together because they will be implemented by the same State programs.

- The New Onsite Disposal System management measure is intended to be applied to all new OSDS including package plants and small-scale or regional treatment facilities not covered by NPDES regulations in order to manage the siting, design, installation, and operation and maintenance of all such OSDS. Application of this management measure will prevent the installation of conventional OSDS in areas where soil absorption systems will not provide adequate treatment of effluents prior to entry into surface or ground waters.

- The Operating Onsite Disposal Systems management measure is intended to be applied to all operating OSDS. This measure will minimize pollutant loadings from operating OSDS by requiring that they be modified, operated, repaired, and maintained to reduce nutrient and pathogen loadings in order to protect and enhance surface waters.

These management measures will be implemented by the following programs:

- Maryland's septic management program implemented by MDE (delegated to local governments) specifies setbacks for a wide range of sensitive areas and require OSDS to be designed, sited and constructed to maintain sufficient separation distance from the

seasonally high water table. The regulations establish the site evaluation criteria necessary for approving a permit for an OSDS and require that OSDS are inspected during and after construction to ensure that they are installed according to specification. Maryland is currently developing a BMP manual which discusses construction and use of innovative systems. The state is also developing a program to label certain areas as "Areas of Special Concern," which will be subject to a management plan. In areas where nitrogen loading is of particular concern, maximum development densities have been established.

- MDE's Shellfish Certification Division conducts routine site inspections at individual septic systems that have the potential to impact shellfish harvesting waters. Violations are reported to the local approving authority who takes corrective action. The sites are inspected on a five year rotating basis. The status of violations detected and referred to the local authorities for action are reviewed at least annually to ascertain compliance.

- Local health departments perform routine inspections of OSDS at all food service establishments, day care facilities, and group homes. MDE's Individual Septic Systems and Wells Program is responsible for routinely inspecting the innovative and alternative septic systems that it designs and approves.

Condition

These management measures are approved with the following condition:

- Within three years, Maryland will include in its program management measures for protection of nitrogen-limited surface waters and inspection and maintenance of existing OSDS in conformity with the 6217(g) guidance.

8. *Pollution Prevention Management Measure*

This management measure is intended to be applied to reduce the generation of nonpoint source pollution throughout the section 6217 management area by preventing and reducing pollutant loadings generated from a variety of activities within urban areas not addressed by other management measures in this source category. It is meant to ensure that communities implement solutions that may result in behavioral changes that reduce the generation of pollutants, thus reducing water quality impacts from these sources.

This measure does not require enforceable policies. In Maryland, numerous state agencies and private nonprofit groups have programs that address this measure. The Urban Nutrient Management Workgroup, formed by MDE and other agencies, is developing a point-of-sale brochure explaining proper fertilizer use and plans to work with professional grounds managers (both private and public) to try to influence their operating and maintenance procedures. The Cooperative Extension Service is working on Bay-wide education for urban/suburban pollution prevention. The Alliance for the Chesapeake Bay has a new program called Bayscapes which includes educational material on environmentally correct landscaping. MDA has worked with the University of Maryland Sea Grant Program to produce three public service announcements featuring farmers giving conservation tips to homeowners. Maryland's Used Antifreeze Recycling Program and Used Oil Recycling Program help "do it yourself" auto and boat mechanics with proper antifreeze and used oil

disposal. The Adopt-a-Stream program is a stewardship program that encourages active citizen involvement in the monitoring and restoration of the state's waterways and watersheds.

9. Management Measures for Roads, Highways, and Bridges

The six management measures pertaining to roads, highways, and bridges are discussed together because they will be implemented by the same state programs.

- The management measure for Planning, Siting, and Developing is intended to be applied to site development and land disturbing activities for new, relocated, and reconstructed roads and highways in order to reduce the generation of nonpoint source pollutants and to mitigate the impacts of urban runoff from such activities. This measure emphasizes the importance of planning to identify potential problems early in the design process.

- The management measure for Bridges is intended to be applied to new, relocated, and rehabilitated bridge structures in order to control erosion, streambed scouring, and surface runoff from such activities. This will ensure that bridges will not be sited over sensitive waters and tributaries in the coastal zone.

- The management measure for Construction Projects is intended to be applied to new, replaced, restored, and rehabilitated road, highway, and bridge construction projects in order to control erosion and offsite movement of sediment from such project sites. This measure emphasizes the importance of erosion and sediment control plans as effective methods in mitigating erosion problems at construction sites before any land-disturbing activity begins.

- The management measure for Construction Site Chemical Control is intended to be applied to new, resurfaced, restored, and rehabilitated road, highway, and bridge construction projects in order to reduce toxic and nutrient loadings from such project sites. The objective of this measure is to safeguard surface and ground waters from toxic spills and hazardous loadings at construction sites from equipment and fuel storage, and also from road salt, fertilizers, and pesticides stored at maintenance areas.

- The management measure for Operation and Maintenance is intended to be applied to existing, restored, and rehabilitated roads, highways, and bridges. This measure will ensure that pollutants generated by operation and maintenance procedures for roads, highways, and bridges, and from sparsely vegetated areas, cracked pavements, potholes, and poorly operating urban runoff control structures, are minimized through the development and implementation of a program that includes standard operating procedures and maintenance guidelines.

- The management measure for Road, Highway, and Bridge Runoff Systems is intended to be applied to existing, resurfaced, restored, and rehabilitated roads, highways, and bridges that contribute to adverse impacts to surface waters. Surface waters will be protected through the use of runoff management systems such as vegetated filter strips, grassed swales, detention basins, constructed wetlands, and infiltration trenches.

These six management measures are or will be implemented by the following programs:

- The State Highway Administration's sediment control program imposes limits on land disturbance, incremental and timely stabilization of bare earth, and aggressive maintenance. SHA submits erosion and sediment control plans to MDE for review and approval.
- Nontidal and Tidal Wetland Regulations
- Stream and Floodplain (waterway construction) Regulations
- Reforestation Act (for state funded roads) or Forest Conservation Act (local roads)
- Chesapeake Bay Critical Area Program (if in the Critical Area)
- Stormwater Management Regulations
- Sediment Control Regulations
- Water Quality Certification
- The Stormwater Retrofit Cost-share Program
- All bridge or culvert crossings of waterways having a drainage area greater than 400 acres are reviewed under the Stream and Floodplain (waterway construction) Regulations.
- Refer to Construction Site Chemical Control management measure.
- MDE's general water quality authority serves as a back-up authority should the lack of proper road operation or maintenance lead to a significant water quality problem.

d. Marinas and Recreational Boating Nonpoint Source Category

Because of the extent of recreational boating and the large number of marinas in Maryland, nonpoint source pollution from these activities poses a significant threat to coastal waters in certain areas. Potential problems can be attributed to poor marina siting and design, dredging, routine marina operation, and boat operations. Pollutants from marinas can also combine with other upland sources such as stormwater runoff to cause significant water quality problems in localized areas. Section 3.B.4.d of this EA provides information on the extent of recreational boating and the number and types of marinas in Maryland.

Maryland has approximately 500 marinas in the 6217 management area, of which 110 are currently served by public pumpout facilities. The overall goal for the state is 350 pumpouts. The total number of marinas (over 50 slips) that will be required to install pumpouts under the new law by 1997 is 170. DNR estimates that 70 additional marinas will install pumpouts: either (1) new or expanding marinas (to more than 10 slips) or (2) smaller marinas targeted by education efforts.

Potential nonpoint source problems can be attributed to poor marina siting and design, maintenance dredging, routine marina operation, and boat operations. Pollutants from the operation and maintenance of marinas can also combine with other upland sources such as stormwater runoff and leachate from OSDS to cause significant water quality problems in localized areas. Pollutants such as heavy metals, toxins, hydrocarbons, bacteria, and nutrients can enter coastal waters as a result of marina and boating activities.

According to the Chesapeake Bay Program, recreational boating contributes a variety of pollutants to the Chesapeake Bay and its tributaries. Boats discharge oil, gas, anti-freeze,

trash, litter, and other debris. Marine sanitation devices, when not used and maintained correctly, can discharge the following pollutants: intestinal microorganisms (fecal coliform), nutrients, and toxic substances, which occur due to the use of chemicals to partially treat wastes prior to discharge (Chesapeake Bay Program Implementation Committee, 1991). According to the National Shellfish Register of Classified Estuarine Waters (NOAA, 1991), boating activities were responsible for adversely affecting 15,000 acres or 12 percent of all harvest-limited shellfish growing acreage in Maryland in 1990.

Management measures have been developed for the following five subcategories of sources of nonpoint pollution from marinas and recreational boating that affect Maryland's coastal waters:

- o Poorly flushed waterways where dissolved oxygen deficiencies exist,
- o Pollutants discharged from boats,
- o Pollutants transported in storm water runoff from parking lots, roofs, and other impervious surfaces,
- o The physical alteration or destruction of wetlands and of shellfish and other bottom communities during the construction of marinas, ramps, and related facilities, and
- o Pollutants generated from boat maintenance activities on land and in the water

Fifteen management measures specified for this source category are grouped under two broad headings: (1) siting and design, and (2) operation and maintenance. Effective implementation of these measures will avoid impacts associated with marina siting and prevent the introduction of nonpoint source pollutants.

The six main pollutant types associated with marina and boating activities that affect water quality include: toxicity in the water column; increased pollutant levels in aquatic organisms; increased pollutant levels in sediments; increased levels of pathogen indicators; disruption of sediment and habitat; and, shoaling and shoreline erosion. The Environmental Consequences section of the PEIS contains an analysis of the impacts of these pollutants on water quality. The management measures are designed to prevent the environmental degradation caused by these pollutants.

The implementation of management measures for marinas and recreational boating will reduce the runoff of pollutants to marina waters and mitigate the impacts associated with the siting and design and the operation and maintenance of new and expanding marinas. Management measures for siting and design will control stormwater runoff from marina parking lots and hull maintenance areas thereby reducing the amount of suspended solids, oil, and grease entering marina waters. The measures will protect wetlands, shellfish beds and submerged aquatic vegetation during marina construction; will provide for water quality assessments to determine whether the marina design will affect water quality; will ensure proper circulation for flushing of the marina basin; and will reduce turbidity and shoaling by protecting against shoreline erosion. The measures for operation and maintenance emphasize the proper disposal of fish and solid wastes and the storage, transfer, containment, and disposal of sewage, oil, antifreeze, solvents, and paints. Restrictions on boating activities in

shallow non-marina waters will protect shallow-water habitats and prevent resuspension of sediments and damage to submerged aquatic vegetation.

The environmental benefits that result from the implementation of management measures for marinas and recreational boating based on the existing State programs and authorities discussed below will be enhanced by fulfillment of the condition listed in Section 2.B. of this Environmental Assessment. In particular, installation and operation and maintenance of additional marine sewage pumpout facilities and the development of educational exhibits and brochures for boaters on proper refueling techniques will help reduce nonpoint pollution from recreational boating.

Management Measures for Marinas and Recreational Boating

Siting and Design

1. Marina Flushing Management Measure

This management measure is intended to be applied to new and expanding marinas. Initial site selection is the most important factor influencing the long-term impact a marina will have on water quality within the immediate vicinity of the marina.

This management measure will be implemented by the following programs:

- Tidal Wetlands Regulations. MDE reviews marina proposals for environmental impacts when deciding whether or not to recommend issuance of a license or permit.
- §401 Water Quality Certification from the MDE.
- Any marina development within the Chesapeake Bay Critical Area must also meet the requirements of the Critical Area Criteria.

2. Water Quality Assessment Management Measure

This management measure is intended to be applied to new and expanding marinas. Water quality assessments such as modeling of flushing rates, measuring water quality characteristics, and monitoring may be used to determine whether a proposed marina design will adversely affect water quality.

(See discussion for marina flushing management measure for programs implementing this measure).

3. Habitat Assessment Management Measure

This management measure is intended to be applied to new and expanding marinas where site changes may impact on wetlands, shellfish beds, submerged aquatic vegetation, or other important habitats. Proper siting and design can reduce short-term impacts (habitat destruction during construction) and long-term impacts (water quality, sedimentation, circulation) on the surrounding environment.

(See discussion for marina flushing management measure for programs implementing this measure).

4. Shoreline Stabilization Management Measure

This management measure is intended to be applied to new and expanding marinas where site changes may result in shoreline erosion. This management measure has been shown to be effective in mitigating shoreline erosion and the resulting turbidity and shoaling.

This management measure will be implemented by the following programs:

(See discussion for marina flushing management measure for programs implementing this measure).

- The Shore Erosion Control Program of DNR provides technical and financial assistance to property owners for the design and construction of structural and nonstructural shore erosion control projects.

5. Storm Water Runoff Management Measure

This management measure is intended to be applied to new and expanding marinas, and to existing marinas for at least the hull maintenance areas. Pollutants can be controlled through three techniques: filtration/infiltration; retention/detention; and, physical separation.

This management measure will be implemented by the following programs:

(See discussion for marina flushing management measure for programs implementing this measure)

6. Fueling Station Design Management Measure

This management measure is intended to be applied to new and expanding marinas where fueling stations are to be added or moved. Marinas should be located and designed and a spill contingency plan developed so that pollutants released during fueling operations can be contained in a limited area to minimize spread through and out of the marina.

This management measure will be implemented by the following programs:

(See discussion for marina flushing management measure for programs implementing this measure).

- MDE has a self-implementing regulation that places all marinas with capacities of less than 50,000 gallons under a "General Oil Operations Permit".

7. Sewage Facility Management Measure

This management measure is intended to be applied to new and expanding marinas in areas where adequate marine sewage collection facilities do not exist. The availability and use of these systems will reduce discharges of sanitary wastes to coastal waters.

This management measure will be implemented by the following programs:

- Tidal Wetlands Regulations. MDE reviews marina proposals for environmental impacts when deciding whether or not to recommend issuance of a license or permit. In general, tidal wetland licenses and permits are conditioned to require sewage pumpout capability in all new and reconfigured marinas.

- DNR's Boating Administration administers a voluntary pumpout grant program whereby marinas can be reimbursed for the costs of purchase and installation of a marine sewage pumpout facility (up to the grant limit of \$12,500). To date, 75 out of approximately 500 Maryland marinas have installed pumpouts under the grant program.

- 1994 legislation requires all new or expanding marinas of more than 10 slips that are capable of berthing vessels 22 feet or greater to install a pumpout facility and requires all existing marinas of 50 slips or greater which berth any vessel greater than 22 feet to install a pumpout facility. All state-owned and attended boat launching facilities or marinas are required to install a pumpout. DNR is required to install a pumpout on-site at any attended boat launching facility or marina purchased, built or acquired by DNR

- Any marina development within the Chesapeake Bay Critical Area must also meet the requirements of the Critical Area Criteria. Local jurisdictions must ensure "that adverse impacts to water quality that may occur as a result of [water dependent] activities, such as nonpoint source runoff, sewage discharge from land activities or vessels, or from boat cleaning and maintenance operations, is minimized"

Operation and Maintenance

1. Solid Waste and Fish Waste Management Measures

The two management measures pertaining to solid waste and fish waste management are discussed together because they will be implemented by the same programs.

- The Solid Waste Management Measure is intended to be applied to new and expanding marinas. If adequate disposal facilities are available there is less likelihood for disposal of solid waste in surface waters or on shore where the material may wash into the waters.

- The Fish Waste Management Measure is intended to be applied to marinas where fish waste is determined to be a source of water pollution. Marina patrons and employees are more likely to properly dispose of fish waste if told of potential environmental effects and provided adequate and convenient disposal facilities.

These management measures will be implemented by the following programs:

- Marinas in Maryland which have boat maintenance or refueling are subject to a general NPDES stormwater permit (issued in September 1992). The marinas are required to develop and keep on file a stormwater pollution prevention plan. These marinas are not subject to this management measure.

2. Liquid Material Management Measure

This management measure is intended to be applied to marinas where liquid materials used in the maintenance, repair, or operation of boats are stored. This measure minimizes entry of potentially harmful liquid materials into marina and surface waters through proper storage and disposal.

In addition to the programs listed above for Solid Waste and Fish Waste management measures, this management measure will also be implemented by the following programs:

- MDE has a self-implementing regulation that places all marinas with capacities of less than 50,000 gallons under a "General Oil Operations Permit"
- The Maryland Environmental Service runs a recycling program that includes a toll-free number to call for recycling locations. MES manages the states' Used Antifreeze Recycling Program and Used Oil Recycling Program to help "do it yourself" auto and boat mechanics with proper antifreeze and used oil disposal. Recycling of used oil and antifreeze is also encouraged in DNR's "Responsible Boater" brochures.
- The Maryland Occupational Safety and Health (MOSH) Law is administered by the Department of Labor, Licensing and Regulation. This requires employers to comply with OSHA's "Hazardous Communication Standard," requiring employers to provide training to employees, label hazardous materials, maintain on site standard information on the hazards of the chemicals used, develop and maintain a written hazard communication program, and provide to MDE a list of chemicals used.

3. Petroleum Control Management Measure

This management measure is intended to be applied to boats that have inboard fuel tanks. The amount of fuel and oil entering marina and surface waters can be reduced by using devices such as automatic shut-off nozzles, fuel/air separators, and oil-absorbing bilge pads.

This management measure will be implemented by the following programs:

- MDE has a self-implementing regulation that places all marinas with capacities of less than 50,000 gallons under a "General Oil Operations Permit"
- DNR is designing an education program to promote the use of the petroleum control best management practices for marinas and boat operation. This includes educational exhibits and brochures to inform the boating public and marina operators.

4. Boat Cleaning Management Measure

This management measure is intended to be applied to marinas where boat topsides are cleaned and marinas where hull scrubbing in the water has been shown to result in water quality problems. This measure minimizes the use and release of potentially harmful cleaners and bottom paints to marina and surface waters.

This management measure will be implemented by the following programs:

- Refer to the programs listed above for the Solid Waste and Fish Waste Management Measures.

Condition

The fish waste, liquid material, petroleum control, and boat cleaning management measures are approved with the following condition:

- Within one year, Maryland will develop a strategy to implement the fish waste, liquid material, petroleum control, and boat cleaning management measures throughout the 6217 management area.

5. Public Education Management Measure

This management measure is intended to be applied to all environmental control authorities in areas where marinas are located. The best method of preventing pollution from marinas and boating activities is to educate the public about the causes and effects of pollution and methods to prevent it.

This management measure will be implemented by the following programs:

- Through its "Responsible Boater" campaign, DNR has developed a brochure which briefly addresses a number of responsible boating related issues, including: the proper disposal of boat sewage; the use of non-toxic treatment/holding tank additives; recycling of used oil and antifreeze; the proper disposal of all trash; and the protection of submerged aquatic vegetation and wildlife.
- DNR also publishes about 25,000 copies of the "Guide for Cruising Maryland Waters" every two years. These are sold to boaters by DNR and various marine retailers.
- Refer to the Petroleum Control management measure for information on a planned educational effort regarding fueling of boats.

6. Maintenance of Sewage Facilities Management Measure

This management measure is intended to be applied to marinas where marine sewage disposal facilities exist. This measure is effective in preventing failure of pumpouts and discourages improper disposal of sanitary wastes thus reducing the release of untreated sewage into marina and surface waters.

This management measure will be implemented by the following programs:

- The Marine Sewage Pumpout Grant Program and associated education efforts administered by the Boating Administration of DNR requires that marinas receiving reimbursement for a pumpout installation agree to maintain the pumpout in good working order for a period of not less than 10 years.
- Maryland is undertaking a comprehensive education initiative regarding boat sewage. Target groups include marina owners/operators (regarding the installation of marine sewage disposal facilities), boat yards (where holding tanks are installed), sewage treatment plant operators, and the boaters themselves. Boating education groups working with the state on this program include the Boat U.S. Foundation, the American Boat and Yacht Council, Save our Streams, and the Center for Marine Conservation.

- Maryland has used Clean Vessel Act funds for several projects that will help to implement this measure. One project is providing operations/maintenance funding for up to 115 marine sewage disposal facilities.

7. Boat Operation Management Measure (applies to boating only)

This management measure is intended to be applied in non-marina surface waters where evidence indicates that boating activities are impacting shallow-water habitats. Boat operation in shallow water can resuspend bottom sediment, increase turbidity, and damage submerged aquatic vegetation. This management measure will minimize damage to sensitive habitats by excluding boats from shallow-water areas not suitable for boat traffic because of their ecological importance. Establishing no-wake zones will minimize the indirect impacts of increased turbidity.

This management measure will be implemented by the following programs:

- DNR's Boating Administration establishes "minimum wake" speed limits on waterways with sensitive natural resource values. "Minimum wake" speed limits were established for creeks with sensitive natural resource features including shallow-water habitat on river systems managed according to Comprehensive Vessel Management Plans (3 river systems in the state). In response to a request by DNR Wildlife and Heritage, the BOA established an annual boating "prohibited area" adjacent to habitat for threatened and endangered bird species during their nesting period.

e. Hydromodification Nonpoint Pollution Source Category

Dredging of the Chesapeake Bay and Coastal Bays is necessary to maintain navigation ways. Dredging is most common in the Port of Baltimore, other Chesapeake Bay channels, and Ocean City inlet. Dredge placement sites in Maryland's portion of the Chesapeake Bay include Pooles Island, Hart Miller Island, CSX/COX Creek, and Court House Road, an upland site which services the C&D Canal. In addition, there are over 800 miles of agricultural drainage ditches in the 6217 management area, most on the Eastern Shore.

The U.S. Congress in 1935 authorized a 200-foot wide by 10-foot deep channel in the Ocean City inlet, and a 150-foot wide by 6-foot deep channel in the harbor. Recently, a recommendation was made to widen and deepen the channels in the vicinity of Ocean City since the size of vessels has increased over time with lengths up to 80 feet and drafts up to 12 feet. The Ocean City inlet channel is proposed to be dredged to a 300 foot width with a depth of 14 feet for a distance of 3,000 feet into West Ocean City harbor. Also proposed is the expansion of the thoroughfare channel from the inlet to the Ocean City Fishing Center just south of the U.S. Route 50 bridge.

The Chesapeake Bay, Atlantic coastal waters, Coastal Bays, and their tidal tributaries include 4,360 miles of shoreline subject to erosion. Approximately 1,341 miles of that shoreline are eroding at rates varying from less than two to greater than eight feet per year (DNR, 1993). The rate is dependent on the type of erosion (e.g., waves, boat wakes, storms, groundwater erosion) and the soil composition of the bank, beach, or marsh, as well as erosion control structures built along a shoreline. DNR statistics show that 37 miles of Maryland's

shoreline are stabilized each year. In 1990, the U.S. Army Corps of Engineers estimated that approximately 4.7 million cubic yards of new sediment enters the Chesapeake Bay annually due to erosion of adjacent shorelines and another 4.3 million cubic yards is contributed annually as riverine sediments from erosion in tributary watersheds.

Projects that restore stream banks and channels and create wetlands are funded by MDE's Nonpoint Source Capital Programs. In 1993, funding was approximately \$1 million, derived from the issuance of bonds.

According to DNR, approximately 220 dams in Maryland fall into the federal criteria used in the section 6217 applicability. There are 93 nonfederal dams in Maryland's 6217 management area.

Although the extent of activities and production of pollutants within the hydromodification source category in Maryland is less severe than other categories, the implementation of management measures will reduce the impacts associated with present activities and ensure that future activities are conducted without causing environmental impacts.

Management measures have been developed for the following three subcategories of sources of nonpoint pollution from hydromodification activities that affect Maryland's coastal waters:

- o Channelization and channel modification
- o Dams
- o Streambank and shoreline erosion

The main effects of the pollutants associated with hydromodification activities that affect water quality include: changed sediment supply, reduced availability of fresh water, accelerated delivery of pollutants, loss of surface water contact with overbank areas, loss or alteration of wetlands and instream and riparian habitats, blocked or impeded migration routes of fish, and increased sediment and nutrient levels. The Environmental Consequences section of the PEIS contains an analysis of the impacts of these pollutants on water quality. The management measures are designed to prevent the environmental degradation caused by these pollutants.

The implementation of management measures for hydromodification activities are intended to prevent degradation of the physical and chemical characteristics of surface waters and detrimental changes to instream and riparian habitat resulting from the transport of pollutants and from alterations in the supply of sediment and freshwater. The measures will minimize erosion, control sediment runoff, prevent downstream contamination from pesticides, petrochemicals, fertilizers, lime, cement, and construction chemicals, and protect the quality of water and aquatic habitat in reservoirs. The measures will also protect eroding streambank and shorelines that constitute a nonpoint pollution source that contributes to increased turbidity and nutrient levels in coastal waters.

Environmental benefits will result from the implementation of management measures for hydromodification activities using the existing programs and authorities discussed below.

Management Measures for Hydromodification

Channelization and Channel Modification

1. Management Measure for Physical and Chemical Characteristics of Surface Waters

This management measure is intended to be applied to public and private channelization and channel modification activities in order to prevent the degradation of physical and chemical characteristics of surface waters from such activities. The purpose of this management measure is to ensure that the planning process for new hydromodification projects addresses changes to physical and chemical characteristics of surface waters that may occur as a result of the proposed work.

This management measure will be implemented by the following programs:

- MDE's Nontidal Wetland and Waterway Permit. Among the impacts considered in permit review are: direct loss of riparian wetlands; exposure of the stream channel to hypothetical increased velocities and the consequent stream channel erosion and degradation; fragmentation of aquatic habitat through the blockage of passage through structures, or through the clogging of structures during operation; aggradation of stream and wetland areas on the upstream side of structures due to trapping of sediment and the need for periodic maintenance; reduction in the transport of allochthonous materials from headwater reaches to the lower portions of the stream; modification of the hydroperiod in wetlands adjacent to structures; increased exposure of streams to insolation from the sun; and incorporation of natural stream and wetland features as components of constructed and managed stormwater management facilities.
- The Maryland Department of Agriculture (MDA) regulates agricultural public drainage facilities; the Agricultural Water Management Program covers over 800 miles of drainage ditches in the coastal zone, mostly on the Eastern Shore.
- Improvements to existing channels are eligible for funding under the state's Small Creek and Estuary Restoration Cost-share Program and Stormwater Cost-share Program, administered by MDE. Projects funded under this program include stream channel reconstruction, wetland creation, and stream bank restoration. In addition, local governments have the authority needed to create utility districts to finance stormwater activities including channel restoration.
- Any channel modification would need a Water Quality Certification from MDE.

2. Instream and Riparian Habitat Restoration Management Measure

This management measure pertains to surface waters where channelization and channel modification have altered or have the potential to alter instream and riparian habitat such that historically present fish or wildlife are adversely affected. The purpose of this management

measure is to correct or prevent detrimental changes to instream and riparian habitat from the impacts of channelization and channel modification projects.

This management measure will be implemented by the following programs:

- MDE's Nontidal Wetland and Waterway Permit, discussed in the previous measure.
- The Small Creek and Estuary Restoration Cost-share Program and Stormwater Cost-share Program, discussed in the previous measure.
- DNR's Fish Passage Program. State law prohibits obstruction to the passage of fish, and DNR can require any dam owners to construct, and keep repaired, a fish ladder.
- The state's Targeted Watershed Program has identified four priority watersheds for instream and riparian habitat restoration measures.

Dams

1. Management Measure for Erosion and Sediment Control

This management measure is intended to be applied to the construction of new dams, as well as to construction activities associated with the maintenance of dams. The purpose of this measure is to prevent sediment from entering surface waters by minimizing erosion and maximizing sediment retention onsite to reduce impacts on surface water quality.

This management measure will be implemented by the following programs:

- DNR's Dam Safety Division coordinates plan approval and enforcement on dam construction and repair projects. Dam Safety will not issue a permit until the sediment and erosion control plans have been approved by the local Soil Conservation District (SCD). On-site inspections ensure compliance. Certain dams are exempt from obtaining a DNR permit, however, they must still obtain plan approval from the local SCD.
- MDE has broad authority to establish policies, procedures, standards, and criteria relating to sediment and erosion control. The regulatory elements of the state and local programs require pre-development planning and limit off-site releases of sediments during and after construction.

2. Management Measure for Chemical and Pollutant Control

This management measure is intended to be applied to the construction of new dams, as well as to construction activities associated with the maintenance of dams. The purpose of this measure is to prevent downstream contamination from pollutants such as pesticides, petrochemicals, fertilizers, lime, cement, and construction chemicals. This measure will provide for retention onsite of the soluble pollutants that are not easily controlled by erosion and sediment control practices.

This management measure will be implemented by the following programs:

- Please see the Construction Site Chemical Control management measure.

3. Management Measure for Protection of Surface Water Quality and Instream and Riparian Habitat

This management measure is intended to be applied to dam operations that could result in the loss of desirable surface water quality, and of desirable instream and riparian habitat. The purpose of this measure is to protect the quality of surface waters and aquatic habitat in reservoirs and in the downstream portions of rivers and streams that are influenced by the quality of water contained in the releases (tailwaters) from reservoir impoundments.

This management measure will be implemented by the following programs:

- Dam construction, reconstruction, repair, or alteration must be done according to a dam construction permit. Generally, the applicant will also need a water appropriation permit. Temperature and release rates may be regulated as conditions of the permit. The applicant must provide a maintenance and operations plan. Permit applications are reviewed by DNR's Fisheries Division to determine if a fish passage is needed (provision of fish passage can be included as a condition of the permit).
- DNR inspects 354 dams every 1 to 7 years, depending on the classification of the dam. Statewide, approximately 220 dams fall into the federal criteria used in the §6217 applicability section. Inspections are authorized under state law. DNR can require a dam owner to make repairs. Owners must apply for permits in order to make the repairs.

Streambank and Shoreline Erosion

1. Management Measure for Eroding Streambanks and Shorelines

This management measure is intended to be applied to eroding shorelines in coastal bays, and to eroding streambanks in coastal rivers and creeks. This measure applies only to eroding shorelines and streambanks that constitute a nonpoint source pollution problem in surface waters. The application of vegetative or engineering stabilization techniques are effective in controlling coastal erosion. These techniques also serve to halt the destruction of wetlands and riparian areas.

This management measure will be implemented by the following programs:

- The Shore Erosion Control Program DNR provides technical and financial assistance to property owners for the design and construction of shore erosion control projects.
- The state has established the Beach Erosion Control District in Ocean City and Assateague Island.
- To limit erosion of banks due to activities on water, DNR's Boating Administration can establish "minimum wake" speed limits on waterways with sensitive natural resource values.
- As discussed in the Existing Development and Channel Modification measures, the Small Creeks and Estuary Restoration Cost Share Program, administered by MDE, funds projects including stream channel reconstruction and stream bank restoration.
- Through the stream and floodplain regulations, MDE reviews applications to change the course, current, or cross section of a stream or waterbody within the state

(including changes to the 100-year frequency floodplain of free-flowing waters) to assure that, among other things, construction activities within waters of the state will not contribute to flooding of upstream or downstream property and/or cause streambank erosion.

- MDE's Stormwater Management Program and Erosion and Sediment Control Program help to limit erosion of banks due to activities on shorelands.

f. **Wetlands, Riparian Areas, and Vegetated Treatment Systems**

In Maryland, tidal wetlands include all the open water of the Chesapeake Bay, its tidal tributaries, the Coastal Bays, the Atlantic Ocean to the three-mile jurisdictional limit, and all the marsh vegetation fringing the shoreline of these bodies of water. In 1971, there were approximately 261,000 miles of tidal wetlands in Maryland. All the land and open water below the mean high water line are State wetlands, owned by the State of Maryland and held in trust for all citizens of the State. Private wetlands are the lands above the mean high water line that are subject to the periodic rise and fall of the tide and support aquatic plants.

Nontidal wetlands are defined as areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation. There are over 2,700 plant species that may occur in wetlands. Maryland contains nearly 275,000 acres of nontidal wetlands, and 15,000 acres were lost between 1955 and 1978, an average annual loss of close to 600 acres.

When hydrologic changes or pollutants exceed the natural assimilative capacity of wetlands and riparian areas, the systems become stressed and may be degraded or destroyed to the point that the wetlands and riparian areas themselves become sources of nonpoint pollution in coastal waters. A degraded wetland has less ability to remove pollutants and can deliver increased amounts of sediment, nutrients, and other pollutants to the adjoining waterbody.

Management measures for wetlands, riparian areas, and vegetated treatment systems address multiple categories of nonpoint source pollution that affect coastal waters, including the five specific categories of sources previously addressed in this chapter. These measures promote the protection and restoration of wetlands and riparian areas and the use of vegetated treatment systems as means to control the nonpoint pollution emanating from such sources. Management measures are discussed for three categories:

- o Protection of wetlands and riparian areas
- o Restoration of wetlands and riparian areas
- o Promoting the use of vegetated treatment systems, such as constructed wetlands and vegetated filter strips

The Environmental Consequences section of the PEIS contains a discussion of the functions and importance of wetlands, riparian areas, vegetated buffers, and vegetated treatment systems.

The intent of the management measures for wetlands, riparian areas and vegetated treatment systems is to ensure that the nonpoint benefits of protecting and restoring wetlands and riparian areas, and of constructing vegetated treatment systems, will be considered in all

coastal watershed water pollution control activities. The implementation of management measures will protect and restore the full range of functions for wetlands and riparian areas serving a nonpoint source abatement function and ensure that they do not become a significant nonpoint source due to degradation.

The environmental benefits that result from the implementation of management measures for wetlands, riparian areas, and vegetated treatment systems based on the existing State programs and authorities discussed below will be enhanced by fulfillment of the condition listed in Section 2.B. of this Environmental Assessment. Aquatic productivity and water quality maintenance and improvement will result from a more coordinated implementation of the management measures. Thus, these areas along Chesapeake Bay, its tidal tributaries, and the Coastal Bays will improve as agents for the removal and retention of nutrients such as nitrogen and phosphorus. The processing of wastes and reduction of sediment loads to adjoining waterbodies will improve, also.

Management Measures for Wetlands, Riparian Areas and Vegetated Treatment Systems

1. Management Measure for Protection of Wetlands and Riparian Areas

This management measure is intended to be applied to protect wetlands and riparian areas from adverse nonpoint source pollution impacts. The purpose is to protect the existing water quality improvement functions of wetlands and riparian areas as a component of nonpoint source programs. The overall approach is to establish a set of practices that maintains functions of wetlands and riparian areas and prevents adverse impacts to areas serving a nonpoint source pollution abatement function. These pollution abatement functions are most effective as parts of an integrated land management system that combines nutrient, sediment, and soil erosion control.

This management measure will be implemented by the following programs:

- The Nontidal Wetland Protection program administered by MDE regulates and protects vegetated nontidal wetlands throughout the state. Maryland does not identify specific nontidal wetlands which serve "significant NPS abatement functions". The nontidal wetland protection program was merged, in October of 1992, with the floodplain management program for the purposes of providing a stronger environmental review for floodplain activities, to provide a stronger engineering review for projects proposed in wetlands, including wetland and stream enhancement/restoration projects. Several local governments have the ability to protect nontidal wetlands through their subdivision review process.

- Maryland's Tidal Wetland Law requires a license or permit for projects involving filling, dredging, or discharging stormwater in tidal wetlands. Maryland's tidal wetland law requires protection of tidal wetlands but also allows for reasonable access to waterways, protection of property from erosion, and reclaiming fastland lost since 1972. Standard conditions are placed on licenses and permits including submittal of final project plans and specifications, the construction time period, term of permit or license, requirement

to notify DNR's Enforcement Division prior to start of work and requirement to comply with approved plans and specifications. DNR may recommend special conditions including requirements for time of year restrictions to protect aquatic resources, mitigation, compensation and financial assurances to the Board for licenses and may include similar conditions or approvals on permits.

Condition

This management measure is approved with the following condition:

- Within three years, Maryland will include in its program management measures for the protection of wetlands and riparian areas that address existing activities within and affecting wetlands and riparian areas that are not currently reviewed under existing permit authorities.

2. Management Measure for Restoration of Wetland and Riparian Areas

This management measure is intended to be applied to restore the full range of wetlands and riparian functions in areas where the systems have been degraded and destroyed and where they can serve a significant nonpoint source abatement function. This management measure should be used in conjunction with other measures addressing the adjacent land and water use activities in order to protect coastal water quality.

This management measure will be implemented by the following programs:

- See previous management measure for discussion of the Nontidal and Tidal Wetlands Protection programs.
- Forest Conservation Plans. Local plans require that applications for subdivision, grading, sediment control, or building permits on land parcels greater than 40,000 sq ft must submit a forest stand delineation and a forest conservation plan including area for conservation and afforestation (on or offsite). Stream buffers are the highest priority area for afforestation.
- MDE's Small Creeks and Estuary Restoration Cost Share Program and Stormwater Management Cost Share Program fund projects including stream channel reconstruction, wetland creation, and stream bank restoration. The State Revolving Loan Fund is another potential source of funding for restoration projects.

3. Management Measure for Vegetated Treatment Systems

This management measure is intended to be applied in cases where engineered systems of wetlands or vegetated treatment systems can treat nonpoint source pollution. Constructed wetlands and vegetated filter strips can serve a significant nonpoint source pollution abatement function. Vegetated filter strips can improve water quality by removing nutrients, sediment, suspended solids, and pesticides. Constructed wetlands can provide limited ecological benefits in addition to their nonpoint source control functions.

This management measure will be implemented by the following programs:

- Maryland's Nontidal Wetland Program has the ability to require the construction of vegetated filter strips through two mechanisms: the Soil Conservation and Water Quality (SCWQ)-plan required of farmers who impact wetlands through an ongoing agricultural activity, and through mitigation plans required of permittees or through the Nontidal Wetland Division's programmatic mitigation efforts.

- In the Tidal Wetlands Program, the use of vegetated treatment systems and creation of wetlands occurs primarily as a stormwater (quality) management function, or else as a mitigation requirement when impacts are unavoidable.

- The Stormwater Management Program encourages the use of wet retention ponds to control and treat stormwater runoff.

- The Small Creek and Estuary Cost-Share Program and the Stormwater Management Cost-share Program may fund restoration of severely degraded stream systems and stormwater management in urban areas; the use of nonstructural and vegetated treatment systems is emphasized in the funding guidelines.

ENVIRONMENTAL CONSEQUENCES

4.A MANAGEMENT MEASURES IMPLEMENTATION, continued

2. SOCIOECONOMIC IMPACTS

a. Section 4.A.2 of the PEIS provides a summary of the economic implications of the management measures guidance as described in the Regulatory Impact Analysis prepared by EPA (EPA, 1992c). This section also summarizes the economic achievability analyses performed for all nonpoint source categories (USEPA, 1992b; Ogg, 1992; DPRA, 1992; Research Triangle Institute, 1992a, 1992b, 1992c). These analyses provided a relative sense of the economic impacts of the management measures on affected households, municipalities, and commercial enterprises. EPA determined from these studies that all the management measures specified in its guidance document are economically achievable.

In developing the (g) guidance document, EPA adopted a flexible approach that emphasized broad principles or standards for nonpoint source pollution control that can be applied nationally. This allows states to develop more specific programs that reflect the most cost-effective approaches in response to local conditions.

While the implementation of management measures will entail some economic costs to Maryland, the flexibility embodied in the (g) guidance and in the NOAA/EPA Program Development and Approval Guidance document, will help to reduce the economic impacts associated with implementing the coastal nonpoint program. For example, Maryland will have until the year 2004 to fully implement the (g) management measures and until 2009 to fully implement the coastal nonpoint program, including additional management measures, where necessary. This ability to phase in program implementation over several years allows economic impacts to be absorbed over a longer time period. Another aspect of the flexibility in the program is that states may also exclude categories, subcategories, or individual nonpoint sources where the sources do not exist or are not anticipated to exist, or do not present a threat to coastal waters. This allows states to adapt their programs to local conditions, thus implementing their programs in a more cost effective manner. Based on this flexibility, Maryland requested and NOAA and EPA approved an exclusion for the agricultural irrigation management measure and partial exclusions for specific management measures within the urban and marinas source categories for activities covered under NPDES permits. States may also adopt voluntary, education, and market-based incentive systems in addition to regulatory programs as a means of management measure implementation.

Maryland has existing programs that implement the urban pollution prevention management measure through prevention and education programs. For example, MDE and other agencies formed an Urban Nutrient Management Workgroup that has developed a point-of-sale brochure explaining proper fertilizer use. MDA, the Cooperative Extension Service of the University of Maryland (CES), and Maryland Sea Grant have produced educational materials for homeowners, including three public service announcements, "Maryland Farmers Baywise Guides" (16,000 copies distributed), and a toll-free number for the CES Home and Garden Center.

Maryland encourages recycling. Maryland Environmental Services (MES), a quasi-governmental nonprofit water, wastewater, and solid waste management utility, is directed by the state to “encourage reduction in the waste generated and discharged to the environment.” MES publishes a Recycling Directory which provides information on recycling centers and MES manages the State’s Used Antifreeze and Oil Recycling Programs. Non-profit groups are also active in Maryland: the Alliance for the Chesapeake Bay has developed the Bayscapes program which includes educational materials on environmentally sensitive landscaping.

b. The implementation of management measures will also produce positive socioeconomic benefits for Maryland. For example, since many of Maryland's coastal water quality problems are linked to agricultural sources of pollutants, the agriculture management measures will help to reduce agricultural nonpoint sources such as sediment from crop lands, nutrient-laden runoff (particularly nitrogen and phosphorus) from fertilized fields and confined animal facilities, and pesticides. In addition, because of the large number of recreational boaters and marinas in Maryland, nonpoint pollution from marinas can be expected to adversely affect coastal resources in certain areas. Management measures that result in improved marina siting and design along with the implementation of best management practices for marina operation and maintenance can reduce impacts associated with this nonpoint source. Implementation of management measures will improve water quality, enhance recreational opportunities, increase property values, provide ground water protection, benefit commercial fisheries, and reduce the risk to human health from water contact activities and consumption of shellfish. Improved water quality will increase the aesthetic value of coastal areas and thus benefit tourism.

4.B PROGRAM IMPLEMENTATION

1. ENVIRONMENTAL IMPACTS

Section 6217 requires that state and territory coastal nonpoint programs contain a number of specific components to be used in developing and implementing their programs. These components are:

- o Coordination with Existing State Programs
- o Determination of the 6217 Management area
- o Implementation of Management Measures in Conformity with (g) Guidance
- o Identification and Implementation of Additional Management Measures
- o Technical Assistance
- o Public Participation
- o Administrative Coordination
- o Identification of Enforceable Policies and Mechanisms

The environmental consequences of these components are discussed below.

a. Coordination with Existing State Programs

The statute requires that coastal nonpoint programs be closely coordinated with state and local water quality plans and programs and with state and territory coastal zone

management programs. This requirement is necessary to ensure that the new coastal nonpoint program can build upon and be integrated into existing state programs upon approval. States and territories should develop their programs to complement and strengthen existing coastal management and nonpoint source authorities. This should produce a positive environmental consequence by minimizing unnecessary duplication or conflicts at the Federal, state, or local levels. It will also fulfill what the statute and legislative history indicate is the central purpose of section 6217, i.e., to strengthen the links between Federal and state coastal zone management and water quality programs in order to enhance state and local efforts to manage land use activities that degrade coastal waters.

The Maryland coastal nonpoint program will be administered through a network of state agencies and their associated programs. The lead agency is the Maryland Department of Natural Resources (DNR) and networked agencies include the Department of the Environment (MDE), Office of Planning (MOP), and Department of Agriculture (MDA). Memoranda of Understanding among the agencies, when updated, will guide agency roles and responsibilities for program implementation.

The Maryland coastal zone management program was approved by NOAA in 1978 as a networked program. As lead agency, DNR administers the Maryland coastal zone management and coastal nonpoint programs. DNR is also responsible for administering Maryland's section 319 program and is the coordinating agency for the Chesapeake Bay Tributary Strategies and Coastal Bays National Estuary Program. DNR and local governments jointly implement the Chesapeake Bay Critical Areas Protection Program. MDE is Maryland's primary regulatory agency and oversees the tidal and nontidal wetlands programs, stormwater management program, and erosion and sediment control program. MOP and DNR provide assistance to local governments to implement the Economic Growth, Resource Protection, and Planning Act.

b. 6217 Management Area

As directed by section 6217, NOAA, in consultation with EPA, reviewed each state's existing coastal zone boundary established under the CZMA, and made recommendations to the states on the geographic scope of their programs, i.e., the 6217 management area. This boundary recommendation, which was based on coastal watersheds, is a guide for states to use during program development. States may propose an alternative 6217 management area at the time of program submission. This proposal will then be evaluated by NOAA and EPA as part of the program review and approval process.

This provision has a positive environmental effect because it recognizes that land and water uses both within and outside of the existing coastal zone have the potential to degrade coastal waters. Evaluating coastal watersheds, whether or not those watersheds are completely encompassed within a state's existing coastal zone, ensures that all potential sources of nonpoint pollution that significantly affect coastal waters are included in the coastal nonpoint programs.

NOAA recommended that the Maryland 6217 management area should encompass the coastal watersheds. Maryland has chosen to propose an alternative management area, consisting of the existing coastal zone. The coastal zone extends from the state's three mile

jurisdiction in the Atlantic Ocean to the inland boundaries of the counties bordering the Atlantic Ocean, the Chesapeake Bay, and the Potomac River up to the District of Columbia (includes 16 counties and the City of Baltimore), including the Chesapeake Bay, the Atlantic coast, and the Coastal Bays. The 6217 management area includes approximately 66 percent of the state's land area and will encompass all nonpoint sources which can impact the state's coastal waters.

c. Implementation of Management Measures in Conformity with (g) Guidance

For program approval, each coastal nonpoint program must provide for the implementation, at a minimum, of management measures in conformity with the guidance published by EPA under section 6217(g). As discussed in section 4.A, this guidance addresses five categories of nonpoint pollution: agricultural runoff, urban runoff, forestry runoff, marinas, and hydromodification. Guidance is also provided for wetlands, riparian areas, and vegetated filter strips. The environmental consequences of implementing each of these management measures is discussed above in section 4.A.1. In order to satisfy statutory requirements, state programs must identify the nonpoint source categories that will be addressed; management measures for those categories; and the process by which the state will ensure the implementation of the management measures. Each coastal nonpoint program must address each of the management measures by either implementing that measure (or an equally effective alternative), or justifying why the management measure is not included in the program.

The requirement that states implement the appropriate measures should have a positive environmental effect because the management measures are designed to reduce pollution from categories and sources of nonpoint pollution that can adversely impact a state's coastal waters. In addition, a state may include management measures for sources not identified in the 6217(g) guidance, if it determines such measures are necessary to protect coastal waters.

Maryland requested and NOAA and EPA approved an exclusion for the agricultural irrigation management measure and partial exclusions for specific management measures within the urban and marinas source categories. The irrigation measure was excluded because irrigation is not a significant contributor of nonpoint source pollution to Maryland's coastal waters. Several urban and marinas measures were partially excluded because the intent of the measures is met through applicable NPDES permits. Upon fulfillment of the conditions listed in Section 2.B. of this Environmental Assessment, the Maryland program will provide for implementation of management measures in conformity with (g) guidance for agriculture runoff, forestry runoff, urban runoff, marinas, hydromodifications, and wetlands, riparian areas, and vegetated treatment systems.

d. Implementation of Additional Management Measures

For program approval, coastal nonpoint programs must provide for the implementation of additional management measures where coastal water quality is impaired or threatened even after the implementation of the management measures specified in the (g) guidance. These additional management measures are to be applied both to existing land and water uses that are

found to cause or contribute to water quality impairment and to new or substantially expanding land uses within critical coastal areas adjacent to impaired or threatened coastal waters.

This requirement should have a beneficial environmental effect because it will provide a second tier of protection where necessary to attain and maintain water quality standards and protect critical areas against future pollution problems.

Maryland has identified the Chesapeake Bay Critical Area Protection Program, which meets the criteria for additional management measures. The Critical Area Program requires local governments to manage growth within 1,000 feet of the Bay and its tidal tributaries and wetlands. The Chesapeake Bay Critical Area Commission developed a set of criteria for local governments to follow to minimize the adverse effects of human activities on water quality and natural habitats and would foster consistent, uniform and more sensitive development activity within the Critical Area. Other criteria spell out protection measures for agricultural and timber harvesting activities. Land within the Critical Area is categorized by its predominant use and the intensity of its development. This system allows local governments to focus new development toward existing developed areas and permits some infill of similar density. It also allows them to designate natural resource areas for habitat protection and for forestry, agriculture and other resource utilization activities.

Intensely Developed Areas (IDAs) are defined as areas of twenty or more adjacent acres where residential, commercial, institutional or industrial land uses predominate. IDAs are areas of concentrated development where little natural habitat occurs. Limited Development Areas (LDAs) are areas in which development is of a low or moderate intensity. LDAs contain areas of natural plant and animal habitats but are not dominated by agriculture, wetland, forest, barren land, surface water or open space. The quality of runoff from these areas has not been substantially altered or impaired. Housing densities in LDAs are between one dwelling unit per five acres and four dwelling units per acre. Resource Conservation Areas (RCAs) are characterized by natural environments or by resource-utilization activities. Resource-utilization refers to such activities as agriculture, aquaculture, commercial forestry and fisheries activities which the Criteria consider protected land uses. The Criteria limit new development in RCAs to one dwelling unit per 20 acres.

All 60 local jurisdictions within the Critical Area have developed comprehensive Critical Area programs based on the criteria developed by the Critical Area Commission. Each jurisdiction has mapped its Critical Area boundary, and classified the land within the boundary into the three development categories based on land use in 1985. Each jurisdiction has also inventoried and mapped certain important resources within the Critical Area, including agricultural lands, wetlands, forest lands, threatened and endangered species, and other significant plant and wildlife habitat.

Local governments are implementing their Critical Area programs through a variety of mechanisms. The primary implementation tools are zoning ordinances and subdivision regulations. The Critical Area Commission receives and reviews copies of all variance applications and variances granted by local jurisdictions.

Maryland has established a process to evaluate the state's progress in pollution reduction and identify any additional measures needed. As part of its ongoing effort to reduce nutrients entering the Chesapeake Bay, the state has formed ten watershed-based "Tributary

Implementation Teams” to facilitate pollution reduction activities. One of the teams’ responsibilities is to identify opportunities to improve the pollution reduction efforts.

In addition, the state, in conjunction with the implementation teams, will reexamine the nutrient reduction strategy in 1997 to ensure that the adopted management practices are achieving the nutrient reduction goals set for the year 2000. If it appears that the goals cannot be met using the adopted practices, the state will take additional actions to ensure that the goals are achieved.

e. Technical Assistance

For program approval, coastal nonpoint programs are required to provide for technical and other assistance to local governments and the public for implementing the additional management measures. States are also encouraged to provide assistance to local governments and the public for the implementation of the (g) guidance measures. Assistance may be provided in developing ordinances and regulations, as technical guidance, training, financial incentives, or demonstration projects.

This requirement will be environmentally beneficial because the technical assistance will enable the management measures to be better implemented at the regional or local level. The assistance will address local needs with respect to implementation and will provide a better understanding of what the measures are trying to accomplish and how to best accomplish it. EPA has assembled a great deal of technical information during the development of its guidance document. This information will be available to the states in a variety of formats, including bibliographies and summaries, and by electronic bulletin boards.

The Maryland coastal nonpoint program summarizes the technical assistance programs used to assist municipalities and the general public with implementation of the additional management measure, the Chesapeake Bay Critical Area Law. The Critical Area Law was specifically designed to be implemented on a cooperative basis between the state and local governments, with local governments having the responsibility for enforcing their own programs, with state oversight. Each local jurisdiction has Critical Area staff who can answer the questions of property owners as to how the Critical Area program affects them, and how they can best manage their property to assist in the restoration of the Chesapeake Bay.

The Commission reviews nearly 700 local development projects annually to ensure compliance with the Critical Area Act. It also provides technical assistance and funding for all jurisdictions and funds three "circuit riders" from the Maryland Office of Planning to assist small municipalities. The Commission is also charged with approving proposed amendments to the local critical area management programs, and overseeing and approving the mandated four-year comprehensive reviews of the local programs.

f. Public Participation

For program approval, states must provide opportunities for public participation in all aspects of the coastal nonpoint program. Congress intended that the public be involved in the development and implementation of the program, calling not only for public participation, but also for public education.

Involving the public early in the development of the program should help improve acceptance of the program and promote and maintain the public's long-term commitment to support the goals of section 6217. Specifically providing opportunities for public comment, especially by those regulated or affected by the program, prior to program development and implementation, can ensure that the program will be accepted, and therefore more effective in controlling nonpoint pollution. The public education aspect of the requirement will be beneficial by making individuals more aware of the impact of their actions on coastal waters and by generating support for pollution control efforts at the state and local level.

Education was the primary means of public involvement during the early stages of Maryland's program development. Two audiences were addressed: 1) those able to assist in the program development (i.e., other state agencies, extension agents) and 2) those affected by the program (i.e., marina operators, farmers). The state has completed numerous presentations and briefings, to groups including the Coastal and Watershed Resources Advisory Committee, State Water Quality Advisory Committee, Chesapeake Bay Workgroup, former State Senator Gerald Winegrad, Maryland Agricultural Nonpoint Source Workgroup, Critical Area Commission staff, other agency staff, Remington Farm Best Management Practices Demonstration, Maryland Association of Soil Conservation Districts, Governor's Pesticide Council, Chesapeake Bay Program Nonpoint Source Subcommittee Technical Exchange, Maryland House of Representatives Environmental Matters Committee, Marine Trade Association, Maryland's Bay Work Group, Soil and Water Conservation Society.

An article was included in the March 1993 "Coastal Report" newsletter. DNR distributed other information including information sheets, program guidance, summaries of management measures (or the entire management measures guidance) to agencies with nonpoint source programs and interested citizens.

There is also a large public education and participation element in the state's ongoing Chesapeake Bay Tributary Strategies nutrient reduction effort. The state involved the public to determine how to best reach the nutrient reduction goals in each tributary basin. There have been multiple public meetings in each watershed. Supporting documentation was produced and distributed in each basin.

Additionally, public participation has occurred through two mechanisms: (1) interaction with existing advisory groups and (2) public notice and review.

Coastal and Watershed Resources Advisory Committee CWRAC is the advisory committee for Maryland's Coastal Zone Management Program. This committee has been periodically briefed on program development, and serves as a sounding board. CWRAC formed a workgroup to discuss §6217.

State Water Quality Advisory Committee SWQAC advises the Departments of Environment and Natural Resources on state-wide water quality issues, including the Clean Water Act §319 program. SWQAC formed a workgroup to discuss §6217.

Other Existing Advisory Groups Maryland also has other advisory groups. Because the Maryland CZM program is a networked program, these advisory groups are considered as part

of the Coastal Nonpoint Program. Agencies will involve existing advisory groups if and when they make any future changes to programs (i.e., when DNR looks at boating policies, it will turn to the existing boating advisory committee).

Tributary Implementation Teams There will be further public involvement as the Tributary Strategies are implemented. Progress will be tracked by tributary implementation teams.

Public notice and review Public notices have announced the public review period for the draft program document prior to submittal to NOAA and EPA. Additionally, any future changes to state regulatory programs would be subject to public notice and review.

g. Administrative Coordination

For program approval, the coastal nonpoint program must include administrative coordination mechanisms. At a minimum, the program must include a list of state, regional and local agencies and the role that they will play in developing and implementing the program.

This requirement will be environmentally beneficial because it will help avoid conflicts and duplication of effort among the agencies involved in the coastal nonpoint program and ensure that the various agencies are fulfilling their responsibilities to implement the program. In recognizing their specific responsibilities, agencies will be able to refine policies and procedures and maximize limited resources to more effectively support the goals of section 6217.

As discussed in section 4.B.1.a above, the primary mechanisms for implementation of the Maryland coastal nonpoint program will be administered through the existing state coastal zone management program network.

The Maryland program submission describes the state, regional, and local agencies and programs and their role in developing and implementing the state nonpoint program. DNR administers the Maryland coastal zone management and coastal nonpoint programs. DNR is also responsible for administering Maryland's section 319 program and is the coordinating agency for the Chesapeake Bay Tributary Strategies and Coastal Bays National Estuary Program. DNR and local governments jointly implement the Chesapeake Bay Critical Areas Protection Program. MDE is Maryland's primary regulatory agency and oversees the tidal and nontidal wetlands programs, stormwater management program, and erosion and sediment control program. MOP and DNR provide assistance to local governments to implement the Economic Growth, Resource Protection, and Planning Act.

h. Monitoring

For program approval, the coastal nonpoint program must contain a description of any necessary monitoring techniques to accompany the management measures to assess over time the success of the measures in reducing pollution loads and improving water quality. The (g) guidance provides guidance for measuring changes in pollution loads and in water quality that may result from the implementation of management measures and for ensuring that the measures are implemented, inspected, and maintained properly.

This requirement should have a beneficial environmental effect because water quality monitoring is the most direct and defensible tool available to evaluate water quality and its response to management measures and other factors. By tracking management measures and water quality simultaneously, state will be able to evaluate the performance of the management measures and determine the need for additional management measures to meet water quality objectives.

The Maryland program includes a plan to assess over time the success of the management measures in reducing pollution loads and improving water quality.

i. Enforceable Policies and Mechanisms

For program approval, the coastal nonpoint program must contain enforceable policies and mechanisms to implement the applicable requirements of section 6217, i.e., the (g) measures and additional management measures. The term "enforceable policy" is defined in the CZMA to mean state policies which are legally binding through constitutional provisions, laws, regulations, land use plans, ordinances, or judicial or administrative decisions, by which a state exerts control over private and public land and water uses and natural resources in the coastal zone. Voluntary approaches, including economic incentives, may be used to implement management measures as long as they are backed by enforceable authorities.

This requirement will be environmentally beneficial because states will be able to use a variety of regulatory and/or non-regulatory approaches in order to ensure implementation of the management measures. In addition, the selection and design of enforceable policies can be tailored to specific state or local circumstances. The success of the implementation of the policies can also be enhanced through public education and technical assistance programs.

Maryland's coastal nonpoint program is a networked program. Implementation of management measures will be administered by several state and local agencies. Management measures for agriculture runoff will be implemented through MDE's erosion and sediment control program, the development of Soil Conservation and Water Quality Plans, the Maryland Pesticide Applicator's Law, and in some areas through the Maryland Agricultural Water Quality Cost Share program, property tax credits, and DNR's Chesapeake Bay Critical Area Program. Where those programs are inadequate, MDE may use its authority to issue general water quality/discharge permits.

Management measures for forestry will be implemented through MDE's Erosion and Sediment Control Law and Regulations, Nontidal Wetland and Waterway Permit program, and DNR's Operation Order for fire management.

Management measures for urban runoff will be implemented through MDE's Erosion and Sediment Control Law and Regulations, Stormwater Management program, and Nontidal Wetlands Protection Act, as well as DNR's Chesapeake Bay Critical Areas program, Planning Act, and Sewage Disposal Code.

Management measures for marinas and recreational boating will be implemented through MDE's Tidal Wetlands Act combined with section 401 water quality certification authority, DNR's Chesapeake Bay Critical Areas program, the state's general water quality authority, and the authority of DNR police to manage recreational boating activities..

Management measures for hydromodifications will be implemented using MDE's Nontidal Wetlands, Stream and Floodplain/Waterway permitting authority, Erosion and Sediment Control program, DNR's Shore Erosion Control program, and various state cost-share programs for streambank restoration activities.

Management measures for wetlands, riparian areas, and vegetated treatment systems will be implemented primarily by Maryland's Tidal and Nontidal Wetlands Acts, administered by MDE.

PROGRAM IMPLEMENTATION

2. SOCIOECONOMIC IMPACTS

There should not be any significant socioeconomic impacts associated with the specific components required to be used in developing and implementing the Maryland coastal nonpoint program. However, some impacts may result from efforts to protect and restore coastal waters.

The designation of critical coastal areas and the implementation of additional management measures may prohibit development and certain land and water uses in some areas. The Chesapeake Bay Critical Area Protection Program has been identified as an additional management measure. The areas under the program's jurisdiction, lands 1,000 feet inland from all Chesapeake Bay tidal wetlands and including the waters of the Bay and the Bay's submerged lands, meet the intent of a critical coastal area designation. All development activities under the program's jurisdiction are subject to special controls, such as buffers, limits on tree-cutting, and allocation of developable land.

Additional technical assistance may be required by local governments and the public in applying additional management measures. However, because Maryland currently has an extensive technical assistance program to assist municipalities and the general public with implementation of the Chesapeake Bay Critical Area Protection Program, no significant additional socioeconomic impacts should result.

A positive impact will be attained through Maryland's existing and planned public participation efforts. These efforts give the public the opportunity to participate in the development of the program and help to improve acceptance of the program. These efforts should also lead to attitude and behavior changes as people become more aware of the environmentally beneficial goals of the coastal nonpoint program. This will produce an increased public awareness of the potential impacts of their activities on the environment and lead to less pollution and lower environmental costs.

4.C ENVIRONMENTAL/SOCIOECONOMIC IMPACTS OF ALTERNATIVES

a. Approval of Maryland Coastal Nonpoint Program

As discussed in the preceding sections, the approval of the Maryland coastal nonpoint program would have a beneficial effect on the environment because it would help to control sources of nonpoint pollution and will result in less pollutants reaching coastal waters. For example, the nonpoint program could help to control agricultural runoff of sediment, nutrient-

rich fertilizers, and pesticides that hinder growth of submerged aquatic vegetation and other critical habitat in the Chesapeake Bay and Maryland Coastal Bays. The program could help to control stormwater runoff and leakage from failed septic systems that add pollutants, including fecal coliform bacteria, to coastal waters adjacent to rural and urbanizing lands on the Eastern Shore, Southern Maryland, and other areas. The coastal nonpoint program would make existing programs more effective by strengthening links between Federal and Maryland state coastal zone management and water quality programs, thereby improving state and local efforts to manage land use activities that degrade coastal waters and habitats.

The requirement for the program to develop additional management measures, to identify critical coastal areas and coastal waters that are not attaining water quality standards, and to identify the land uses that cause or threaten those coastal waters would have a positive environmental effect by focusing attention on existing or potential problem areas that could degrade coastal waters. Maryland's 305(b) Report, the nonpoint source assessment of surface waters, identifies and contains descriptions of the state's waterbodies that are threatened and impaired by nonpoint source pollution. A number of cooperative efforts (e.g., the Chesapeake Bay Tributary Strategies) are underway to prevent and mitigate nonpoint sources of pollution to these identified areas where nonpoint pollution impacts are known to exist or threaten water quality. Maryland's revised Nonpoint Source Management Plan also contains a priority watersheds selection system that establishes an ongoing process for the coordinated targeting of future watershed management efforts to threatened and impaired waters. Based on these efforts, additional management measures will be developed to address these threatened and impaired waters.

The approval of the Maryland coastal nonpoint program would also have positive socioeconomic benefits. The improvements in coastal water quality that would result from controlling nonpoint source pollution would increase the aesthetic value of coastal areas, and would help ensure that beaches and shellfishing areas remain open, thus benefitting tourism and providing opportunities for boating and swimming and other water-related activities.

b. Conditional Approval of Maryland Coastal Nonpoint Program

The conditional approval of the Maryland coastal nonpoint program will have a beneficial effect on the environment because it will produce the same beneficial results as approval, provided Maryland satisfies the conditions, and will, at least temporarily, avoid the adverse impacts of denying approval. The implementation of portions of a conditionally approved program will begin to fulfill the intent of section 6217 by helping to control sources of nonpoint pollution and will result in fewer pollutants reaching coastal waters. The same socioeconomic impacts resulting from changes in land and water uses that are associated with approval of the Maryland program should also result from conditional approval.

c. Deny Approval of Maryland Coastal Nonpoint Program

The denial of approval of the Maryland coastal nonpoint program would result in a reliance on existing programs to control nonpoint source pollution. It would result in the loss of a portion of Federal funds awarded under section 306 of the CZMA and section 319 of the

CWA. This may produce adverse environmental impacts because it may cause the state not to implement management measures that are meant to control nonpoint pollution.

Nonpoint pollution has caused significant environmental problems in Maryland. Only 3.7 percent of Maryland's 2,522 square miles of estuarine waters met their designated uses during 1989-1991 (MDE, 1993). All of these waters are classified as "threatened." Excessive nutrients were the primary cause of water quality problems, with elevated bacteria levels and sedimentation also responsible. Nonpoint sources were found to be the cause of virtually all estuarine water pollution. Low dissolved oxygen conditions, or hypoxia, occur in the central channel of the middle and lower Chesapeake Bay, Baltimore Harbor, and the lower to middle Potomac River, while algal blooms have a direct impact on water quality conditions in several Chesapeake Bay tributaries and Eastern Shore coastal lagoons. Several square miles of shellfish harvesting areas are restricted in Chesapeake Bay tributaries and Isle of Wight Bay due to stormwater runoff, boating activity, seafood processing, and animal waste, combined with poor flushing of the estuarine waters.

The denial of approval might also have an adverse economic impact because the continued degradation of water quality will affect the recreational and commercial uses and users of coastal waters. Denying approval might also cause the state not to implement a second tier of pollution control provided by additional management measures that are meant to restore degraded coastal waters and protect critical coastal areas against future pollution.

4.D UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The conditional approval of the Maryland coastal nonpoint program and the implementation of management measures should not produce any unavoidable adverse environmental impacts. The Maryland coastal nonpoint program is intended to protect the environment by controlling nonpoint pollution and protecting and restoring coastal waters. There may be some changes in the patterns of land and water uses in order to avoid activities that degrade coastal waters and habitats. These changes in activities, such as directing development away from critical coastal areas, should not result in any unavoidable adverse environmental impacts. Any unavoidable effects associated with development or other activities being directed to more suitable non-critical areas are regulated under existing state and Federal programs. In addition, section 6217(g) requires a description of any necessary monitoring techniques to accompany the management measures to assess over time the success of the measures in reducing pollution loads and improving water quality. The Maryland program addresses these required monitoring techniques on pages 171-176 in Volume I of the program submission.

4.E RELATIONSHIP BETWEEN SHORT-TERM USES OF ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The overall purpose of section 6217 and the Maryland coastal nonpoint program is to protect and restore coastal waters and thus to enhance the long-term productivity of all coastal resources. The NOAA/EPA review of the Maryland program and NOAA's preparation of this

environmental assessment have not indicated that the Maryland program includes any short-term uses of the environment that may reduce long-term productivity. Some short-term uses of the environment may have to be modified in response to implementation of management measures. This may result in short-term costs to the users, but will result in long-term benefits to the environment through cleaner coastal waters, protected resources, and increased productivity.

4.F IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NOAA does not anticipate any irreversible or irretrievable commitment of resources as a result of the approval of the Maryland coastal nonpoint program. However, the section 6217 requirements for states and territories to establish a 6217 management area, to implement management measures in this area, and to identify and map critical coastal areas that need additional measures to protect them against present and future nonpoint pollution problems, may have the effect of reallocating resources for an indefinite period of time. The identification of critical areas may also have the effect of restricting development or other activities in the critical areas and concentrating these activities in other locations. Although development activity results in the affected site being committed to the new use for an indefinite period of time, and can practically be considered an irretrievable commitment of resources, the amount of resources is expected to be minimal. Also, although critical areas may need special controls such as setbacks and low density zoning to protect coastal waters, these designations may change in the future.

5. LIST OF PREPARERS

Joshua Lott - Program Specialist, Coastal Programs Division in the Office of Ocean and Coastal Resource Management, had lead responsibility for the preparation of the Maryland environmental assessment. He has a B.A. in Political Science from the University of Pennsylvania and a Master of Urban and Regional Planning from The George Washington University.

Joseph P. Flanagan - Environmental Protection Specialist, Coastal Programs Division in the Office of Ocean and Coastal Resource Management, assisted in the preparation of the Maryland environmental assessment. He has been involved in the preparation of environmental impact statements and assessments since 1980, mainly in NOAA's Ocean Minerals and Energy Division. He has a B.S. in Geology/Chemistry from the University of Miami and an M.S. in Environmental Systems Management from The American University.

6. LIST OF AGENCIES AND PERSONS CONSULTED

The following Federal and Maryland agencies were consulted during the preparation of the environmental assessment and during the review of the Maryland coastal nonpoint program. These agencies also received a copy of the environmental assessment.

Federal Agencies

Environmental Protection Agency
Office of Wetlands, Oceans and Watersheds
Office of Ecosystem Protection
Region III - Nonpoint Source Coordinator
Department of Commerce
National Marine Fisheries Service
Department of the Interior
U.S. Fish and Wildlife Service

Maryland Agencies

Department of Natural Resources
Department of the Environment
Department of Agriculture
Office of Planning

7. FINDING OF NO SIGNIFICANT ENVIRONMENTAL IMPACT

Having reviewed the environmental assessment and the available information relating to the proposed action, I have determined that there will be no significant environmental impact resulting from the action different from those analyzed in the Programmatic Environmental Impact Statement prepared for the 6217 program. Preparation of an environmental impact statement on the action is not required by Section 102 (2) (c) of the National Environmental Policy Act or its implementing regulations.

W. Stanley Wilco

Assistant Administrator for Ocean Services
and Coastal Zone Management, NOAA

10/3/96
Date

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APPENDIX A. MANAGEMENT MEASURES FOR SOURCES OF NONPOINT POLLUTION IN COASTAL WATERS

1. Management Measures for Agricultural Sources

1. Erosion and Sediment Control Management Measure

Apply the erosion component of a Conservation Management System (CMS) as defined in the Field Office Technical Guide of the U.S. Department of Agriculture Natural Resources Conservation Service to minimize the delivery of sediment from agricultural lands to surface waters, or

Design and install a combination of management and physical practices to settle the settleable solids and associated pollutants in runoff delivery from the contributing area for storms of up to and including a 10-year, 24-hour frequency.

2a. Management Measure for Facility Wastewater and Runoff from Confined Animal Facility Management (Large Units).

Limit the discharge from the confined animal facility to surface waters by:

(1) Storing both the facility wastewater and the runoff from confined animal facilities that is caused by storms up to and including a 25-year, 24-hour frequency storm.

Storage structures should:

(a) Have an earthen lining or plastic membrane lining, or

(b) Be constructed with concrete, or

(c) Be a storage tank; and

(2) Managing stored runoff and accumulated solids from the facility through an appropriate waste utilization system.

This management measure is intended to be applied to all new facilities regardless of size and to all new or existing confined animal facilities that contain the following number of head or more:

	<u>Head</u>	<u>Animal Units</u>
Beef Feedlots	300	300
Stables (horses)	200	400
Dairies	70	98
Layers	15,000	150 ¹ 495 ²
Broilers	15,000	150 ¹ 495 ²
Turkeys	13,750	2,475
Swine	200	80

This measure does not apply to those facilities that are defined as concentrated animal feeding operations by Federal regulation 40 CFR 122 and are required to obtain NPDES discharge permits. This regulation allows the Director of a NPDES discharge program to designate any animal feeding operation as a concentrated animal feeding operation (thus subjecting the operation to NPDES program requirements) upon determining that it is a significant contributor of pollution. If an NPDES permit is issued, the terms of the permit apply and this management measure is not required.

A confined animal facility is a lot or facility (other than an aquatic animal production facility) where the following conditions are met:

- Animals (other than aquatic animals) have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period, and
- Crops, vegetation forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.

2b. Management Measure for Facility Wastewater and Runoff from Confined Animal Facility Management (Small Units)

Design and implement systems that collect solids, reduce contaminant concentrations, and reduce runoff to minimize the discharge of contaminants in both facility wastewater and in runoff that is caused by storms up to and including a 25-year, 24-hour frequency storm. Implement these systems to substantially reduce significant increases in pollutant loadings to ground water. Manage stored runoff and accumulated solids from the facility through an appropriate waste utilization system.

This management measure is intended to be applied to all existing confined animal facilities that contain the following number of head:

	<u>Head</u>	<u>Animal Units</u>
Beef Feedlots	50-299	50-299 1b
Stables (horses)	100-199	200-399
Dairies	20-69	28-97
Layers	5000-14,999	50-149 ³ 165-494 ⁴
Broilers	5,000-14,999	50-149 ³ 165-494 ⁴
Turkeys	5,000-13,749	900-2,474
Swine	100-199	40-79

³ If facility has a liquid manure system, as used in 40 CFR Section 122, App.B.

⁴ If facility has continuous overflow watering, as used in 40 CFR Section 122, App.B.

This measure is subject to the same NPDES designation criteria mentioned for large unit animal facilities. Facilities containing fewer than the number of head listed above are not subject to this management measure. Existing facilities that meet the requirements of management measures for large units are in compliance with the requirements of this measure. Existing and new facilities that already minimize the discharge of contaminants to surface waters, protect against contamination of ground water, and have an appropriate waste utilization system may already meet the requirements of this measure. Such facilities may not need additional controls for the purposes of this measure.

3. Nutrient Management Measure

Develop, implement, and periodically update a nutrient management plan to:

(1) apply nutrients at rates necessary to achieve realistic crop yields, (2) improve the timing of nutrient application, and (3) use agronomic crop production technology to increase nutrient use efficiency. When the source of the nutrients is other than commercial fertilizer, determine the nutrient value and the rate of availability of the nutrients. Determine and credit the nitrogen contribution of any legume crop. Soil and plant tissue testing should be used routinely.

Nutrient management plans contain the following core components:

(1) Farm and field maps showing acreage, crops, soils, and waterbodies.

(2) Realistic yield expectations for the crop(s) to be grown, based primarily on the producer's actual yield history, State Land Grant University yield expectations for the soil series, or SCS Soils-5 information for the soil series.

(3) *A summary of the nutrient resources available to the producer, which at a minimum include:*

- *Soil test results for pH, phosphorus, nitrogen, and potassium;*
- *Nutrient analysis of manure, sludge, mortality compost or effluent;*
- *Nitrogen contributions to the soil from legumes grown in the rotation;*
- *Other significant nutrient sources (e.g., irrigation water).*

(4) *An evaluation of field limitations based on environmental hazards or concerns, such as,*

- *Sinkholes, shallow soils over fractured bedrock, and soils with high leaching potential,*
- *Lands near surface water,*
- *Highly erodible soils, and,*
- *Shallow aquifers.*

(5) *Use of the limiting nutrient concept to establish the mix of nutrient sources and requirements for the crop based on a realistic yield expectation.*

(6) *Identification of timing and application methods for nutrients to: provide nutrients at rates necessary to achieve realistic crop yields; reduce losses to the environment; and avoid applications as much as possible to frozen soil and during periods of leaching and runoff.*

(7) *Provisions for the proper calibration and operation of nutrient application equipment.*

4. Pesticide Management Measure

To reduce contamination of surface water and ground water from pesticides:

- (1) *Evaluate the pest problems, previous pest control measures, and cropping history;*
- (2) *Evaluate the soil and physical characteristics of the site including mixing, loading, and storage areas for potential leaching or runoff of pesticides. If leaching or runoff is found to occur, steps should be taken to prevent further contamination;*
- (3) *Use integrated pest management (IPM) strategies that:*
 - (a) *Apply pesticides only when an economic benefit to the producer will be achieved (i.e., applications based on economic thresholds); and*
 - (b) *Apply pesticides efficiently and at times when runoff are unlikely;*
- (4) *When pesticide applications are necessary and a choice of registered materials exists, consider the persistence, toxicity, runoff potential, and leaching potential of products in making a selection;*
- (5) *Periodically calibrate pesticide spray equipment; and*
- (6) *Use anti-backflow devices on hoses used for filling tank mixtures.*

5. Grazing Management Measure

Protect range, pasture and other grazing lands:

- (1) *By implementing one or more of the following to protect sensitive areas (such as streambanks, wetlands, estuaries, ponds, lake shores, and riparian zones):*
 - (a) *Exclude livestock,*
 - (b) *Provide stream crossings or hardened watering access for drinking,*
 - (c) *Provide alternative drinking water locations,*
 - (d) *Locate salt and additional shade, if needed, away from sensitive areas, or*
 - (e) *Use improved grazing management (e.g., herding)*
to reduce the physical disturbance and reduce direct loading of animal waste and sediment caused by livestock; and
- (2) *By achieving either of the following on all range, pasture, and other grazing lands not addressed under (1):*
 - (a) *Implement the range and pasture components of a Conservation Management System (CMS) as defined in the Field Office Technical Guide of*

the USDA-SCS by applying the progressive planning approach of the USDA Soil Conservation Service (SCS) to reduce erosion, or
(b) Maintain range, pasture, and other grazing lands in accordance with activity plans established by either the Bureau of Land Management of the U.S. Department of the Interior or the Forest Service of the USDA.

6. Irrigation Water Management

To reduce nonpoint source pollution of surface waters caused by irrigation:

- (1) Operate the irrigation system so that the timing and amount of irrigation water applied match crop water needs. This will require, as a minimum: (a) the accurate measurement of soil-water depletion volume and the volume of irrigation water applied, and (b) uniform application of water.*
- (2) When chemigation is used, include backflow preventers for wells, minimize the harmful amounts of chemigated waters that discharge from the edge of the field, and control deep percolation. In cases where chemigation is performed with furrow irrigation systems, a tailwater management system may be needed.*

The following limitations and special considerations apply:

- (1) In some locations, irrigation return flows are subject to other water rights or are required to maintain stream flow. In these special cases, on-site reuse could be precluded and would not be considered part of the management measure for such locations.*
- (2) By increasing the water use efficiency, the discharge volume from the system will usually be reduced. While the total pollutant load may be reduced somewhat, there is the potential for an increase in the concentration of pollutants in the discharge. In these special cases, where living resources or human health may be adversely affected and where other management measures (nutrients and pesticides) do not reduce concentrations in the discharge, increasing water use efficiency would not be considered part of the management measure.*
- (3) In some irrigation districts, the time interval between the order for and the delivery of irrigation water to the farm may limit the irrigator's ability to achieve the maximum on-farm application efficiencies that are otherwise possible.*
- (4) In some locations, leaching is necessary to control salt in the soil profile. Leaching for salt control should be limited to the leaching requirement for the root zone.*
- (5) Where leakage from delivery systems or return flows supports wetlands or wildlife refuges, it may be preferable to modify the system to achieve a high level of efficiency and then divert the "saved water" to the wetland or wildlife refuge. This will improve the quality of water delivered to wetlands or wildlife refuges by preventing the introduction of pollutants from irrigated lands to such diverted water.*
- (6) In some locations, sprinkler irrigation is used for frost or freeze protection, or for crop cooling. In these special cases, applications should be limited to the amount necessary for crop protection, and applied water should remain on-site.*

2. Management Measures for Urban Areas

1. New Development Management Measure

(1) By design or performance:

- (a) After construction has been completed and the site is permanently stabilized, reduce the average annual total suspended solid (TSS) loadings by 80 percent.*

For the purposes of this measure, an 80 percent TSS reduction is to be determined on an average annual basis, or*

(b) Reduce the postdevelopment loadings of TSS so that the average annual TSS loadings are no greater than predevelopment loadings, and

(2) To the extent practicable, maintain postdevelopment peak runoff rate and average volume at levels that are similar to predevelopment levels.

Sound watershed management requires that both structural and nonstructural measures be employed to mitigate the adverse impacts of storm water. Nonstructural Management Measures 11.B and 11.C can be effectively used in conjunction with Management Measure 11.A to reduce both the short-and long-term costs of meeting the treatment goals of this management measure.

** Based on the average annual TSS loadings from all storms less than or equal to the 2-year/24 hour storm. TSS loadings from storms greater than the 2-year/24 hour storm are not expected to be included in the calculation of the average annual TSS loadings.*

2. Watershed Protection Management Measure

Develop a watershed protection program to:

(1) Avoid conversion, to the extent practicable, of areas that are particularly susceptible to erosion and sediment loss;

(2) Preserve areas that provide important water quality benefits and/or are necessary to maintain riparian and aquatic biota; and

(3) Site development, including roads, highways, and bridges, to protect to the extent practicable the natural integrity of waterbodies and natural drainage systems

3. Site Development Management Measure

Plan, design, and develop sites to:

(1) Protect areas that provide important water quality benefits and/or are particularly susceptible to erosion and sediment loss;

(2) Limit increases of impervious areas, except where necessary;

(3) Limit land disturbance activities such as clearing and grading, and cut and fill to reduce erosion and sediment loss; and

(4) Limit disturbance of natural drainage features and vegetation.

4. Construction Site Erosion and Sediment Control Management Measure

(1) Reduce erosion and, to the extent practicable, retain sediment onsite during and after construction, and

(2) Prior to land disturbance, prepare and implement an approved erosion and sediment control plan or similar administrative document that contains erosion and sediment control provisions.

5. Construction Site Chemical Control Management Measure

(1) Limit application, generation, and migration of toxic substances;

(2) *Ensure the proper storage and disposal of toxic materials; and*

(3) *Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters.*

6. Existing Development Management Measure

Develop and implement watershed management programs to reduce runoff pollutant concentrations and volumes from existing development:

(1) *Identify priority local and/or regional watershed pollutant reduction opportunities, e.g., improvements to existing urban runoff control structures;*

(2) *Contain a schedule for implementing appropriate controls;*

(3) *Limit destruction of natural conveyance systems; and*

(4) *Where appropriate, preserve, enhance, or establish buffers along surface waterbodies and their tributaries.*

7. New Onsite Disposal Systems Management Measures

(1) *Ensure that new Onsite Disposal Systems (OSDS) are located, designed, installed, operated, inspected, and maintained to prevent the discharge of pollutants to the surface of the ground and to the extent practicable reduce the discharge of pollutants into ground waters that are closely hydrologically connected to surface waters. Where necessary to meet these objectives: (a) discourage the installation of garbage disposals to reduce hydraulic and nutrient loadings; and (b) where low-volume plumbing fixtures have not been installed in new developments or redevelopments, reduce total hydraulic loadings to the OSDS by 25 percent. Implement OSDS inspection schedules for preconstruction, construction, and postconstruction.*

(2) *Direct placement of OSDS away from unsuitable areas. Where OSDS placement in unsuitable areas is not practicable, ensure that the OSDS is designed or sited at a density so as not to adversely affect surface waters or ground water that is closely hydrologically connected to surface water. Unsuitable areas include, but are not limited to, areas with poorly or excessively drained soils; areas with shallow water tables or areas with high seasonal water tables; areas overlaying fractured bedrock that drain directly to ground water; areas with floodplains; or areas where nutrient and/or pathogen concentrations in the effluent cannot be sufficiently treated or reduced before the effluent reaches sensitive waterbodies;*

(3) *Establish protective setbacks from surface waters, wetlands, and floodplains for conventional as well as alternative OSDS. The lateral setbacks should be based on soil type, slope, hydrologic factors, and type of OSDS. Where uniform protective setbacks cannot be achieved, site development with OSDS so as not to adversely affect waterbodies and/or contribute to a public health nuisance.*

(4) *Establish protective separation distances between OSDS system components and groundwater which is closely hydrologically connected to surface waters. The separation distances should be based on soil type, distance to ground water, hydrologic factors, and type of OSDS;*

(5) *Where conditions indicate that nitrogen-limited surface waters may be adversely affected by excess nitrogen loadings from ground water, require the installation of OSDS that reduce total nitrogen loadings by 50 percent to ground water that is closely hydrologically connected to surface water.*

8. Operating Onsite Disposal Systems Management Measure

(1) *Establish and implement policies and systems to ensure that existing OSDS are operated and maintained to prevent the discharge of pollutants to the surface of the ground and to the extent practicable reduce the discharge of pollutants into ground waters that are closely hydrologically connected to surface waters. Where necessary to meet these objectives, encourage the reduced use of garbage disposals, encourage the use of low-volume plumbing fixtures, and reduce total phosphorus loadings to the OSDS by 15 percent (if the use of low-level phosphate detergents has not been required or widely adopted by OSDS users). Establish and implement policies that require an OSDS to be repaired, replaced, or modified where the OSDS fails, or threatens or impairs surface waters;*

(2) *Inspect OSDS at a frequency adequate to ascertain whether OSDS are failing:*

(3) *Consider replacing or upgrading OSDS to treat influent so that total nitrogen loadings in the effluent are reduced by 50 percent. This provision applies only:*
(a) *where conditions indicate that nitrogen-limited surface waters may be adversely affected by significant ground water nitrogen loadings from OSDS;*
(b) *where nitrogen loadings from OSDS are delivered to ground water that is closely hydrologically connected to surface water.*

9. Pollution Prevention Management Measure

Implement pollution prevention and education programs to reduce nonpoint source pollutants generated from the following activities, where applicable:

- o The improper storage, use and disposal of household hazardous chemicals, including automobile fluids, pesticides, paints, solvents, etc.,*
- o Lawn and garden activities, including the application and disposal of lawn and garden care products, and the improper disposal of leaves and yard trimmings;*
- o Turf management on golf courses, parks, and recreational areas;*
- o Improper operation and maintenance of onsite disposal systems;*
- o Discharge of pollutants into storm drains including floatables, waste oil, and litter;*
- o Commercial activities including parking lots, gas stations, and other entities not under NPDES purview; and*
- o Improper disposal of pet excrement.*

10. Management Measure for Planning, Siting, and Developing Roads and Highways

Plan, site, and develop roads and highways to:

- (1) *Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss; and*
- (2) *Limit land disturbance such as clearing and grading and cut and fill to reduce erosion and sediment loss; and*
- (3) *Limit disturbance of natural drainage features and vegetation.*

11. Management Measure for Bridges

Site, design, and maintain bridge structures so that sensitive and valuable aquatic ecosystems and areas providing important water quality benefits are protected from adverse effects.

12. Management Measure for Construction Projects

(1) *Reduce erosion and, to the extent practicable, retain sediment onsite during and after construction and;*

(2) Prior to land disturbance, prepare and implement an approved erosion control plan or similar administrative document that contains erosion and sediment control provisions.

13. Management Measure for Construction Site Chemical Control

(1) Limit the application, generation, and migration of toxic substances;

(2) Ensure the proper storage and disposal of toxic materials; and

(3) Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface water.

14. Management Measure for Operation and Maintenance

Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutant loadings to surface waters.

15. Management Measure for Road, Highway, and Bridge Runoff Systems

Develop and implement runoff management systems for existing roads, highways, and bridges to reduce runoff pollutant concentrations and volumes entering surface waters.

(1) Identify priority and watershed pollutant reduction opportunities (e.g., improvements to existing urban runoff control structures; and

(2) Establish schedules for implementing appropriate controls.

3. Management Measures for Forestry

1. Preharvest Planning

Perform advance planning for forest harvesting that includes the following elements where appropriate:

(1) Identify the area to be harvested including location of waterbodies and sensitive areas such as wetlands, threatened or endangered aquatic species habitat areas, or high-erosion-hazard areas (landslide-prone areas) within the harvest unit.

(2) Time the activity for the season or moisture conditions when the least impact occurs.

(3) Consider potential water quality impacts and erosion and sedimentation control in the selection of silvicultural and regeneration systems, especially for harvesting and site preparation.

(4) Reduce the risk of occurrence of landslides and severe erosion by identifying high-erosion-hazard areas and avoiding harvesting in such areas to the extent practicable.

(5) Consider additional contributions from harvesting or roads to any known existing water quality impairments or problems in watersheds of concern.

Perform advance planning for forest road systems that includes the following elements where appropriate:

(1) Locate and design road systems to minimize, to the extent practicable, potential sediment generation and delivery to surface waters. Key components are:

- o locate roads, landings, and skid trails to avoid to the extent practicable steep grades and steep hillslope areas, and to decrease the number of stream

- o crossings;
 - o avoid to the extent practicable locating new roads and landings in Streamside Management Areas (SMAs); and
 - o determine road usage and select the appropriate road standard.
- (2) Locate and design temporary and permanent stream crossings to prevent failure and control impacts from the road system. Key components are:
- o size and site crossing structures to prevent failure;
 - o for fish-bearing streams, design crossings to facilitate fish passage.
- (3) Ensure that the design of road prism and the road surface drainage are appropriate to the terrain and that road surface design is consistent with the road drainage structures.
- (4) Use suitable materials to surface roads planned for all-weather use to support truck traffic.
- (5) Design road systems to avoid high erosion or landslide hazard areas. Identify these areas and consult a qualified specialist for design of any roads that must be constructed through these areas.

Each state should develop a process (or utilize an existing process) that ensures that the management measures in the chapter are implemented. Such a process should include appropriate notification, compliance audits, or other mechanisms for forestry activities with the potential for significant adverse nonpoint effects based on the type and size of operation and the presence of stream crossings or SMAs.

2. Streamside Management Areas (SMAs)

Establish and maintain a streamside management area along surface waters, which is sufficiently wide and which includes a sufficient number of canopy species to buffer against detrimental changes in the temperature regime of the waterbody, to provide bank stability, and to withstand wind damage. Manage the SMA in such a way as to protect against soil disturbance in the SMA and delivery to the stream of sediments and nutrients generated by forestry activities, including harvesting. Manage the SMA canopy species to provide a sustainable source of large woody debris needed for instream channel structure and aquatic species habitat.

3. Road Construction/Reconstruction

- (1) Follow preharvest planning (as described under Management Measure 1) when constructing or reconstructing the roadway.
- (2) Follow designs planned under Management Measure 1 for road surfacing and shaping.
- (3) Install road drainage structures according to designs planned under Management Measure 1 and regional storm return period and installation specifications. Match these drainage structures with terrain features and with road surface and prism designs.
- (4) Guard against the production of sediment when installing stream crossings.
- (5) Protect surface waters from slash and debris material from roadway clearing.
- (6) Use straw bales, silt fences, mulching, or other favorable practices on disturbed soils on unstable cuts, fills, etc.
- (7) Avoid constructing new roads in SMAs to the extent practicable.

4. Road Management

- (1) Avoid using roads where possible for timber hauling or heavy traffic during wet

or thaw periods on roads not designed and constructed for these conditions.

(2) Evaluate the future need for a road and close roads that will not be needed. Leave closed roads and drainage channels in a stable condition to withstand storms.

(3) Remove drainage crossings and culverts if there is a reasonable risk of plugging or failure from lack of maintenance.

(4) Following completion of harvesting, close and stabilize temporary spur roads and seasonal roads to control and direct water away from the roadway. Remove all temporary stream crossings.

(5) Inspect roads to determine the need for structural maintenance. Conduct maintenance practices, when conditions warrant, including cleaning and replacement of deteriorated structures and erosion controls, grading or seeding of road surfaces, and, in extreme cases, slope stabilization or removal of road fills where necessary to maintain structural integrity.

(6) Conduct maintenance activities, such as dust abatement, so that chemical contaminants or pollutants are not introduced into surface waters to the extent practicable.

(7) Properly maintain permanent stream crossings and associated fills and approaches to reduce the likelihood (a) that stream overflow will divert onto roads, and (b) that fill erosion will occur if the drainage structures become obstructed.

5. Timber Harvesting

The timber harvesting management measure consists of implementing the following:

(1) Timber harvesting operations with skid trails or cable yarding follow layouts determined under Management Measure 1.

(2) Install landing drainage structures to avoid sedimentation to the extent practicable. Disperse landing drainage over sideslopes.

(3) Construct landings away from steep slopes and reduce the likelihood of fill slope failures. Protect landing surfaces used during wet periods. Locate landings outside of SMAs.

(4) Protect stream channels and significant ephemeral drainages from logging debris and slash material.

(5) Use appropriate areas for petroleum storage, draining, dispensing. Establish procedures to contain and treat spills. Recycle or properly dispose of all waste materials.

For cable yarding:

(1) Limit yarding corridor gouge or soil plowing by properly locating cable yarding landings.

(2) Locate corridors for SMAs following Management Measure 2.

For groundskidding:

(1) Within SMAs, operate groundskidding equipment only at stream crossings to the extent practicable. In SMAs, fell and endline trees to avoid sedimentation.

(2) Use improved stream crossings for skid trails which cross flowing drainages. Construct skid trails to disperse runoff and with adequate drainage structures.

(3) On steep slopes, use cable systems rather than groundskidding where groundskidding may cause excessive sedimentation.

6. Site Preparation and Forest Regeneration

Confine on-site potential NPS pollution and erosion resulting from site preparation and the regeneration of forest stands. The components of the management measure for site preparation and regeneration are:

- (1) Select a method of site preparation and regeneration suitable for the site conditions.*
- (2) Conduct mechanical tree planting and ground-disturbing site preparation activities on the contour of sloping terrain.*
- (3) Do not conduct mechanical site preparation and mechanical tree planting in streamside management areas.*
- (4) Protect surface waters from logging debris and slash material.*
- (5) Suspend operations during wet periods if equipment used begins to cause excessive soil disturbance that will increase erosion.*
- (6) Locate windrows at a safe distance from drainages and SMAs to control movement of the material during high runoff conditions.*
- (7) Conduct bedding operations in high-water-table areas during dry periods of the year. Conduct bedding in sloping areas on the contour.*
- (8) Protect small ephemeral drainages when conducting mechanical tree planting.*

7. Fire Management

Prescribe fire for site preparation and control or suppress wildfire in a manner which reduces potential nonpoint source pollution of surface waters:

- (1) Intense prescribed fire should not cause excessive sedimentation due to the combined effect of removal of canopy species and the loss of soil-binding ability of subcanopy and herbaceous vegetation roots, especially in SMAs, in streamside vegetation for small ephemeral drainages, or on very steep slopes.*
- (2) Prescriptions for prescribed fire should protect against excessive erosion or sedimentation to the extent practicable.*
- (3) All bladed firelines, for prescribed fire and wildfire, should be plowed on contour or stabilized with water bars and/or other appropriate techniques if needed to control excessive sedimentation or erosion of the fireline.*
- (4) Wildfire suppression and rehabilitation should consider possible NPS pollution of watercourses, while recognizing the safety and operational priorities of fighting wildfires.*

8. Revegetation of Disturbed Areas

Reduce erosion and sedimentation by rapid vegetation of areas disturbed by harvesting operations or road construction:

(1) Revegetate disturbed areas (using seeding or planting) promptly after completion of the earth-disturbing activity. Local growing conditions will dictate the timing for establishment of vegetative cover.

(2) Use mixes of species and treatments developed and tailored for successful vegetation establishment for the region or area.

(3) Concentrate revegetation efforts initially on priority areas such as disturbed areas in SMAs or the steepest areas of disturbance near drainages.

9. Forest Chemical Management

Use chemicals when necessary for forest management in accordance with the following to reduce nonpoint source pollution impacts due to the movement of forest chemicals off-site during and after application:

(1) Conduct applications by skilled and, where required, licensed applicators according to the registered use, with special consideration given to impacts to nearby surface waters.

(2) Carefully prescribe the type and amount of pesticides appropriate for the insect, fungus, or herbaceous species.

(3) Prior to applications of pesticides and fertilizers, inspect the mixing and loading process and the calibration of equipment, and identify the appropriate weather conditions, the spray area, and buffer areas for surface waters.

(4) Establish and identify buffer areas for surface waters. (This is especially important for aerial applications.)

(5) Immediately report accidental spills of pesticides or fertilizers into surface waters to the appropriate State agency. Develop an effective spill contingency plan to contain spills.

10. Wetlands Forest

Plan, operate, and manage normal, ongoing forestry activities (including harvesting, road design and construction, site preparation and regeneration, and chemical management) to adequately protect the aquatic functions of forested wetlands.

4. Management Measures for Marinas and Recreational Boating

Siting and Design

1. Marina Flushing Management Measure

Site and design marinas such that tides and/or currents will aid in flushing of the site or renew its water regularly.

2. Water Quality Assessment Management Measure

Assess water quality as part of marina siting and design.

3. Habitat Assessment Management Measure

Site and design marinas to protect against adverse effects on shellfish resources,

wetlands, submerged aquatic vegetation, or other important riparian and aquatic habitat areas as designated by local, State, or Federal governments.

4. Shoreline Stabilization Management Measure

Where shoreline erosion is a nonpoint source pollution problem, shorelines should be stabilized.- Vegetated methods are strongly preferred unless structural methods are more cost effective, considering the severity of wave and wind erosion, offshore bathymetry, and the potential adverse impact on other shorelines and offshore areas

5. Storm Water Runoff Management Measure

Implement effective runoff control strategies which include the use of pollution prevention activities and the proper design of hull maintenance areas. Reduce the average annual loadings of total suspended solids (TSS) in runoff from hull maintenance areas by 80 percent. For the purposes of this measure, an 80 percent reduction of TSS is to be determined on an average annual basis.

6. Fueling Station Design Management Measure

Design fueling stations to allow for ease in cleanup of spills.

7. Sewage Facility Management Measure

Install pumpout, dump station, and restroom facilities where needed at new and expanding marinas to reduce the release of sewage to surface waters. Design these facilities to allow ease of access and post signage to promote use by the boating public.

Operation and Maintenance

1. Solid Waste Management Measure

Properly dispose of solid wastes produced by the operation, cleaning, maintenance, and repair of boats to limit entry of solid wastes to surface waters.

2. Fish Waste Management Measure

Promote sound fish waste management through a combination of fish-cleaning restrictions, public education, and proper disposal of fish waste.

3. Liquid Material Management Measure

Provide and maintain appropriate storage, transfer, containment, and disposal facilities for liquid material, such as oil, harmful solvents, antifreeze, and paints, and encourage recycling of these materials.

4. Petroleum Control Management Measure

Reduce the amount of fuel and oil from boat bilges and fuel tank air vents entering marina and surface waters.

5. Boat Cleaning Management Measure

For boats that are in the water, perform cleaning operations to minimize, to the extent practicable, the release to surface waters of (a) harmful cleaners and solvents and (b) paint from in-water hull cleaning.

6. Public Education Management Measure

Public education/outreach/training programs should be instituted for boaters, as well as marina owners and operators, to prevent improper disposal of polluting material.

7. Maintenance of Sewage Facilities Management Measure

Ensure that sewage pumpout facilities are maintained in operational condition and encourage their use.

8. Boat Operation Management Measure (applies to boating only)

Restrict boating activities where necessary to decrease turbidity and physical destruction of shallow-water habitat.

5. Management Measures for Hydromodification

Channelization and Channel Modification

1. Management Measure for Physical and Chemical Characteristics of Surface Waters

(1) Evaluate the potential effects of proposed channelization and channel modification on the physical and chemical characteristics of surface waters in coastal areas;

(2) Plan and design channelization and channel modification to reduce undesirable impacts; and

(3) Develop an operation and maintenance program for existing modified channels that includes identification and implementation of opportunities to improve physical and chemical characteristics of surface waters in those channels.

2. Instream and Riparian Habitat Restoration Management Measure

(1) Evaluate the potential effects of proposed channelization and channel modification on instream and riparian habitat in coastal areas;

(2) Plan and design channelization and channel modification to reduce undesirable impacts; and

(3) Develop an operation and maintenance program with specific timetables for existing modified channels that includes identification of opportunities to restore instream and riparian habitat in those channels.

Dams

1. Management Measure for Erosion and Sediment Control

(1) Reduce erosion and, to the extent practicable, retain sediment onsite during

and after construction, and

(2) Prior to land disturbance, prepare and implement an approved erosion and sediment control plan or similar administrative document that contains erosion and sediment control provisions.

2. Management Measure for Chemical and Pollutant Control

(1) Limit application, generation, and migration of toxic substances;

(2) Ensure the proper storage and disposal of toxic materials; and,

(3) Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters.

3. Management Measure for Protection of Surface Water Quality and Instream and Riparian Habitat

Develop and implement a program to manage the operation of dams in coastal areas that includes an assessment of:

(1) Surface water quality and instream and riparian habitat and potential for improvement and

(2) Significant nonpoint source pollution problems that result from excessive surface water withdrawals.

Streambank and Shoreline Erosion

1. Management Measure for Eroding Streambanks and Shorelines

(1) Where streambank or shoreline erosion is a nonpoint source pollution problem, streambanks and shorelines should be stabilized. Vegetative methods are strongly preferred unless structural methods are more cost-effective, considering the severity of wave and wind erosion, offshore bathymetry, and the potential adverse impact on other streambanks, shorelines, and offshore areas.

(2) Protect streambank and shoreline features with the potential to reduce NPS pollution.

(3) Protect streambanks and shorelines from erosion due to uses of either the shorelands or adjacent surface waters.

6. Management Measures for Wetlands, Riparian Areas and Vegetated Treatment Systems

1. Management Measure for Protection of Wetlands and Riparian Areas

Protect from adverse effects wetlands and riparian areas that are serving a significant NPS abatement function and maintain this function while protecting the other existing functions of these wetlands and riparian areas as measured by characteristics such as vegetative composition and cover, hydrology of surface water and ground water, geochemistry of the substrate, and species composition.

2. Management Measure for Restoration of Wetland and Riparian Areas

Promote the restoration of the preexisting functions in damaged and destroyed wetlands and riparian systems in areas where the systems will serve a significant NPS pollution abatement function.

3. Management Measure for Vegetated Treatment Systems

Promote the use of engineered vegetated treatment systems such as constructed wetlands or vegetated filter strips where these systems will serve a significant NPS pollution abatement function.