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National Artificial Reef Plan

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National Artificial Reef Plan

Compiled by Richard B. Stone

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Richard B. Stone

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EXECUTIVE SUMMARY

The National Artificial Reef Plan (Plan) was developed pursuant to the National Fishing Enhancement Act (Act) of 1984 (P.L. 98-623, Title II). The Congress recognized in section 202 of the Act that ". . . properly designed, constructed, and located artificial reefs . . . can enhance the habitat and diversity of fishery resources; enhance United States recreational and commercial fishing opportunities; increase the production of fishery products in the United States; increase the energy efficiency of recreational and commercial fisheries; and contribute to the United States and coastal economies." Further, through the Act, Congress established a national policy to promote and facilitate responsible and effective efforts to establish artificial reefs which will:

(1) enhance fishery resources to the maximum extent practicable;

(2) facilitate access and utilization by United States recreational and commercial fishermen;

(3) minimize conflicts among competing uses of waters covered under the Act and the resources in such waters;

(4) minimize environmental risks and risks to personal health and property; and

(5) be consistent with generally accepted principles of international law and shall not create any unreasonable obstruction to navigation.

To accomplish the purposes of the Act, Congress directed the Secretary of Commerce to develop and publish a long-term plan including:

(1) geographic, hydrographic, geologic, biological, ecological, social, economic, and other criteria for siting artificial reefs;

(2) design, material, and other criteria for constructing artificial reefs;

(3) mechanisms and methodologies for monitoring the compliance of artificial reefs with the requirements of permits;

(4) mechanisms and methodologies for managing the use of artificial reefs;

(5) a synopsis of existing information on artificial reefs and needs for further research on artificial reef technology and management strategies; and

(6) an evaluation of alternatives for facilitating the transfer of artificial reef construction materials to persons holding permits, including, but not limited to, credits for environmental mitigation and modified tax obligations.

The Secretary of Commerce has formulated this Plan in consultation with Federal agencies involved in reviewing and approving Federal permits for artificial reef construction (National Marine Fisheries Service, U.S. Fish and Wildlife Service, Environmental Protection Agency, Minerals Management Service, U.S. Coast Guard, and U.S. Army Corps of Engineers), and with substantial assistance from the States, local governments, Regional Fishery Management Councils and Marine Fisheries Commissions, industry, artificial reef authorities, and the public. The Plan will be revised as new information becomes available.

The Plan serves three major functions. First, based on the best available scientific information, it provides guidance to individuals, organizations and government agencies on technical aspects of artificial reef planning, design, siting, construction, and management for effective artificial reef development. Second, the Plan is a guide and technical reference for Federal and State agencies involved in artificial reef permitting and management to help ensure the national standards and objectives established by the Act are met. The Act requires the Secretary of the Army to ensure that siting, construction, monitoring and management of artificial reefs permitted under applicable Federal laws (section 10, Rivers and Harbors Act of 1899; section 404, Clean Water Act; section 4(e), Outer Continental Shelf Lands Act) is conducted in a manner consistent with standards set forth in the Act. The Secretary of the Army must consider the Plan when issuing an artificial reef permit and notify the Secretary of Commerce of any need to depart from the Plan. Third, the Plan encourages and provides guidance for developing detailed, site-specific regional, State, and local artificial reef plans that focus on specific criteria for local conditions. As of September 1985, several artificial reef siting plans were being developed in various parts of the country; this Plan should stimulate additional plan development in other geographical areas.

The Plan briefly addresses environmental mitigation and modified tax obligations as possible incentives to facilitate the donation and transfer of materials of opportunity for artificial reef construction. Alternatives for the transfer of construction materials also are mentioned.

NATIONAL ARTIFICIAL REEF PLAN

I. INTRODUCTION

The National Fishing Enhancement Act (Act) of 1984 (Appendix C) directs the Secretary of Commerce to develop and publish a long-term National Artificial Reef Plan (Plan) to promote and facilitate responsible and effective artificial reef use based on the best scientific information available. This Plan has been developed to provide guidance or criteria on planning, siting, designing, types of materials, constructing, and managing artificial reefs. It includes reviews of existing information sources and discusses research needs. Other issues, such as liability and mitigation, are introduced; these issues should be addressed in more detail by groups of knowledgeable individuals from the Federal, State, university, and private sectors. The Plan is intended as a dynamic, working document that will change as new information becomes available.

This Plan reflects input from Federal agencies involved in reviewing and approving permits for artificial reefs, the States, Regional Fishery Management Councils, Commissions, industry, artificial reef authorities, and the general public. More than 50 individuals have helped prepare this document. While it is general in scope, it provides a framework for regional, State, and local planners to develop more detailed site-specific artificial reef plans sensitive to highly variable local needs and conditions. These more specific plans should be developed under the cooperative leadership of State agencies and interstate organizations responsible for fisheries management and development and they should focus on specific criteria for reef construction in their geographic areas.

Increasing demands on fish stocks by both commercial and recreational fishermen and losses of aquatic, rough or hard bottom habitat because of development and pollution have had substantial local effects on some reef-associated fish species. Properly constructed artificial reefs can enhance fish habitat, provide more accessible quality fishing grounds, benefit anglers and the economies of shore communities, increase total fish biomass within a given area, and provide managers with another option for conserving and/or developing fishery resources.

Artificial reefs have been used for centuries to enhance fishery resources and fishing opportunities, however, the United States has not systematically developed the potential of this fishery management technique. Unlike Japan, which has invested billions of dollars in developing sophisticated techniques to create new habitat and increase seafood production, the United States generally has pursued a less sophisticated and more frugal approach. State and local groups have been responsible for most reef construction, often with limited budgets. Natural or scrap materials, because of the low cost, have been used extensively.

Although artificial reefs can enhance recreational and commercial fishing opportunities, creating a successful reef entails more than placing miscellaneous materials in ocean, estuarine, or fresh water environments.

Planning and management are needed to ensure that the maximum anticipated benefits are derived from artificial reefs. Improperly planned, constructed, or managed reefs can be ineffective, interfere with other activities (e.g., trawling) or damage natural habitats and benefits may not be realized. This Plan provides guidance for using the best information available to develop effectively and responsibly artificial reefs for long-term fishery enhancement. It is intended to address the needs of a wide variety of users, not just reef developers; other potential users include reef regulators, fishery or environmental managers, prospective donors of reef material, government officials and the general public. The plan addresses both criteria specified in the Act and unspecified criteria considered important by the working groups responsible for providing input to this plan. The consideration and use of these guidelines and criteria will assist reef developers, managers, and regulators in focusing their activities on effective artificial reef programs. It also will help establish standard terminology to improve communication between parties interested in reefs and assist in developing more uniform permit procedures.

II. ROLES

There is considerable government and private sector involvement in artificial reef development.

A. Federal

The Federal Government has been involved in artificial reef activities for several decades, both in research and development sponsored by individual agencies as programs and budgets permitted, and in reviewing and commenting on reef permit applications (see Act section 205). There is, however, no overall Federally coordinated program to guide artificial reef activities except through permit review. The President's Proclamation of an Exclusive Economic Zone (EEZ) on March 10, 1983 declared a National (Federal) interest in living and nonliving resources found within 200 nautical miles from shore. Increased activities are expected in the EEZ, particularly by the private sector, to use fishery and mineral resources. There will undoubtedly be more interest in the use of artificial reefs and fish aggregating devices (FADs) to enhance fishing opportunities.

Five Federal entities--the Departments of the Interior (DOI), Commerce (DOC), Defense (DOD), and Transportation (DOT), and the Environmental Protection Agency (EPA)--have varying degrees of interest in and responsibility for artificial reefs. The DOI has broad authority under the Outer Continental Shelf Lands Act to protect natural resources, and specific responsibility to enhance recreational fishery resources under the Sport Fish Restoration Act, which provides monies to the States for approved studies and projects. The DOC has responsibility under the Magnuson Fishery Conservation and Management Act to restore, maintain, and enhance fishery resources in the EEZ, and general authority under the Fish and Wildlife Act of 1956 and the Commercial Fisheries Research and Development Act to cooperate with the States to conserve and manage fishery resources in the territorial sea. The DOD is responsible for preserving national security, maintaining navigation, and protecting the public interest in multiple uses of the Nation's waters. The

U.S. Army Corps of Engineers (Corps), an element of the DOD, is responsible for regulating certain activities in waters of the United States including lakes, rivers, oceans, and estuarine areas under sections 9 and 10 of the Rivers and Harbors Act of 1899 (RHA); section 404 of the Clean Water Act (CWA); and Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA). The Corps regulates work on structures under the RHA and the transport of dredged material under the MPRSA (see Appendix A). The Corps and EPA share responsibility for regulating the discharge of dredged or fill material under the CWA. The DOT, of which the U.S. Coast Guard is a part, has authority to (1) promulgate regulations dealing with lights, warning devices, and other public and private aids to navigation on offshore installations; (2) establish safety fairways and traffic separation schemes for safe movement of vessel traffic under the Ports and Waterways Safety Act; (3) establish safety zones around offshore facilities; (4) enforce fishery laws; and (5) monitor and enforce compliance with international conventions and statutes on environmental protection (see Appendix B). The EPA has responsibility under MPRSA and the CWA to regulate ocean dumping and point-source pollution. All permits issued under these two Acts must comply with environmental guidelines promulgated by EPA. Under the MPRSA, EPA also has authority to designate ocean dumping sites for all discharges into ocean waters. Under the CWA, EPA co-administers the section 404 program with the Corps. Among other responsibilities, EPA may prohibit or restrict discharges of dredged or fill material at sites where the discharge would have unacceptable effects on fish, shellfish, wildlife, recreation, or municipal water supplies.

The Federal role is to provide technical assistance, guidance and regulations for the proper use of artificial reefs by local governments and the private sector in a manner compatible with other long-term needs, and to improve coordination and communication on artifical reef issues between the Federal agencies, States, Councils, Commissions, industry, and other interested parties. Basically, the Federal role is carried out by the permit process, and by providing guidelines, services, information, and in-kind support rather than financial commitments, which are more appropriately borne by those who benefit most directly from artificial reefs, such as fishermen and local communities.

B. State

Virtually all State natural resource agencies which have active fisheries management and enhancement programs are in some way involved in artificial reef activities. This involvement ranges from artificial reef construction as part of an agency's efforts to improve a specific fishery to an agency's review and support for other organizations' reef building programs. The level of State involvement in an artificial reef program is usually governed by the need to offset fishery or habitat stress with habitat enhancement, and the availability of a stable funding source to support reef construction.

State resource managers are recognizing that benthic artificial reef construction involves long-term, if not permanent, alteration of bottom habitat. As such, possible effects on natural resources and the environment must be considered prior to construction. Some past artificial reef

construction projects were used largely to justify solid waste disposal, were not well-researched regarding specific resource or fishery enhancement problems, and would not be acceptable under present artificial reef development policies or philosophies. A few coastal States have developed specific site selection and resource enhancement guidelines for artificial reef construction, and are experimenting with potential applications to mitigate environmental damage caused by industrial and other development. However, efforts are presently neither coordinated, nor universal among State agencies. To achieve the greatest benefits from reefs, it is imperative that appropriate State agencies play a major role in the development of national and site-specific guidelines for artificial reefs.

The State's role in the artificial reef construction process should be to develop or participate in developing site-specific plans and to maintain regulatory and quality control that ensures all reef construction: (1) has biological justification to meet present and future fishery management needs; (2) minimizes negative effects on existing fisheries, and conflicts with other uses; (3) minimizes negative effects on other natural resources and their future use; (4) uses materials that have long-term compatability with the aquatic environment; and (5) is subsequently monitored to determine if reefs meet permit terms and conditions and the original enhancement justification. State natural resource agencies should be involved in all artificial reef construction in their waters, and should also have a major role in adjacent Federal waters, due to contiguous fishery and resource management concerns. When artificial reef construction projects go beyond State government limitations, State natural resource agencies should provide technical expertise or recommend consultants to assist other responsible organizations undertaking artificial reef projects. This may require money from outside the State budget.

C. Local Governments (county and municipal)

Occasionally local government agencies have been involved in directing or coordinating artificial reef programs. Their role has included coordinating recycling programs to provide scrap materials for reef construction; providing technical support or supervision for community efforts; conducting reef programs including financial support; obtaining State monies for local reef efforts; and publicizing local reef efforts.

D. Private

Many artificial reefs constructed over the last 40 years were initiated by individuals, sport fishing clubs, local artificial reef committees, and diving clubs. Private groups and organizations play an important role in artificial reef development. They communicate the needs of fishermen, lobby for the development of local and State artificial reef programs, and undertake fund raising activities. Private individuals and clubs often provide volunteer services for the cleaning, modification, construction, transportation, and deployment phases of artificial reef projects. Under the supervision of biologists, local divers have contributed to monitoring and evaluation studies. However, it is important that these groups coordinate their activities with Federal, State, local, and university expertise to

achieve the most successful reef projects. Without this interaction, reef development can be frustrating, ineffective, and more costly than necessary.

Recent developments in the private sector should help resolve some of the problems reef builders have had in initiating programs. Several companies now provide expertise in artificial reef development and other companies and non-profit organizations are adding expertise in this area. Also, university and consortium expertise has grown considerably.

III. GUIDELINES

Below are general guidelines and some specific criteria that have been developed by a working group of artificial reef authorities. These guidelines and criteria cover artificial reef planning, development, and management in a logical order: siting, materials and design, regulatory requirements, construction, and monitoring and maintenance. More specific guidelines and criteria will be available in State or regional site-specific plans that address local conditions.

A. Siting

In selecting sites for artificial reefs, purpose, social and economic considerations, and environmental and biological concerns must be considered in the early planning stages. The following guidelines are provided to assist reef builders in the critical site-selection stage of artificial reef development.

1. Purpose

The fundamental issue dictating the design and location of an artificial reef is its intended purpose(s). Failure to identify clearly the purpose(s) of a reef at the outset, and to use reef purpose(s) as the driving force for subsequent reef siting, design, construction, and management decisions, can detract significantly from overall reef effectiveness and utility.

In developing artificial reef siting options, prospective reef builders should contact State and Federal fishery management agencies, Regional Fishery Management Councils, and other natural resource management entities to obtain pertinent background information, i.e., biological, demand, and regulatory. Also, commercial and recreational fishing interests must be considered in the planning process from the outset and care must be taken to open lines of communications to avoid conflicts with other user groups.

While the majority of reefs are built to support and enhance recreational and commercial fishing, there is growing interest in using artificial reefs to restore, mitigate, or create habitat and to improve recruitment, juvenile survival, and growth of reef associated species. The following factors should be considered in siting reefs for recreational fishing, commercial fishing, and habitat and fisheries enhancement purposes.

a. Recreational Fishing Enhancement

Prospective reef builders should understand the nature and extent of recreational fishing in the area when planning artificial reefs for recreational fishing enhancement. Particular attention should be given to assessing the relative importance of, and demand for, shore-based and boat-based fishing activity; identifying principal target species and where they occur; identifying the location of shoreline access points (e.g. ramps, piers, marinas, bridges, charterboats, headboats); identifying general fishing methods and patterns (e.g. trolling versus bottom fishing, distances traveled offshore, skin and SCUBA diving needs); and assessing potential conflicts with other users (e.g. commercial fishermen, shipping, general navigation, military, mineral and energy extraction, waste disposal, etc.).

State and local government-sponsored artificial reef programs should attempt to accommodate the full range of recreational fishing needs. In addition to providing for the needs of boat-based anglers in offshore and inshore waters, benthic reefs and FADs should be considered to enhance or maintain recreational fishing from bridges, piers, jetties, and other shoreline locations. Enhancement of shore-based angling can have particular social and economic significance to coastal communities with heavy tourist traffic and can help to expand public support for artificial reef development.

The needs of the sport diving community should also be considered. Reefs proposed for divers should be constructed at depths that will provide reasonable bottom time and minimize the decompression hazard. Water depths between 30 and 90 feet (total depth) are usually suitable. Water depths of 150 feet over the reef effectively exclude most divers, but depths of 210 feet or greater over the reef should be used by reef builders seeking to exclude divers. Water clarity and current velocities at the site should also be considered.

Recreational reefs are generally used more when they are properly charted (mapped); adequately marked (buoyed); located fairly close to shore; accessible by running simple compass headings and known distances from permanent marker buoys at the mouths of major rivers, inlets, or passes; and have published Loran C coordinates. If reefs are located fairly close to shore and are not buoyed, reef sponsors should provide visual lineups with shoreline reference points (e.g., water tanks, buildings, antenna towers) to allow boaters who do not have LORAN equipment to find the reef easily.

Recreational artificial reef sponsors should develop and distribute public information brochures and/or flyers describing reef locations, fishing conditions at each site, applicable fishing regulations or use restrictions (e.g. observance of diving flags, anchoring guidelines, fishing gear restrictions, and catch limitations), and courtesies which should be extended to other reef users. Reef information is critical to public use and benefits.

b. Commercial Fishing Enhancement

A number of commercial fisheries in the United States are habitat limited (e.g., lobster, sea bass, grouper, Pacific rockfish). Experiences in Japan,

Taiwan, other Southeast Asian countries, and, to a limited degree, the United States provide justification for more extensive commercial fisheries application of artificial reef technology in the United States. Along with the historical practice of shell stock (cultch) plantings to create or enhance oyster reefs, some experience has been gained in applying artificial reef technology to (1) create kelp beds; (2) culture oysters and mussels; (3) enhance the yield and survival of spiny lobster; and, with FADs, (4) concentrate pelagic species (e.g., tuna) for commercial harvest. Much work, however, remains to be done to refine and apply this technology on a larger scale.

As with recreational fisheries, effective use of artificial reefs for commercial fishing and aquaculture and mariculture ventures requires clear delineation of program objectives and purposeful planning. Special attention must be given to understanding the nature and extent of commercial fisheries in the geographic area targeted for reef construction and to the biology and habitat requirements of species targeted for development. Opportunities for enhancing established fisheries, and/or developing new fisheries for underutilized species also should be carefully evaluated. Shoreside docking, landing, processing, and freezing facilities are important considerations in these deliberations.

c. Habitat/Fisheries Enhancement and Restoration

While there is growing interest in using artificial reefs to enhance or restore fishery resources and associated habitat, there is limited research or experience to guide in siting reefs for these purposes. Some lessons, however, have been learned, as follows.

If the primary reef construction goal is resource enhancement, builders must clearly identify the habitat type and/or species targeted for enhancement and determine which biological, physical, and chemical site conditions will be most conducive to goal attainment. Once these siting criteria are determined they should be used in identifying potential construction sites.

Artificial reefs to enhance fishery resources and associated habitat should not be constructed on (1) existing coral reefs; (2) significant beds of aquatic grasses or macroalgae; (3) oyster reefs (except for shell stock replenishment); (4) scallop, mussel, or clam beds; or (5) existing "live bottom" (marine areas supporting dense growth of sponges, sea fans, corals, and other sessile invertebrates generally associated with rock outcrops). In some cases, however, it may make sense to construct artificial reefs in areas with sparse "live assemblages" or on barren bottoms in proximity to biologically productive areas. This can be done to enhance the area and/or to divert user pressure from fragile natural areas. Proper placement of FADs could shift some user effort from heavily fished benthic species to less exploited pelagic stocks. If pelagic resources are over exploited, FADs may not be appropriate.

In using artificial reefs to help mitigate development-related habitat loss, project sponsors should use reef technology to simulate the type of habitat which has been lost--reef habitat should be replaced with similar type

reef habitat (e.g., offshore reef development for the loss of offshore habitat). Artificial reefs should not be construed as appropriate replacement for dissimilar habitat types such as shallow-water estuarine habitat, submerged grass flats, or mud flats.

2. Social and Economic Considerations

Recognizing that the majority of artificial reefs will continue to be built to support recreational and commercial fishing, artificial reef development should be in geographic areas of greatest user need, demand and constituency support. For recreational reef construction, these normally will be near major population centers. Occasional reef construction in less populated areas may be appropriate to stimulate local economies and alleviate fishing pressure on more congested sites. U.S. census reports, together with fishing license, boat registration, and landings data can be used by reef builders to delineate recreational fishing demand centers. For commercial fishing reefs, demand centers may be more sparsely populated but should be recognized fishing communities. Artificial reefs built for research, preserves, aquaculture or mariculture, and other less user-oriented purposes will require siting criteria more specific to those uses. Further, it may be appropriate to avoid population centers for these types of reefs.

Within each of the user demand centers identified, land and water access systems should be evaluated. Reefs should be planned in areas where there are adequate public access facilities and infrastructure support. Recreational reefs should be located so they can be reached easily and safely by anglers. Studies of recreational use patterns can be particularly useful in this endeavor. Reefs for commercial fishing can be sited further from harbors, but energy conservation should remain an important consideration. Reefs installed as refuge, nursery areas, or spawning habitats, should be located or managed to minimize fishing pressure.

Before beginning the site selection process, reef planners should determine existing recreational and/or commercial fishing patterns and conditions offshore of each identified demand center in question. Such information should include (1) how many fishermen (boats) might use the reef; (2) preferred target species; (3) distances traveled offshore; (4) traditional fishing areas and methods; and (5) existing or future fishery management issues (e.g., stock status problems, user conflicts). Analysis of this information should enable prospective reef builders to delineate broad geographical areas adjacent to identified demand centers within which to begin the site selection process and should help determine reef size and management needs. The size (areal extent) of a reef can be important depending on the type and quantity of material to be used and the number of boats expected to be on a reef at any one time.

Within the identified target area, existing artificial reefs and known bottom obstructions should be identified. Further, areas where reefs should not be built because of existing legislative or regulatory prohibitions and potential user conflicts should be identified and excluded from further consideration. Exclusion areas should include, but need not be limited to, shipping lanes, existing "live bottom" areas (see p. 13), restricted military

areas, areas of poor water quality (e.g., sewage outfalls, toxic chemical dumps), traditional trawling grounds, unstable bottoms, existing rights-of-way (e.g., oil and gas pipelines and telecommunication cables), and sites for other purposes which are incompatible with artificial reef development. While traditional water uses must be considered, they need not be considered as an absolute cause for rejecting specific sites for artificial reef development. For example, known snags and hangs within established trawling areas may be desirable locations for reef construction. Also, the goals and priorities of State and local reef programs should be considered fully.

The funding commitment of State or local government or private entities for reef construction projects can affect siting options and should receive full and early consideration. For example, because of the typically high cost of transporting bulky discard materials to permitted reef sites, marginally funded reef programs must often confine their efforts to sites nearshore. Further, poorly sited reefs often do not produce desired social and economic benefits and may preclude reef developers from securing future artificial reef funding commitments from government and private sponsors.

3. Environmental Considerations

When the intended artificial reef construction purpose is clearly established, social and economic siting concerns are evaluated, a general reef construction target area defined, and known exclusion areas delineated, an assessment of the target area's geologic and hydrographic characteristics and its water quality will help determine specific reef construction sites. In conducting this assessment, information and assistance can be gained from State, and local natural resource management agencies, academic institutions, private consulting firms, and local residents. Specific attention should be given to the following points.

a. Geologic

The bottom composition and character at an artificial reef site has a pronounced effect on the reef's stability and longevity and must be carefully evaluated in the site selection process. In most cases, soft sediments such as clays, silts, and loosely packed sands should be avoided. Over time, most reef materials sink into these sediments or become partially covered, thereby losing their utility as fish habitat.

Hard rock or hardpan bottoms with several inches of sand or silt cover provide excellent substrate for most types of reef construction. Dense materials such as concrete cannot settle or scour much on these substrate types. Firm bottoms of gravel, compacted sand, and shell are also appropriate substrates, especially for low density reef materials such as tires, fiberglass molds, small boats, and prefabricated units made of PVC or fiberglass. Some low density materials, e.g., tires, become more stable when partially embedded in sand.

Other problems involving bottom type include siltation and sand abrasion. Artificial reefs placed on silt or sand bottoms subject to currents and wave action can lose all or part of their effectiveness if resuspended

silt and sand are deposited on reef organisms. The abrasion effect of sand particles driven against the reef by currents and waves can damage or eliminate sessile organisms that are essential to the reef food web. Occasional sand abrasion during severe storms generally will not have a long-term effect. Water column sediment loads may reduce reef productivity by reducing light penetration.

Finally, substrate type is also a critical factor in selecting anchoring and mooring systems for FADs and benthic reef materials sited in areas of strong current and wave action.

Information about bottom type and water depth can be obtained from bottom sampling or observation, diver inspection, depth recorder, or sounding lead, or it can be estimated with information from National Ocean Survey charts, State agencies, local colleges and universities with marine science programs, commercial fishermen, or oil company geologists (see section IV.A.).

A diver can estimate the load bearing capacity of bottom substrate by probing it with a metal rod or by hand. A substrate may be suitable for reef construction if a diver cannot push their hand into the sediment beyond the wrist (with fingers extended) in a single push.

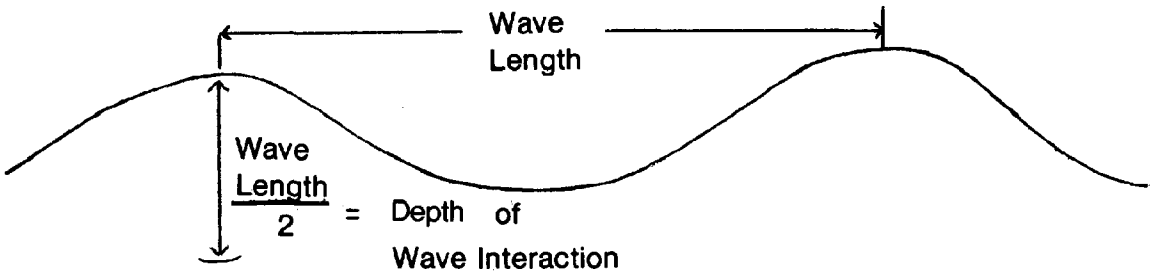
b. Hydrographic

Principal hydrographic factors to be considered in selecting sites for artificial reef construction include water depth, waves, currents, and tides. Water depth, as a siting criteria, is significant for several reasons. First, reefs must be built in water sufficiently deep to avoid creating a hazard to navigation. Mimimum clearence above the reef should be related to the draft of the vessels expected to operate in the vicinity. The U.S. Coast Guard and Army Corps of Engineers will review the merits of each reef construction proposal in light of local circumstances (see Regulations section). Factors considered in these cases include water depths at and near the site, type of construction materials to be used, reef clearance, nature and extent of vessel traffic in the area, and proposed marking methods.

Second, water depth has implications for reef users. In many coastal areas, water depth is a function of the distance offshore. This relationship must be considered when making tradeoffs between reef stability, clearance requirements, target species, and reef accessibility to various user groups (e.g., small versus large boat fishermen, commercial versus recreational fishermen, fishermen versus divers).

Third, water depth affects the nature of fishery resources that will be supported by the reef. Reefs placed in shallow (10-15 meters), warmer water with good light penetration above thermoclines will generally support a larger and more diverse fish community (characterized by smaller sized fish) than will reefs built in deeper, cooler water where light cannot penetrate to the bottom and support primary production by attached algae. The biology and habits of target species dictate optimum reef depths.

Also, water depth at the reef site may critically affect reef stability and effectiveness. In this case, average wave energy in large, open bodies of water as a function of water depth is the major concern. In open water, waves travel free of the bottom when water depth is greater than one half of the wave length (measured from crest to crest). Once a wave enters water shallower than one half of its wave length, it begins to sound or interact with the bottom and any structure on the bottom.



The magnitude of this wave interaction with a reef is difficult to predict but it can be destructive. It is primarily dependent on (1) wave height; (2) wave speed; (3) depth of the reef; (4) density of the reef material; and (5) the shape of the reef. This force can stir up bottom sediments causing siltation of the reef and reef materials to become unstable and move either small distances or entirely off the site. Reef materials and designs should be properly matched to water depths and wave conditions to ensure their stability. In fresh water, consider the impact ice movement might have on reef material.

Currents, tides, and wave action also are important hydrographic siting factors because they can undermine reef material, cover it with shifting sediment, and scatter reef materials. Reefs should be designed and sited to resist breakup, movement, or burial. If a reef or FAD is to be placed in a high energy environment where wave surge or strong currents may be experienced, engineering studies should be conducted or existing engineering information used to assure stability.

Currents also influence reef effectiveness and the number of boats that can fish a reef at one time. Fishing reefs constructed across prevailing currents will allow the maximum flow of nutrient/food-laden, well oxygenated water through the reef and increase the availability of food for reef organisms and may improve hatching success of adhesive egg masses. This also helps create nutrient upwellings over the reef which, if large enough, attract and concentrate bait fishes and their predators which are often targeted by fishermen. In spite of the advantages of orienting reefs perpendicular to general current directions, there are cases (exceptionally strong currents or storm surge) where restrictions to water flow should be minimized. In these cases, reefs should be oriented parallel to or at shallow angles to current flow or storm surge.

c. Water Quality

General water quality is another important reef siting consideration. Water turbidity, salinity (in estuarine and coastal areas), dissolved oxygen, biological oxygen demand, water temperature, nutrient loads, pollution levels, and other water quality factors affect both the biological productivity and use value of artificial reefs. For example, benthic reefs built in areas with low dissolved oxygen levels (generally below 3 mg/l) or where anoxic (oxygen depletion) conditions periodically occur will not achieve desired biological productivity levels and will probably not achieve management goals. Similarly, reefs built in highly turbid water would have limited value to the diving community but may be valuable as fish habitat. Polluted areas and areas affected by treated sewage effluent should be avoided to minimize resource exposure.

Information and assistance can be obtained from Federal, State, and local resource management, environmental quality, and scientific research agencies (see Sources of Information section). If sufficient background information does not exist to permit an adequate water quality assessment, prospective reef builders should hire a qualified scientist or consulting company to make a site evaluation.

4. Biological Considerations

Artificial reef effectiveness is largely determined by the biological processes that enhance habitat for invertebrates and fishes or improve recreational or commercial fishing. Specific biological criteria for reef siting are not appropriate in a national plan because variation exists in the biological requirements of fishes in different geographical areas. This discussion, therefore, focuses on general procedures that should be used in isolating and accommodating key biological siting factors.

At the outset, reef builders should contact local, State, and Federal fishery management agencies, and other knowledgeable parties to determine the nature of fishery resources and fishing activities in the geographical area targeted for reef construction. Concerns regarding fisheries conservation and management should be identified in this process. Based on an assessment of public need and background information gathered, reef builders should select the species or species groups that they wish to enhance or rebuild and identify critical habitat and environmental requirements of those species. If selected target species are particularly sensitive to water temperature, salinity, dissolved oxygen levels, water turbidity, and contaminants, or if they have stringent habitat or food requirements, these parameters should be used as artificial reef site selection and design criteria. For example, in building reefs for snapper, grouper, black sea bass, rockfish, and other marine or freshwater demersal species, low and medium profile reefs should be constructed from different-sized materials which will create numerous holes and crevices of varying sizes to provide shelter for juveniles and adults. Higher profile benthic reefs and midwater or surface FADs are more effective in attracting baitfish and providing areas for predatory pelagic species such as billfish, mackerel, barracuda, wahoo, bluefish, and tuna. Combination reefs using FADs together with benthic reefs can provide more diverse fish assemblages. The effect of FADs in freshwater is uncertain.

Prospective reef builders should be aware of existing and proposed fishery management plans and regulations for the species that may be significantly affected. They should not site or construct artificial reefs that would compromise fishery management goals. For example, if a species targeted for enhancement by artificial reef developers is managed by a minimum size limit, fishing reefs should be sited to avoid concentrations of undersize fish and/or to maximize survival of released fish.

5. Specific Site Evaluation

A clear determination of the intended purpose of artificial reef construction and evaluation of social, economic, physical, chemical, and biological characteristics of the geographic area targeted for reef construction should lead to the identification of one or more prospective reef sites. At this point, detailed site surveys and analyses are needed to make final site selection(s). Because information obtained from site surveys should be incorporated into artificial reef permit applications and will play a critical role in Corps permit decisions, on-site surveys should be conducted by experienced personnel. Consultation with local, State, and Federal agencies, universities with marine science programs, and private consulting firms can help identify qualified site surveyors.

At a minimum, on-site surveys should evaluate (1) substrate types; (2) water depths; (3) prevailing currents; (4) wave energy levels; (5) existing habitat types; (6) local fishery resources; (7) cultural resources; (8) general water quality; and (9) traditional, existing and other possible uses of the site. A general assessment of habitat conditions in the vicinity of the site should also be made. The relative importance given to assessing site characteristics will vary depending on the reef type (benthic versus FAD), and the type of intended construction materials. For example, substrate type is extremely important in determining site suitability for benthic reef construction; it is less important in FAD construction projects, even though substrate type will affect the design of FAD anchoring and mooring systems. If FADs are used as temporary structures, designed to be installed at the beginning of a particular fishing season and removed for maintenance at its close, reef builders must select sites suited for seasonal installation and make sure the FADs are not a significant threat to navigation.

Biological surveys should be considered prior to reef construction to provide data that can be used in estimating the effects of the reef. Adequate pre-construction surveys could consist of seasonal sampling at the proposed reef site and on nearby representative habitat for at least one year and preferably two. On-site surveys should enable a prospective reef builder to determine if site conditions will foster artificial reef construction objectives.

Once a specific site(s) has been selected, a detailed description of its location is required as part of the permit application to the Corps of Engineers (see Regulations section and Appendix A).

B. Materials and Design

1. Standards

When planning artificial reef development, certain general characteristics can be useful in evaluating specific materials and design regardless of the specific purpose or location (marine, estuarine, or freshwater). Listed below are four major characteristics or standards for artificial reef materials. These standards, together with siting and management considerations, will in great part determine the success or failure of an artificial reef project. Safety is an additional major consideration during the planning, transportation, construction, and operational phases of artificial reef projects.

a. Function

Selection of materials which are known to be effective in stimulating desired growth of micro-and macro-organisms and providing habitat for the target species is critically important in developing artificial reefs. Good design or configuration of selected materials on the reef site will contribute significantly to artificial reef function. Surface area, profile, shape, orientation, open spaces, and size are major design features affecting the function of artificial reefs.

b. Compatibility

To maximize fishing and fisheries benefits, artificial reef materials and selected designs should minimize environmental risks (e.g., damage to natural reefs, etc.) and user conflicts. While some risks and tradeoffs are inevitable in any special purpose development project, knowledge of a site's physical and biological characteristics and the possible uses of a reef can help planners design reefs that will avoid major problems. For example, reefs designed for divers should have materials that are attractive and minimize safety risks. Artificial reefs placed near natural reefs can be "over" designed to ensure the materials will not encroach on the natural reef.

c. Durability and Stability

Artificial reef materials should be resistant to deterioration, breakup, and movement off the reef site. Durable materials that retain the desired configuration reduce maintenance and enhancement requirements and minimize use conflicts. Reefs should be designed to withstand exceptional storms as well as normal conditions on the site.

d. Availability

Artificial reefs can be constructed onshore from raw materials or from modified used materials. Effective artificial reefs can be made from some used or recycled materials. Generally a combination of recycled materials and/or natural materials in association with specifically manufactured materials (enhancement devices such as FADs) are effective. The challenge is to implement State or regional site-specific reef plans and individual

projects in the most effective, least expensive manner. Planners must consider transportation, preparation, deployment, maintenance, and enhancement costs in assessing which materials meet reef development goals. Many de facto artificial reefs exist (shipwrecks, gas and oil structures, etc.) and, if appropriately sited, may need only to be located, enhanced, and publicized. Other excellent materials may already be at or near suitable development sites. Besides donation or sale of materials, a corporate sponsor, donor, or provider of materials may be willing to assist in transportation, preparation, and development needs, especially if confronted with an expensive disposal alternative for these materials.

2. Materials

There are two general kinds of materials commonly used to develop artificial reefs--materials of opportunity and fabricated materials. Each kind, and the common types within each kind, are discussed below.

a. Materials of Opportunity

This kind of material has always been attractive to reef builders because of a low initial cost. Preparation and transportation costs can be quite high and may add significantly to the cost of building the reef. The following types of materials have been commonly used.

(1). Ships and Other Vessels.

Vessels have been sucessfully used as artificial reef material in marine environments worldwide. Steel vessels generally make better reef material than wood or fiberglass vessels because they last longer and are more dense. A steel vessel may be effective for demersal and pelagic species. Except for barges, ships offer complex internal spaces and large amounts of surface area per-unit-volume. The effectiveness of a vessel can be greatly enhanced by creating openings in its hull to eliminate stagnant areas. A large steel vessel lying upright on the ocean floor and acting as a high profile benthic reef can provide both excellent diving and fishing opportunitities; however, this attractiveness to different users can cause conflicts. Vessels should be anchored during placement on the reef site to assure they do not drift off the site.

Steel vessels usually are durable in either marine or freshwater environments. Corrosion varies greatly with locality. The durability will be significantly reduced if excessive explosives used during deployment destroy structural supports. Fiberglass boats are resistant to chemical and biological processes but require considerable ballast. Wooden vessels also require considerable ballast and are short-lived in the marine environment because fasteners corrode and marine boring invertebrates cause deterioration. Wooden vessels often have adequate durability in fresh water to be cost-effective.

Vessel stability varies greatly with depth, current, and wave surge and is directly related to the density (weight/volume) of the vessel itself and added ballast. Both fiberglass and wooden vessels are more likely to shift than the more dense steel vessels. To assess stability, an analysis of the

hydrodynamic characteristics of the artificial reef site, proximity to other structures (natural reefs, oil drilling platforms, pipelines, aids to navigation, etc.), design, and condition of the vessel itself should be made prior to deployment.

Availability of vessels varies greatly from area to area. In areas with maritime industries and deepwater ports, steel vessels are often abandoned, available through confiscation, for sale below market price, or available at no cost. However, difficulties often lie in identifying the owner, satisfying liens, and taking title. Seaworthiness, ease of cleanup of petroleum products, and the amount of floatable debris on board should be considered before acquisition. Although wooden or fiberglass vessels are more readily available, the life expectancy and stability of these vessels can limit the cost-effectiveness of the project.

Safety and liability during and after deployment should be a major concern to the reef builder (see Liability section). If a ship is deployed in areas accessible to divers, hatches should be removed and suitable access openings cut to allow water flow throughout. Hazards such as cables, wires, and other entrapping materials should be minimized.

(2). Concrete

Surplus concrete can be an excellent artificial reef material. Concrete's density and various configurations, ranging from rubble to large fabricated pieces, allow construction of low, intermediate, and high profile reefs which are stable and have a variety of interstitial spaces and surfaces for attaching organisms. Sources of material range from clean demolition rubble, (e.g., bridge, or sea wall debris) to fabrication plant rejections. Rubble from buildings generally has floatable debris intermixed. Because debris must be removed, the cost-effectiveness of the material is lowered. Some States (e.g., Washington) have developed specifications for acceptable sizes or condition of scrap concrete for artificial reef construction. Concrete culvert, whether culled culvert from a fabrication plant or used culvert from other sources, can usually be obtained at no cost. However, transporting the material can be expensive.

The substrate must be suitable to support concrete. In areas of high sedimentation or shoaling, partial or complete burial can reduce the effectiveness of concrete as artificial reef material. If culvert is used in areas with strong bottom currents and surge, linked units of two or more culverts are desirable because single culverts can roll. The material used to join or modify culvert must be as durable as the concrete or the increased stability will be negated in time.

For high profile, complex artificial reefs, large reject or used fabricated concrete (such as planks, pilings, beams, large slabs, etc.) is an excellent material, especially when it is used partially to cover a base of smaller concrete (rubble) or natural (rock) materials. The resulting reef provides a wide variety of habitats for all aquatic organisms.

(3). Oil and Gas Structures

Though basically limited to the Gulf of Mexico and offshore California, oil and gas structures are excellent artificial reef material. There are currently about 4,000 active offshore gas and oil structures in place with most serving as de facto reefs. The advantages of petroleum structures as reef material derive from their diverse locations and water depths, large numbers, inherent design, modification flexibility, longevity, and stability.

Under existing requirements, more than 400 obsolete structures have been removed from location in the Gulf of Mexico at great cost. Because of the high relocation and preparation costs, only a few have been used as reef material. While it would be inappropriate to leave all future obsolete structures in place, there may be cases where this would be an appropriate fisheries management option. Regardless of the merits of retention in place--either upright, cut off some distance below wave base, or toppled--there are reasons why many structures should be relocated or removed. Potential conflicts with other user groups (e.g., trawling, shipping, and military) for the existing location must be resolved. A structure which is left standing poses a considerably higher risk as a hazard to navigation than one which is toppled in place, partially dismantled to provide adequate clearance, or removed to another location. A standing structure also requires the expense of maintaining proper aids to navigation.

The costs of retention, relocation, and/or modification of platforms for fishing purposes generally are much less than the costs of constructing similar new structures. However, these costs will be compared with other disposal options. Relocation is usually quite expensive and will limit this option unless incentives to cover the incremental costs are available to the donor. Economic considerations will continue to be most important in the disposal decision process.

(4). Tires

Uncompressed scrap tires, a plentiful source of artificial reef construction material, are adaptable to many designs. They can be bound into units, modules, or other habitat structures that provide extensive surface area and interstitial spaces for invertebrates and fishes (most notably demersal and cryptic species). Tires are exceptionally durable, without demonstrated toxic effects attributable to leaching or decomposition processes.

The primary concern with tires is their instability on the bottom. To be effective, tires must be adequately bound in units with durable binding material and sufficiently ballasted to withstand movement during normal and exceptional storm events. Experience has demonstrated that the use of tires in high-energy (strong currents and surge effects) environments or over hard bottom is generally not advisable. Unless properly sited and weighted, tires can move out of the reef site to nearby natural reefs, trawling grounds, and beaches. This movement negates construction objectives and can result in significant damages and costs. Tire reefs have been restricted or banned in some States (e.g., California and Washington).

Despite these difficulties, tire reefs have been successful in many areas of the United States and abroad. The cost-effective use of tires as reef material varies, depending on the unit design and available resources and capabilities. However, expenses are generally significant because tire reef construction is labor intensive and typically requires heavy equipment to build, load, transport, and place the assembled units.

(5). Brush and Trees

Brush and trees are "natural" artificial reef materials. They do best in cold freshwater environments such as northern reservoirs and lakes. They are effective only for a short time in warmer fresh waters, marine waters, and high energy locations because they decompose rapidly. Rapid decomposition may be damaging to egg masses deposited on the material. The annual availability of material such as Christmas trees and the ease of low cost deployment encourages community involvement. Palm fronds are frequently used on FADs in the western Pacific.

(6). Rock and Stone

Rock and stone are cost-effective in some States for use in reefs built to increase biomass of fish and invertebrates. The stability and durability of such materials allows for amortization of high initial transportation costs over a long time. In areas where rock and stone are not available close to staging areas (e.g., south Atlantic, parts of the mid-Atlantic, and Gulf of Mexico), cost-effectiveness would be reduced considerably or would be poor. Rock and stone, being "natural" materials, provide excellent substrate for invertebrate colonization. Rock size can be selected to enhance habitat for target species. For example, large boulders with large interstices are used by larger fish species while smaller cobble patches can significantly increase recruitment of some invertebrates and larval and juvenile fish. Stability of rock and stone reefs generally increase as the average size of the material increases.

Rock and stone are frequently used in the construction of piers, groins, and breakwaters. In suitable environments, these structures also function as fishing reefs. Anglers should encourage the design of piers, groins and breakwaters that would permit access to and use of these structures for fishing purposes. However, in many areas rock and stone may not be cost-effective materials for artifical reefs designed solely for fishing purposes.

(7). Miscellaneous High Density Materials

The availability of artificial reef material is only restricted by the reef builder's imagination, ecological acceptability, and economic constraints. Creative new materials such as solid blocks made from by-products of coal combustion (fly ash) are being tested in some areas. Whenever a material is proposed, the standards for function, durability, stability, availability, compatibility, and safety must be assessed and satisfied. For example, although material such as automobiles and appliances are readily available, these are not dense and their durability and stability are poor. If steel objects are used, not only the gauge of steel, but also

the condition and type of fasteners should be considered. Good communication with other reef builders can help to avoid potential problems when dealing with artificial reef materials (see Sources of Information section).

b. Manufactured or Fabricated Materials

To date, the comparatively high availability of recycled materials in the United States has fostered, and in all probability will continue to promote, the use of materials of opportunity in a majority of the nation's artificial reef projects. Technological advances and an increasing awareness of potential applications, however, may lead to substantial future investment in and development of fabricated reefs.

(1). Concrete

Concrete is an excellent material for fabricated artificial reefs because of its high durability, high stability, and because it can be cast into a variety of shapes. Identical or compatible units can be manufactured individually and deployed in a stacked or otherwise fitted configuration to form reefs of considerable size or vertical profile. Concrete reef material constructed in Japan and Taiwan have demonstrated the utility of concrete.

(2). Metals

When properly selected and tooled, metals can be effective artificial reef materials. Durability is largely dependent on composition (e.g., specific alloys of steel or aluminum) and thickness, factors which govern the rate of deterioration caused by corrosive processes. Metals have certain advantages in ease of construction. For example, metals can be framed and welded into configurations that would be difficult to cast in concrete. These advantages must be weighed against the generally shorter life expectancy of submerged metal structures, especially in saltwater, compared to concrete reefs.

(3). Plastic and Other Synthetics

Plastic and other synthetic materials are potentially very useful for artificial reefs with specialized designs or objectives. Poly- vinyl chloride plastic (PVC) tubing is extremely adaptable for design purposes, and structural components are exceptionally easy to assemble. As raw materials, plastics and other synthetics have excellent durability characteristics. Durability of a particular artificial reef incorporating these materials, however, will depend on engineering factors.

Most plastic and synthetic materials have very low densities. This may require ballasting or anchoring systems for benthic reef applications in high energy environments, but could be an asset in low energy, soft bottom situations. Low densities do render these materials suitable for midwater or surface reefs, where they are commonly used in the construction of FADs.

(4). Wood

Wood has been used as artificial reef material in the United States since the early 1800s, when South Carolinians placed logs in estuaries to help improve local angling. The use of wood to provide habitat continues today, particularly in freshwater, as fishery managers leave stumps and construct brush piles and other structures to provide cover for fishes and to enhance fishing opportunities. For these programs, wood constitutes a functional, available, and relatively inexpensive material for reef construction. Treated wood, although durable, may have toxic side effects on aquatic organisms and should not be used.

However, under marine conditions wood materials, notably wooden-hulled vessels, have often proved ineffective. Initial heavy ballasting is required to secure these naturally buoyant materials in open sea locations and to prevent movement off the permitted site. Once anchored, the ravages of boring organisms and other deteriorating factors quickly reduce the life and effectiveness of the wooden components. Further, wave action and storm surge can cause the structure to collapse and break apart, creating hazards and associated liabilities.

(5). Electrodeposition

Electrodeposition is a relatively recent and novel approach to artificial reef construction and maintenance in marine waters. During this process, construction material is formed when an electrical current (D.C.) is passed through submerged structures (e.g., wire cloth), causing an accretion of elements normally dissolved in seawater. Under certain conditions, the reactions may be remarkably rapid and result in durable and stable end products.

In some instances, electrodeposition can be a functional alternative for programs lacking access to other, more traditional construction materials. For most situations, however, the process remains labor intensive and is not practical under current technology because extended periods of calm, sheltered water are necessary to allow complete accretion to occur.

3. Transfer of Construction Materials

Many artificial reefs would not have been constructed without the donation of reef material. In most cases, the costs to the donor for providing the reef material have been offset by benefits. These benefits have included reduced removal or disposal costs, treatment of the transfer as a charitable donation (to government agencies), and favorable publicity.

a. Incentives

Potential donors of reef material often face large salvage or disposal costs for retired or surplus materials. These materials could serve as effective reef materials but the additional costs to relocate them on an artificial reef site may be much higher than normal disposal costs. Innovative thinking is needed on possible incentives for donors that would

allow reef builders to obtain donated reef material that, if fabricated from raw materials, would be very expensive to locate on reef sites and even more expensive to construct. This donated reef material, once on site, could increase recreational and commercial fishing opportunities and contribute to coastal economies for many years.

Some form of incentive could be considered where there would be a cost to the donor, beyond normal disposal costs, for future donations of materials of opportunity, particularly large items (e.g., ships, gas and oil structures, railroad cars, bridges, etc.). One such incentive could be credits for environmental mitigations. Another could be modified tax obligations.

b. Alternatives

Some industries that must dispose of materials that would make suitable artificial reef material are considering applying for permits to build artificial reefs. When completed, the reef could be maintained by the industry or turned over to a State or local government.

If State and local reef programs receive more money (e.g., expanded Sportfish Restoration and Boating Enhancement Funds), the transfer of potential reef material from owner to reef builder may be easier. Some or all of the incremental costs to build a reef could be paid by the reef builder.

4. Design

The proper design of artificial reefs can significantly affect the cost and effectiveness of these reefs. When design criteria are defined, appropriate types of reefs can be chosen.

a. Criteria

Based on historical experience with a wide spectrum of artificial reef designs and the results of many scientific investigations, qualitative criteria can be identified which are useful for planning and evaluating artificial reef designs. Several of these criteria are interrelated, while others apply only to certain categories of reef design. Because many variables affect the design selection, the designer should recognize that any given design decision will involve compromises. The criteria listed below should be considered in comparing reef designs for maximum benefits, both for biological resources and the user community.

(1). Openness

Reef designs should allow adequate water circulation throughout internal spaces to avoid standing or stagnant water masses. Water flow through a structure allows recruitment of organisms to all available surfaces.

(2). Surface Area

For most artificial reef designs, biomass (the amount of organisms on the reef) will be positively related to the amount of available surface area.

This surface area is habitat for "fouling" organisms (such as algae, sponges, hydroids, bryozoans, barnacles, corals, etc.) which represent food sources and refuge for additional reef organisms. Upper and lower surfaces as well as vertical planes tend to recruit different species, some more important than others as resource species and forage.

(3). Profile

The amount of vertical relief (profile) presented by an artificial reef helps determine which species will be attracted to or established on the structure. Low profile reefs are usually effective for demersal species such as bass, lingcod, snappers, and groupers and for certain shellfish. High profile reefs are effective for pelagic forms such as jacks, mackerel, and barracuda and may also support demersal species. FADs can be used to enhance the characteristics of low profile reefs.

(4). Footprint (Dispersion)

"Footprint" is the term used to describe the horizontal area covered by a reef on the bottom. The ideal footprint of a reef design depends not only on the quantity or volume of materials used, but also on the pattern of materials on the bottom. A large pile or clump of materials may be more or less effective than scattered, smaller clumps depending on the openness of the materials and the behavior and habitat preferences of particular target species. A single pile of small diameter reef material generally will have more limited surface area relative to mass and recruit fewer and smaller invertebrates and fishes than a similar size pile of larger diameter reef material. Those species which inhabit the fringe areas at the base of reef structures or use the reef for protective habitat and feed on surrounding areas, would benefit from separated clumps of material. Also, using seperated clumps of material would allow more boats to fish the reef. If the reef is intended to be used by divers, a moderate amount of separation might be desirable if the distance is not so great that water clarity would prevent movement from one clump to the next.

(5). Interstitial Space

Interstitial space influences the diversity of organisms found on an artificial reef. These spaces consist of holes and crevices in the reef structure. Between irregular rock surfaces, interstitial spaces form excellent habitat for many small or cryptic invertebrates and fishes. Interstitial spaces effectively increase the amount of surface area available for colonization by a wide variety of organisms; a well-designed reef could be described as porous, with many holes or crevices. For example, if rock rubble is used, then larger size rock will create larger holes and crevices that may be used by large fish and invertebrates. Reefs constructed of materials which do not contain generous amounts of interstitial spaces (e.g., barges or stripped vessels) may be improved by adding rock, concrete rubble, or other appropriate materials.

(6). Configuration

Configuration refers to the overall size and shape of an artificial reef; it may refer either to individual small reef structures or modules, or more appropriately the entire artificial reef complex. A configuration which contains a variety of habitat types will usually result in a more effective reef for a wider variety of organisms. Also, a configuration which has a significant size, or mass, or encompasses a substantial volume may be more like a natural reef. In most cases for which the purpose of the artificial reef is enhancement of a variety of target species, the optimum configuration has (1) the greatest amount of material located in the bases or lower profile portions of several reef structures; (2) has a substantial amount of projecting overhangs (this feature produces a shadow effect which attracts some species) and other protective habitat; and (3) some high profile features projecting well above the substrate. Additionally, the general shape of a structure will influence its resilience to wave surge during storms. Configuration also is an important determinant for effective use of the reef by fishermen and divers.

(7). Orientation

An artificial reef's orientation to prevailing water currents can govern overall effectiveness. Generally, an alignment perpendicular to the prevailing current is best. This orientation creates the greatest amount of shelter against currents for fish on the leeward side of the reef. Also, some species feed or maintain a presence in the disturbed water flow over the reef. From a user perspective, more fishermen may anchor or drift fish over a reef that is constructed at right angles to dominant currents. Scuba divers also benefit from reduced current velocities that can result from this orientation.

(8). Color and Contrast

Color and contrast affect the visibility of structures. Many fish species appear to be attracted to artificial reefs as points of visual reference or rheotactic orientation. Mid-water and surface FADs which contrast against the water column background seem to be especially effective in attracting baitfishes, which in turn attract pelagic predators. Contrast may not be a long-term factor as the indigenous encrusting organisms will create a different color scheme over time.

(9). "Fishability"

While user accessibility is an important siting consideration, access to the fish (fishability), is an important design consideration. If the purpose of a reef project is fishing enhancement, then choosing materials and a configuration which facilitates rather than hinders fishing also is important. For example, reefs with obstructions, projections, or hangs could snag anchors or hamper gear retrieval. The use of several reef modules verses one large module provides more space for reef users. In contrast, if the objective of a reef project is to create a sanctuary for a target species, the

presence of obstructions to fishing might be desirable. Reefs can be designed to maximize the number of anglers that can anchor over, or troll through, a reef area (see Orientation section).

(10). Flexibility

Flexibility pertains specifically to FADs or other specialized designs which incorporate either moving parts or segments. For such structures, the flexibility or rigidity will influence the durability and stability. Generally, flexible, non-rigid FAD units survive best. These units will respond to current, tidal action, and storm surge by changing shape or direction rather than resisting these factors, and they generally remain on station longer than rigid and heavier structures.

b. Type of Artificial Reef Design

(1). Benthic

Benthic (bottom) reefs are constructed primarily to enhance bottom-dwelling invertebrate and fish habitat. Pelagic species frequently occur over benthic reefs, but these relationships with bottom structures are generally temporary. Benthic reefs can be divided into two categories based on their vertical relief: low profile with a reef height to water depth (aspect ratio) of less than 1/3, or high profile, with a height greater than a third of the water depth.

(a). Low Profile

This type of reef should be designed to maximize the available surface area and structural complexity which enhances colonization and refuge opportunities. The footprint of the reef should be designed for desired target species or other specific uses. If the purpose is to improve fishing, openness should be maximized by including materials such as culvert or large pieces of rubble. Popular marine species that would use benthic reefs include sea bass, ling, tautog, sheepshead, snapper, grouper, grunt, porgy, kelp bass, lingcod, and rockfish. In fresh water, species using these reefs include sauger, walleye, catfish, perch, bass, brown trout, brook trout, suckers, and sturgeon. If the reef is meant to increase survival of juvenile fishes, small diameter rock or other materials should be used. This will provide small holes and crevices for small fish but exclude many adults. To replicate natural reef situations, low profile reefs can be designed to enhance fishing and juvenile recruitment and survival.

(b). High Profile

Openness may be a more important criteria for high rather than low profile reefs. Access to large internal spaces by pelagic (off-bottom) species is desirable. The abundance of species associated with open supporting structures of petroleum platforms is evidence of the attractiveness of these designs. Maximizing structural complexity necessitates a compromise with openness, but is nevertheless a desirable characteristic to build into

benthic, high profile reefs. An example of a compromise solution for a sunken vessel would be to place smaller material such as tire units or culvert in large, empty spaces.

The shadow effect produced by upper portions of high profile reefs does not appear to be as critical as for lower portions of benthic reefs, yet remains a desirable feature. For good fishability, high profile artificial reefs are more versatile than low profile reefs because they potentially harbor a wider diversity of fish species. This also means that different user groups may be brought together, possibly into conflict. These tradeoffs should be considered during the design stage.

(2). Mid-water and Surface FADs

FADs are moored structures that either float at the surface or are suspended in mid-water between surface and bottom. They are secured to the bottom by anchor, rise vertically through the water column and are suspended by means of a subsurface or surface buoy. Various devices, specifically designed to attract and temporarily hold desired fish species, may be attached to the vertical mooring line.

A primary concern in the design of a FAD is the strength and durability of the mooring system. The mooring system is improved if non-metallic components are used and chafing points are protected. If the mooring fails, the whole system usually is lost. Other criteria important in the design of a FAD include:

(a) Structural integrity--FADs should be strong enough or flexible enough to hold up under strong current or wave surge conditions.

(b) Apparent surface area--FAD attraction may be increased if a large surface is developed with materials such as net webbing or streamers or by close spacing of several structures. This may not be practical in areas with high current velocities. Profile and structural complexity can be adjusted for target species and oceanographic conditions.

(c) Fishability--FADs should be configured (1) in rows in nearshore waters so fishermen can troll along them; (2) as isolated, deep moored systems at the edge of the contintenal shelf; and (3) in conjunction with benthic reefs. When FADs are placed adjacent to fishing piers, jetties, or other shore fishing sites, they should be located beyond normal casting range.

(3). Combination

Combination reef structures include reefs constructed of a mixture of two or more materials (e.g., a vessel with tire units added to enhance structural complexity), and reefs using two or more design features (e.g., a benthic prefabricated concrete reef with FADs suspended in the water column above it). Combination reefs can be useful for increasing biomass at a site or for providing habitat for juvenile and adult fishes. Combination reefs may offer the limited budget reef builder the most economical way to improve fishing. User conflicts, however, may arise by overlapping anchored and drift fish locations with FADs for trolling.

C. Regulatory Requirements

1. Corps of Engineers

The U.S. Army Corps of Engineers (Corps) regulates the construction and maintenance of fishing reefs and fish attractors in waters of the United States including the waters that overlay the outer continental shelf. Permits for such structures are required under Section 10 of the Rivers and Harbors Act of 1899, and/or Section 404 of the Clean Water Act.

An application for a permit must be submitted to the appropriate Corps district office. An application form, guidance on completing the form, and the geographical area of responsibility and address for each Corps district is provided in Appendix A. In addition to the basic information detailed in Appendix A, applicants must provide a plan describing provisions for siting, constructing, monitoring, operating, maintaining, and managing the proposed artificial reef. The district engineer will evaluate those provisions for consistency with the following conditions;

(i) enhancing fishery resources;

(ii) facilitating access and use by recreational and commercial fishermen;

(iii) lessening conflicts among competing uses of the navigable waters or waters overlying the outer continental shelf and of the resources in these waters;

(iv) minimizing environmental risks and risks to personal health and property;

(v) following generally accepted principles of international law; and

(vi) preventing any unreasonable obstructions to navigation.

In addition, the district engineer will determine if the provisions in the artificial reef permit application are consistent with this Plan. When the district is satisfied that the application is complete, a public notice (with a comment period of 15 to 30 days) is published and distributed to individuals, organizations, and governmental agencies with an interest in artificial reefs. All comments received, along with other information gathered by the district, are considered in reaching a decision to issue or deny a permit. If no serious problems develop, the permit decision normally can be made within 60 to 90 days after the application is completed.

Common problems which could lengthen processing include:

1. the proposed reef location conflicts with existing or potential use of the area (e.g., navigation, military restricted area, energy and minerals development, commercial fishing, marine sanctuaries);

2. incompatibility of reef materials (e.g., stability, contaminants or pollutants); and

3. marking and monitoring requirements.

The Corps districts may require a public hearing to gather information for decisionmaking. The decision on whether to issue a permit is based on an evaluation of the probable effects on the public. The benefits which reasonably may be expected to accrue from the proposal must be balanced against reasonably foreseeable detriments. For reefs involving 404 (Clean Water Act) discharges, the activity must comply with the section 404(b)(1) guidelines. Then a reef permit will be granted unless the district engineer determines that its issuance would be contrary to the public interest. If a permit is issued, private applicants must pay a small fee ($10; 1984). Government agencies (e.g., State or local fisheries agencies) are exempt from such fees.

Permits issued for permanent artificial reefs usually will have no expiration date cited. However, the construction period for a permanent artificial reef normally will be limited to a specified length of time. Time limits may include a date by which the work must be completed (normally three years from the date of issuance). The district engineer must be advised of the dates when work is to commence and when the work is completed so that notification can be given to mariners and the reef can be noted on navigation charts, when appropriate. Permits can be extended by written request, although, an extension usually is not granted if the request is submitted after the permit's expiration date.

To reduce paperwork and regulatory burden, a number of Corps districts have developed general permits for certain kinds of artificial reefs. Where such permits have been issued, a reef may be built without applying for an individual permit, provided all conditions of the general permit are met. Individuals interested in constructing artificial reefs should contact the appropriate district office (Appendix A) to determine if general permits authorizing construction are available for their area.

Persons interested in constructing artificial reefs are cautioned that, in addition to other applicable provisions of law, the Act provides that anyone who violates any provision of a Corps permit issued for the construction of an artificial reef is liable to the United States for a civil penalty not to exceed $10,000 for each violation.

2. Coast Guard

The Coast Guard (USCG) manages the private aids to navigation program to ensure that aids being maintained by private parties conform to certain minimum standards, and to promote the accuracy of information which is available to mariners. In some cases, aids are required because the artificial reef poses some hazard to navigation. By law, the owner of an obstruction is liable for the costs of marking the obstruction with an appropriate aid to navigation. These costs can be substantial. If, for example, an offshore structure, which normally must be removed, was left standing as artificial reef material and as a convenient "landmark" for users of the artificial reef site, it would be a hazard to navigation and need a continuously maintained aid. In other cases, the responsible party may prefer

to have an aid for the convenience of those who use the reef even though it is not required. In either case, it is necessary to submit an application to the commander of the Coast Guard district having jurisdiction over the reef site. Application forms can be obtained from USCG district offices. Procedures for filing an application are described in Title 33, Part 66 of the Code of Federal Regulations. A copy of the application form (CG-2554) and instructions for completing it are contained in Appendix B. All private aids, including floats used as markers, fall within the private aids program and must comply with USCG regulations.

The only way of determining exactly what aid will be appropriate for a particular reef site is to evaluate the characteristics of that site (i.e., the depth of water in relation to the draft of vessels operating in the vicinity, and the proximity of established navigation lanes). Thus, it is advisable for artificial reef builders to contact the appropriate USCG district office before applying for a Corps permit.

Some districts have prepared written descriptions of factors they consider critical in evaluating a private aid application for an artificial reef. Reference to these criteria should help reef builders select specific aids for the reef. An address list of appropriate district offices is attached in Appendix B. Prospective reef builders may be able to contract with a local company to install and maintain aids at the site; however, the permittee is responsible for the aid. The USCG District may be able to provide information on companies that provide such services.

As part of the planning process for an artificial reef, the sponsor should be aware that a significant cost may be involved in buying and maintaining the appropriate aid to navigation. Also, reef management should include a mechanism by which the aid is monitored for compliance with the USCG authorization for color and signal characteristics, and to ensure that the aid stays on station.

When an artificial reef is not considered to be an obstruction to navigation, aids which are established only for the purpose of indicating the presence of a reef to users may be discontinued when construction is completed, if authorized by the USCG District Commander. The decision on when an aid is no longer mandatory will be made by the USCG District Commander upon receiving an application from the reef sponsor.

Generally, site-specific considerations determine requirements and it will be difficult to develop a simple, universal formula for a program as complex and technical as aids to navigation. Sponsors and managers of artificial reefs are encouraged to make practical suggestions to the USCG on how the present regulations and procedures can be modified in the interest of both reef development and navigation safety.

3. Other

The EPA is required to consult with the Corps to assure that any permit that EPA issues under section 402 of the CWA for any activity relating to the design, siting, construction, operation, maintenance, monitoring, or managing

an artificial reef is consistent with the permit for that artificial reef issued by the Corps. Under section 404 of the CWA, the EPA may prohibit, restrict, or withdraw use of a site for the discharge of dredged or fill material which would have unacceptable effects on fish, wildlife, shellfish, recreation, or municipal water supplies.

Other State and/or local permits may be required. Many Corps districts have working agreements with State agencies for joint application and/or processing of permits. Where available, this process will streamline the overall permitting process.

D. Construction

Although the importance of material composition and design is understood, successful artificial reef construction is ultimately determined by the ability of managers to predict and plan on-site deployment of materials. This process should begin well before field operations with pre-site surveys, decisions on material options, deployment techniques, design choices, and permitting. Throughout, program managers and permitting agencies should temper all decisions with an assessment of the possible effects of major storms, especially the effect on material stability and anchoring.

Another important pre-placement consideration is the selection of an accessible material staging site that will allow safe and efficient construction, storing, and loading of materials. Equipment and personnel needed to handle the materials must be readily available at the site to (1) allow construction of the reef during favorable weather conditions; (2) coordinate with donated or contracted services such as towing and other volunteer or contracted assistance; and (3) reduce unnecessary delays.

Pre-planning among involved agencies not only clarifies mission objectives, but also ensures that all participants are aware of planned reef material configurations and orientations. Careful attention to planning details can assure the final success of the project. For example, reef planners should:

- acquire an adequate environmental and biological data base;
- select safe weather and water conditions appropriate to the type of transportation and construction technique;
- employ reputable and competent personnel;
- coordinate with any biologists, oceanographers, or engineers studying the reef;
- coordinate with Coast Guard or local marine police;
- assure that all equipment is tested, sufficient for the task to be performed;
- obtain liability insurance, if needed, to protect all involved (see Liability section);

- assure that all pre-surveyed sites can be successfully relocated and are clearly marked by project coordinators prior to arrival of materials;

- maintain staging area to be compatable with surrounding neighborhood and to avoid potential conflicts at the staging area;

- stage and deploy primary or emergency navigational aids, as required;

- manage the flow of raw materials to the staging area and the movement of completed units to the reef site;

- assess daylight and other operational constraints;

- supervise any required clean-up after placing reef material on the site (e.g., overlooked floatables);

- be prepared to cancel operations if necessary to insure the safety of participants and the proper placement of materials; and

- secure funding and other support to complete construction.

E. Management

1. General

Artificial reefs can be an effective tool for managing fishery resources. To be most effective, they must be developed using clear, specific objectives. With objectives in mind, reef developers/managers can choose and plan strategies and reef characteristics that they believe will best meet their goals. Reef management should begin with the idea for a reef and continue for the life of that reef. When a reef has been constructed, another important phase of reef management begins--monitoring and maintenance.

Specific management strategies will depend on the purpose of the reef and compliance with existing management or regulating mechanisms, such as regulations mandated as part of the permitting process or conforming with existing State or Regional Fishery Management Council (FMC) resource or user management plans (see Act, section 205 b). Generally, in marine waters beyond the territorial limit, the FMCs determine management strategies for resources or users through fishery management plans. Therefore, FMCs should be consulted from the inception in artificial reef development. The FMCs can be a major source of information about the fisheries resources and potential conflicts in Federal waters. Reef planners can discuss with Regional Fishery Management Council members the possibility of establishing special management zones around existing or proposed artificial reefs to regulate fishing activity, including gear and harvest restrictions, at these locations. This is being considered by the South Atlantic Fishery Management Council for the snapper-grouper fishery management plan. Maintaining the integrity of artificial reefs should be considered in future resource management or development actions.

States should be the primary source of management advice pertaining to artificial reefs in their waters. States with artificial reef projects are encouraged to develop site-specific artificial reef plans for areas within their jurisdiction and in adjacent waters. These site-specific plans would facilitate development and management of artificial reefs in a responsible manner, based on user needs and the best technical or scientific information available on local conditions. Private reef construction should be closely supervised by States, but it is the builder's responsibility to comply with applicable laws, regulations, and permit conditions. To assist in evaluating reef success, standards should be a part of the site-specific plan and these standards should require the builder, sponsor, scientific advisor, or management entity to demonstrate that reef objectives are met. These standards could include: (1) increases in any number or combination of resource variables (number of fish per unit area or biomass per unit area; (2) increases in harvest (catch per unit of effort) or an increase in the average size of fish caught; (3) increases in the number of fishermen using an area; or (4) reduction in user conflicts or changes in other socio-economic factors affecting the specific purpose of the artificial reef. Performance standards are essential for managers to evaluate accurately the effects of reefs.

Information gathered from monitoring can be used to test predictions made in the planning phase about the designs, materials or total structure. The results of these tests can be used to: (1) improve or refine siting or design; (2) evaluate benefit/costs; (3) effect regulations to protect stocks from overharvesting or to resolve user conflicts; and (4) propose alternate management strategies or options. Management should provide: (1) programs that promote public or administrative awareness about the effectiveness of the artificial reef programs; (2) assurance of adequate long-term funding for the total program; (3) encouragement of research on artificial reefs; and (4) documentation of reef development and effects to share with other builders.

Artificial reef managers should, whenever possible, develop and distribute public information brochures and/or flyers describing: (1) reef locations; (2) fishing conditions at each site; (3) applicable fishing regulations or use restrictions (e.g., observance of diving flags, anchoring guidelines, fishing gear restrictions, and catch limitations); and (4) tips on courtesies which should be extended to other reef users. User information is critical to achieving benefits.

Reef design and the effective use of buoys can be important parts of artificial reef management. Reefs with numerous clumps of material can provide more anglers with better fishing and fewer conflicts than a single clump reef. The use of FADs along the perimeter of benthic reefs can reduce space conflicts between trollers and bottom fishermen. Buoys can be used to place anglers over productive fishing areas of the reef. The State of Washington constructs reef structures in different areas within the permitted reef site and directs fishing effort by buoy placement. The State places some reef structure away from the reef buoy(s) to minimize the chance of anglers locating the material. This creates sanctuaries, or less heavily fished areas, which could be buoyed later if overharvest occurs on the areas buoyed initially.

2. Monitoring

There are two primary reasons for establishing monitoring programs as part of reef management: (1) to assure compliance with the conditions defined in any authorizing permits or other applicable laws or regulations (see Act, section 205 b); and (2) to provide an assessment of the predicted performance of reefs and assure that the reefs meet the general standards established in section 203 of the Act (Appendix 3).

The specific monitoring strategies will depend on the degree of compliance required and the objectives and resources of the reef builder. The information obtained should be useful for improving the existing reef or for building effective reefs in the future.

a. Compliance Monitoring

Specific compliance monitoring requirements for the parties responsible for the design, construction, and maintenance of reefs will be determined by the requirements of governing law, regulations, and conditions for approval of the various required permits (e.g., Coast Guard permits, Corps of Engineer permit, State permits (State waters), and conditions of consistency concurrence for Coastal Zone Management purposes). The degree to which Federal, State, or local agencies will carry out compliance inspections of an artificial reef will also be governed by applicable law, regulations, and the conditions of approval for the permit(s) under which the artificial reef is authorized. Generally, the recording and reporting requirements placed upon the responsible parties should be held to the minimum required to demonstrate that conditions of the governing permits are being met.

Inspection of the reef buoy, mooring chain, and anchor and of the reef material on the bottom is the major consideration in compliance monitoring. If the Coast Guard permit application specifies a certain type and color of buoy to mark the reef location, the permittee is legally obligated to ensure the buoy remains the same type and color, even if re-painting or replacement of the original buoy is necessary. The position and general condition of a buoy can be determined from surface inspections, but the condition of the mooring equipment can only be obtained by sub-surface inspections. Divers, underwater television cameras, side-scanning sonar and magnetometers have been used for these inspections. Monitoring reef materials involves determining that the materials have not moved out of the permitted area. Although inspections should be undertaken annually, the permit holder must immediately follow up on any problems reported between annual inspections, such as complaints of missing or damaged buoys. Additional inspections should be made after severe storms in the reef area.

b. Performance Monitoring

Generally, performance monitoring is voluntary; it is not required under the authorizing permit(s). Rather, it is conducted to provide understanding of artificial reefs. This includes recording and analysis of the physical, biological, economic, and social impacts of a given artificial reef or group

of reefs. Performance monitoring determines whether the reef is accomplishing the purpose(s) for which it was authorized, and whether the reef is causing an unacceptable level of predicted or unforeseen damage or conflict.

Performance monitoring includes measurement and analysis of the reef materials and reef design variations to determine their effectiveness in obtaining desired results. Such monitoring may focus specifically on obtaining data on ways to improve the reef design to increase its effectiveness in achieving a desired goal (e.g., improve habitat for nursery stock vs. aggregating adult species for harvesting). Monitoring may also be designed to test the appropriateness of available reef construction materials for stability, durability, cost effectiveness, or safety.

Monitoring for biological effects includes documenting, with quantifiable data, that an enhancement has occurred and whether it is short- or long-term. It should provide some understanding of the nature of the enhancement. Biological monitoring can provide information (which is presently limited or unknown) about the basic biology of resource species found on reefs and the specific interactions between these species and the reef so more effective plans or designs can be developed. Monitoring can also detect conditions that may place the targeted resources or other resources sharing the reef area in jeopardy.

The social and economic impacts of artificial reefs should be monitored to: (1) determine total project benefits and costs; (2) assess the user impacts (safety, extent of use, use patterns, related expenditures, and conflicts); and (3) learn more about the interaction between the reef's resources and users. Benefit-cost analyses can be useful in maintaining public and administrative support for reef programs or for defining the most efficient methodology.

Designing and implementing good monitoring programs can be highly complex, often requiring the services of statisticians, fishery biologists, oceanographers, sociologists, engineers, and economists, depending on what is being monitored and the information required. While monitoring can be expensive, it is necessary to determine if artificial reefs are having the intended effect and if the effort going into them is warranted, both short-and long-term. Monitoring is not an end in itself; it should be intended to provide information for future planning and design of reefs and support for management actions.

3. Maintenance

Maintenance should also be part of a reef program. Certain maintenance may be necessary to comply with permit conditions (buoys, materials scattering, etc.). Additional maintenance, through not required by law, can enhance reef effectiveness (e.g., removing entangled fishing gear, repositioning buoys, and adding materials).

a. Maintenance to Comply with Permit Requirements

The buoy system must be maintained to comply with the Coast Guard permit requirements. This may involve painting, maintenance, or complete relacement of a badly deteriorated buoy or mooring. If monitoring reveals that the buoy does not mark the actual location of the reef, either because it was deployed inaccurately or because the materials have moved in relation to the buoy, the buoy must be repositioned.

b. Maintaining Reef Effectiveness

If monitoring reveals that the reef materials were inappropriate for the substrate, resulting in sunken or covered material, then maintenance might include deploying additional materials more suited to the site conditions. This maintenance may also be the answer to more complex biological problems, such as failure to attract the target species--additional higher or lower profile material might provide the missing habitat.

c. Maintaining Documentation

Accurate documentation of a reef's development stages, especially the addition of materials, is important for determining reef effectiveness. Documentation should include the types of reef materials, deployment dates, locations of various materials on the reef and fish species present. Whenever possible information should be recorded on fisherman and diver use of the artificial reef.

F. Liability

Improper artificial reef placement can potentially injure persons, property, and natural resources. Risks include: (1) injuries to personnel handling the reef materials; (2) damage to vessels transporting reef materials; (3) improper location causing damage to fishing gear; (4) damage to vessels in transit over the reef; (5) injury to recreational divers; (6) decomposition or movement of the reef material to an unauthorized location; or (7) environmental hazzards caused by incomplete cleaning of hulls or holds containing toxic residues. To date, there have been no reported cases imposing liability for injuries associated with artificial reefs.

The National Fishing Enhancement Act of 1984, (Act) Title II of P.L. 98-623, section 205 c., addresses the liability issue from three perspectives--that of the reef permittee, that of the materials donor, and that of the Federal government. Issues of liability which are not addressed by the legislation will require reference to maritime law, sovereign immunity, and traditional tort concepts.

Described below is a hypothetical situation which culminates in the actual placement of reef materials in navigable waters of the United States or on the Continental Shelf. There are several stages in this process.

1. Plan and Permit Stage

The Act requires the Secretary of Commerce to publish a long-term plan which will establish criteria for design, construction, and siting of artificial reefs. This Plan and the statutory standards of section 203 of the Act guide the Corps of Engineers in its decision to issue the permit required to begin construction. The materials to be used for the reef must minimize environmental risks and the placement of the reef must not create an unreasonable hazard to navigation.

The Act creates no liability on the part of the United States. The Suits in Admiralty Act is the basic remedy for injuries or damage resulting from maritime actions of the Federal Government. Under this statute, if the Corps negligently authorized placement of a reef on top of a pipeline or undersea cable or in shallower water than intended, the United States might be sued for any damages that resulted from that negligence. Some courts, however, have implied an exemption from liability under the Suits in Admiralty Act for discretionary functions of the Government. In this respect Federal sovereign immunity has not been waived. As a result, an intentional Government decision to permit a reef in a particular place or to require certain materials for construction would not create liability even if there were some risks involved, assuming that the explicit requirements of the Act had been satisfied.

2. Construction Stage

When a permit has been obtained, the materials must be transported to the reef site and properly located, anchored, and marked. The Act does not address the transportation phase. Presumably all the usual maritime accidents of injury to crew, grounding, premature discharge, collision and/or sinkings could occur. Liability for transportation accidents would be the same as in any other maritime context.

The Act does provide that the donor of the materials to be used in reef construction, once title has transferred, is immune from liability if the materials meet the requirements of the Plan and are not otherwise defective. It would therefore be in any donor's interest to verify that the materials meet the Plan requirements and to document title transfer.

The actual placement of materials in the water will usually involve private parties, either volunteers to, or contractors of, the permit holder. Since the permit will specify the location and procedures for placing and marking, the permit holder would generaly be liable for any failure to follow those specifications (Act, section 205(c)(2)). Conversely, strict adherence to the requirements of the permit will immunize the permit holder from liability for injuries resulting from those required activities (Act, section 205(c)(1)).

3. Monitoring Stage

When a reef has been properly located, marked on navigation charts if necessary, and any required surface markers afixed, there should be very

little potential for liability. Unless the reef breaks up or moves to a different location, or the marker buoys become detached, sink, or are otherwise destroyed, it would be each vessel owner's responsibility to avoid collision. The plan suggests and each permit may contain requirements for systematic monitoring of each new artificial reef. These requirements must be followed by permit holders to avoid liability.

Some reefs will be used by recreational divers and diving accidents may occur. In this respect, an artificial reef is like a public park--there are dangers in most parks, guard rails and fences cannot be placed everywhere, and everyone who visits the park assumes some risk of injury. A warning could be placed on nautical charts and posted in local dive shops to warn of these dangers. However, each case would probably involve determination of comparative negligence.

If the permit holder is a State government, it may have sovereign immunity from liability. It is unclear whether the National Fishing Enhancement Act affects any State claim of sovereign immunity.

4. General Observations

The placement of a reef, particularly if sponsored by a public agency, involves decisions similar to those a municipality makes in building a public park. The requirement for a Federal permit and the standards and procedures of the Act, provide additional assurances that the reef will be safely located. Strict adherence to all the terms of the permit immunizes the permit holder for activities the Government has specified in the permit. The Federal Government will generally not be liable for discretionary acts in specifying permit terms and conditions. The nature of the Federal Government's liability for properly performing its assigned responsibilities under the Act are not different than other forms of government activity. The liability for transportation accidents is the same as for most other maritime activities. To minimize the risks for all concerned, the Secretary of Commerce and the Corps should provide explicit permit standards and conditions. If these conditions are not negligently devised and are properly monitored, both the Government and the permit holder will be protected from liability to the greatest possible degree.

IV. EXISTING INFORMATION AND RESEARCH NEEDS

A. Sources of Information

Considerable information exists on artificial reefs. Bohnsack and Sutherland (1985) critically reviewed 413 artificial reef references to determine what had been scientifically established on the biology, ecology, and economics of artificial reefs. The authors provide a number of recommendations for future studies, some of which are listed in the next section, "Research Needs." The paper has an excellent literature cited section. Other good sources of information include: (1) the bibliographies by Steimle and Stone (1973), Rickards (1973), and Stanton (in press); (2) the translations of selected Japanese literature by Sheehy and Vik (1982); (3) reviews of Japanese literature by Mottet (1981), and Grove and Sonu

(1983); (4) artificial reef conference proceedings compiled and edited by Colunga and Stone (1974), Aska (1981), D'Itri (1985), and Buckley, Grant, and Stephens (1985); and (5) information on oil and gas structures as artificial reefs by Continental Shelf Associates, Inc. (1982).

Publications on how to build artificial reefs include Parker, et al. (1974); Prince, et al. (1977); and the Artificial Reef Development Center Planning Guide (1985). Specific information on the locations and composition of existing artificial reefs can be found in the files of State agencies with active artificial reef programs; in State publications on fishing sites; in Sea Grant publications on artificial reef locations; and in National Marine Fisheries Service files.

B. Research Needs

Although artificial reefs of various types have been used for centuries, many social, economic, biological, and engineering questions and needs remain. Some of the priority areas that require research are:

- What is the relationship between attraction vs production functions of artificial reefs for various fish species under various oceanographic conditions?

- Can artificial reefs be effective mitigation tools (e.g., replace lost habitat) and under what circumstances? What is the potential for artificial reefs or similar structures in mariculture?

- What is the applicability of marine experience with fishery enhancement systems to the estuarine and fresh water environments?

- Compile and evaluate the "state-of-the-art" information on artificial reef research, development, and management.

- Potential use of FADs to alter migratory patterns of oceanic pelagics and improve catches.

- Further field testing of assumptions of why or how reefs work as well as laboratory and in situ manipulative experiments to optimize designs, size, density, and configuration for particular habitats. What size reef is needed to sustain a given amount of fishing pressure? Is there a best time to place a reef?

- Improved engineering of reef materials to provide effective, inexpensive, long-lasting, easily handled, easily transported and environmentally acceptable structures.

- Are expendable benthic reefs and FADs economically viable? What are the cost-benefits of prefabricated reefs versus reefs of opportunity, both short- and long-term?

- Improved monitoring techniques and methods for quantifying data.

- What are the benefits of designing and building reefs to improve recruitment, growth and spawning, as well as for fishing?

- Document the social and economic values of artificial reefs (direct and indirect benefits).

- What are the effects of harvesting on reef populations and the relationships of reef population to overall populations?

- Why are some reef structures more effective than others? Why do some fishermen use artificial reefs while others do not?

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APPENDIX A

U. S. ARMY CORPS OF ENGINEERS

REGULATORY PROGRAM APPLICANT

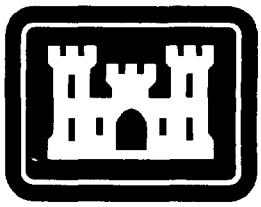
INFORMATION

EP 1145-2-1
May 1985

United States Army Corps of Engineers

Regulatory Program

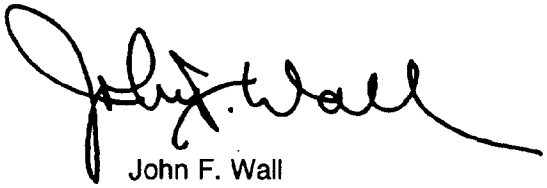
Applicant Information



This Pamphlet Supersedes EP 1145-2-1, November 1977

INTRODUCTION

This pamphlet is designed to assist you in applying for a Department of the Army permit from the Corps of Engineers. The pamphlet is not intended to be a complete description of all aspects of the permit program, but will provide general information of a non-technical nature and specific guidance on how to complete a permit application. Full explanation of the program may be found in Title 33 Code of Federal Regulations, Parts 320 through 330. These regulations are available for review at the Corps of Engineers District offices listed at the back of this pamphlet. Answers to technical questions and detailed information about special aspects of the program that pertain to your geographical area and your proposed activity may also be obtained from Corps of Engineers District offices.



John F. Wall
Major General, USA
Director of Civil Works

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Authority for the Regulatory Program

The U.S. Army Corps of Engineers has been regulating activities in the nation's waters since 1890. Until the 1960's the primary purpose of the regulatory program was to protect navigation. Since then, as a result of laws and court decisions, the program has been broadened so that it now considers the full public interest for both the protection and utilization of water resources.

The regulatory authorities and responsibilities of the Corps of Engineers are based on the following laws:

- ☐ **Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403)** prohibits the obstruction or alteration of navigable waters of the United States without a permit from the Corps of Engineers.
- ☐ **Section 404 of the Clean Water Act (33 U.S.C. 1344).** Section 301 of this Act prohibits the discharge of dredged or fill material into waters of the United States without a permit from the Corps of Engineers.
- ☐ **Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended (33 U.S.C. 1413)** authorizes the Corps of Engineers to issue permits for the transportation of dredged material for the purpose of dumping it into ocean waters.

Other laws may also affect the processing of applications for Corps of Engineers permits. Among these are the National Environmental Policy Act, the Coastal Zone Management Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, the Deepwater Port Act, the Federal Power Act, the Marine Mammal Protection Act, the Wild and Scenic Rivers Act, and the National Fishing Enhancement Act of 1984.

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Explanation of Some Commonly Used Terms

Certain terms which are closely associated with the regulatory program are explained briefly in this section. If you need more detailed definitions, refer to the Code of Federal Regulations (33 CFR Parts 320 through 330) or contact a Corps district regulatory office.

Activity(ies) as used in this pamphlet includes structures (for example a pier, wharf, bulkhead, or jetty) and work (which includes dredging, disposal of dredged material, filling, excavation or other modification of a navigable water of the United States).

Navigable Waters of the United States are those waters of the United States that are subject to the ebb and flow of the tide shoreward to the mean high water mark and/or are presently used, or have been used in the past or may be susceptible to use to transport interstate or foreign commerce. These are waters that are navigable in the traditional sense where permits are required for certain activities pursuant to Section 10 of the Rivers and Harbors Act. This term should not be confused with the term *waters of the United States* below.

Waters of the United States is a broader term than navigable waters of the United States defined above. Included are adjacent wetlands and tributaries to navigable waters of the United States and other waters where the degradation or destruction of which could affect interstate or foreign commerce. These are the waters where permits are required for the discharge of dredged or fill material pursuant to Section 404 of the Clean Water Act.

Pre-application Consultation is one or more meetings between members of the district engineer's staff and an applicant and his agent or his consultant. A pre-application consultation is usually related to applications for major activities and may involve discussion of alternatives, environmental documents, National Environmental Policy Act procedures, and development of the scope of the data required when an environmental impact statement is required.

Public Hearings may be held to acquire information and give the public the opportunity to present views and opinions. The Corps may hold a hearing or participate in joint public hearings with other Federal or state agencies. The district engineer may specify in the public notice that a hearing will be held. In addition, any person may request in writing during the comment period that a hearing be held. Specific reasons must be given as to the need for a hearing. The district engineer may attempt to resolve the issue informally or he may set the date for a public hearing. Hearings are held at times and places that are convenient for the interested public. Very few applications involve a public hearing.

The Public Interest Review is the term which refers to the evaluation of a proposed activity to determine probable impacts. Expected benefits are balanced against reasonably foreseeable detriments. All relevant factors are weighed. Corps policy is to provide applicants with a timely and carefully weighed decision which reflects the public interest.

Public Notice is the primary method of advising interested public agencies and private parties of the proposed activity and of soliciting comments and information necessary to evaluate the probable impact on the public interest. Upon request, anyone's name will be added to the distribution list to receive public notices.

Waterbody is a river, creek, stream, lake, pool, bay, wetland, marsh, swamp, tidal flat, ocean, or other water area.

Questions That Are Frequently Asked

Various questions are often asked about the regulatory program. It is hoped that these answers will help you to understand the program better.

Q. When should I apply for a Corps permit?

A. Since two to three months is normally required to process a routine application involving a public notice, you should apply as early as possible to be sure you have all required approvals before your planned commencement date. For a large or complex activity that may take longer, it is often helpful to have a "pre-application consultation" or informal meeting with the Corps during the early planning phase of your project. You may receive helpful information at this point which could prevent delays later. When in doubt as to whether a permit may be required or what you need to do, don't hesitate to call a district regulatory office.

Q. I have obtained permits from local and state governments. Why do I have to get a permit from the Corps of Engineers?

A. It is possible you may not have to obtain an individual permit, depending on the type or location of work. The Corps has many general permits which authorize minor activities without the need for individual processing. Check with your Corps district regulatory office for information on general permits. When a general permit does not apply, you may still be required to obtain an individual permit.

Q. What will happen if I do work without getting a permit from the Corps?

A. Performing unauthorized work in waters of the United States or failure to comply with terms of a valid permit can have serious consequences. You would be in violation of Federal law and could face stiff penalties, including fines and /or requirements to restore the area.

Enforcement is an important part of the Corps regulatory program. Corps surveillance and monitoring activities are often aided by various agencies, groups, and individuals, who report suspected violations. When in doubt as to whether a planned activity needs a permit, contact the nearest district regulatory office. It could save a lot of unnecessary trouble later.

Q. How can I obtain further information about permit requirements?

A. Information about the regulatory program is available from any Corps district regulatory office. Addresses and telephone numbers of offices are listed at the back of this pamphlet. Information may also be obtained from the water resource agency in your state.

Q. Why should I waste my time and yours by applying for a permit when you probably won't let me do the work anyway?

A. Nationwide, only three percent of all requests for permits are denied. Those few applicants who have been denied permits usually have refused to change the design, timing, or location of the proposed activity. When a permit is denied, an applicant may redesign the project and submit a new application. To avoid unnecessary delays pre-application conferences, particularly for applications for major activities, are recommended. The Corps will endeavor to give you helpful information, including factors which will be considered during the public interest review, and alternatives to consider that may prove to be useful in designing a project.

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Q. What is a wetland and what is its value?

A. Wetlands are areas that are periodically or permanently inundated by surface or ground water and support vegetation adapted for life in saturated soil. Wetlands include swamps, marshes, bogs and similar areas. A significant natural resource, wetlands serve important functions relating to fish and wildlife; food chain production; habitat; nesting; spawning; rearing and resting sites for aquatic and land species; protection of other areas from wave action and erosion; storage areas for storm and flood waters; natural recharge areas where ground and surface water are interconnected; and natural water filtration and purification functions.

Although individual alterations of wetlands may constitute a minor change, the cumulative effect of numerous changes often results in major damage to wetland resources. The review of applications for alteration of wetlands will include consideration of whether the proposed activity is dependent upon being located in an aquatic environment.

Q. How can I design my project to eliminate the need for a Corps permit?

A. If your activity is located in an area of tidal waters, the best way to avoid the need for a permit is to select a site that is above the high tide line and avoids wetlands or other waterbodies. In the vicinity of fresh water, stay above ordinary high water and avoid wetlands adjacent to the stream or lake. Also, it is possible that your activity is exempt and does not need a Corps permit or that it has been authorized by a nationwide or regional general permit. So, before you build, dredge or fill, contact the Corps district regulatory office in your area for specific information about location, exemptions, and regional and nationwide general permits.

General

The application form used to apply for a permit is Engineer Form 4345, *Application for a Department of the Army Permit.* You can obtain the application from one of the Corps of Engineers district regulatory offices listed in the back of this pamphlet. Some offices may use a slightly modified form for joint processing with a state agency; however, the required information is basically the same. It is important that you provide complete information in the requested format. If incomplete information is provided, processing of your application will be delayed. This information will be used to determine the appropriate form of authorization, and to evaluate your proposal. Some categories of activities have been previously authorized by nationwide or regional permits, and no further Corps approvals are required. Others may qualify for abbreviated permit processing, with authorizations in the form of letters of permission, in which a permit decision can usually be reached in less than 30 days. For other activities, a Public Notice may be required to notify Federal, state, and local agencies, adjacent property owners, and the general public of the proposal to allow an opportunity for review and comment or to request a public hearing. Most applications involving Public Notices are completed within four months and many are completed within 60 days.

The district engineer will begin to process your application immediately upon receipt of all required information. You will be sent an acknowledgement of its receipt and the application number assigned to your file. You should refer to this number when inquiring about your application. Your proposal will be reviewed, balancing the need and expected benefits against the probable impacts of the work, taking into consideration all comments received and other relevant factors. This process is called the *public interest review.* The Corps goal is to reach a decision regarding permit issuance or denial within 60 days of receipt of a complete application. However, some complex activities, issues, or requirements of law may prevent the district engineer from meeting this goal.

For any specific information on the evaluation process, filling out the application forms, or the status of your application, you should contact the regulatory branch of the Corps of Engineers district office which has jurisdiction over the area where you plan to do the work.

Typical Processing Procedure for a Standard Individual Permit

1. Preapplication consultation (optional)
2. Applicant submits ENG Form 4345 to district regulatory office*
3. Application received and assigned identification number
4. Public notice issued (within 15 days of receiving all information)
5. 15 to 30 day comment period depending upon nature of activity
6. Proposal is reviewed** by Corps and:
   Public
   Special interest groups
   Local agencies
   State agencies
   Federal agencies
7. Corps considers all comments
8. Other federal agencies consulted, if appropriate
9. District engineer may ask applicant to provide additional information
10. Public hearing held, if needed
11. District engineer makes decision
12. Permit issued
    or
    Permit denied and applicant advised of reason

A local variation, often a joint federal-state application form may be submitted.

**Review period may be extended if applicant fails to submit information or due to requirements of certain laws.*

Evaluation Factors

The decision whether to grant or deny a permit is based on a public interest review of the probable impact of the proposed activity and its intended use. Benefits and detriments are balanced by considering effects on items such as:

conservation
economics
aesthetics
general environmental concerns
wetlands
cultural values
fish and wildlife values
flood hazards
floodplain values
food and fiber production
navigation
shore erosion and accretion
recreation
water supply and conservation
water quality
energy needs
safety
needs and welfare of the people
considerations of private ownership

The following general criteria will be considered in the evaluation of every application:

- ☐ the relative extent of the public and private need for the proposed activity;
- ☐ the practicability of using reasonable alternative locations and methods to accomplish the objective of the proposed activity; and
- ☐ the extent and permanence of the beneficial and/or detrimental effects which the proposed activity is likely to have on the public and private uses to which the area is suited.

Section 404(b) (1) of the Clean Water Act

If your project involves the discharge of dredged or fill material, it will be necessary for the Corps to evaluate your proposed activity under the Section 404(b)(1) guidelines prepared by the Environmental Protection Agency. The guidelines restrict discharges into aquatic areas where less environmentally damaging, practicable alternatives exist.

Forms and Permits

The following forms apply to the permit process:

Application

The form that you will need to initiate the review process is ENG Form 4345 or a joint Federal-state application that may be available in your state. The appropriate form may be obtained from the district regulatory office which has jurisdiction in the area where your proposed project is located.

Individual Permits

An individual permit may be issued as either ENG Form 1721, the standard permit, or as a Letter of Permission.

- ☐ A standard permit is one processed through the typical review procedures, (see page 7) which include public notice, opportunity for a public hearing, and receipt of comments. It is issued following a case-by-case evaluation of a specific activity.
- ☐ If work is minor or routine with minimum impacts and objections are unlikely, then it may qualify for a Letter of Permission (LOP). An LOP can be issued much more quickly than a standard permit since an individual public notice is not required. The District Engineer will notify you if your proposed activity qualifies for an LOP.

General Permits

In many cases the formal processing of a permit application is not required because of general permits already issued to the public at large by the Corps of Engineers. These are issued on a regional and nationwide basis.

Separate applications may not be required for activities authorized by a general permit; nevertheless, reporting may be required. For specific information on general permits, contact a district regulatory office.

ENG Form 4336

The third form, ENG Form 4336, is used to assist with surveillance for unauthorized activities. The form, which contains a description of authorized work, should be posted at the site of an authorized activity. If the Corps decides it is appropriate for you to post this form, it will be furnished to you when you receive your permit.

Fees. Fees are required for most permits. $10.00 will be charged for a permit for a non-commercial activity; $100.00 will be charged for a permit for a commercial or industrial activity. The district engineer will make the final decision as to the amount of the fee. Do not send a fee when you submit an application. When the Corps issues a permit, you will be notified and asked to submit the required fee payable to the Treasurer of the United States. No fees are charged for transferring a permit from one property owner to another, for Letters of Permission, or for any activities authorized by a general permit or for permits to governmental agencies.

Instructions for Preparing an Application

The instructions given below, together with the sample application and drawings, should help in completing the required application form. If you have additional questions, do not hesitate to contact the district regulatory office.

Block Number 1. Application Number. Leave this block blank. When your completed application is received, it will be assigned a number for identification. You will be notified of the number in an acknowledgement letter. Please refer to this number in any correspondence or inquiry concerning your application.

Block 2. Name and address of applicant(s). Fill in name, mailing address, and telephone number(s) for all applicants. The telephone number(s) should be a number where you can be reached during business hours. If space is needed for additional names, attach a sheet of white, 8½ × 11 inch paper labeled "Block 2 Continued."

Block 3. Name, address and title of authorized agent. It is not necessary to have an agent represent you; however, if you do, fill in the agent's name, address, title and telephone number(s). If your agent is submitting and signing the application, you must fill out and sign the Statement of Authorization in Block 3.

Block 4. Detailed description of proposed activity. The written description and the drawings are the most important parts of the application. If there is not enough space in Block 4, (a), (b) or (c) attach additional sheet(s) of white, 8½ × 11 inch paper labeled "Block 4 Continued."

a. **Activity.** Describe the overall activity. Give the approximate dimensions of structures, fills, excavations (lengths, widths, heights or depths).

b. **Purpose.** Describe the purpose, need and intended use (public, private, commercial, or other use) of the proposed activity. Include a description of related facilities, if any, to be constructed on adjacent land. Give the date you plan to begin work on the activity and the date work is expected to be completed.

c. **Discharge of Dredged or Fill Material.** If the activity will involve the discharge of dredged or fill material, describe the type (rock, sand, dirt, rubble, etc.), quantity (in cubic yards), and mode of transportation to the discharge site.

Block 5. Names and addresses of adjoining property owners, lessees, etc. whose property adjoins the waterbody. List complete names, addresses and zip codes of adjacent property owners (both public and private), lessee, etc., whose property also adjoins the waterbody or wetland, in order that they may be notified of the proposed activity. This information is usually available at the local tax assessor office. If more space is needed attach a sheet of white, 8½ × 11 inch paper labeled "Block 5 Continued."

Block 6. Waterbody and location on waterbody where activity exists or is proposed. Fill in the name of the waterbody and the river mile (if known) at the location of the activity. Include easily recognizable landmarks on the shore of the waterbody to aid in locating the site of the activity.

Block 7. Location and land where activity exists or is proposed. This information is used to locate the site. Give the street address of the property where the proposed activity will take place. If the site does not have a street address, give the best descriptive location (name or waterbody), names and/or numbers of roads or highways, name of nearest community or town, name of county and state, and directions, such as 2 miles east of Brown's Store on Route 105.

Do not use your home address unless that is the location of the proposed activity. Do not use a post office box number.

Block 8. Information about completed activity. Provide information about parts of the activity which may be complete. An activity may have been authorized by a previously issued permit, may exist from a time before a Corps permit was required or may be constructed on adjacent upland.

Block 9. Information about approvals or denials by other government agencies. You may need approval or certification from other Federal, interstate, state, or local government agencies for the activity described in your application. Applications you have submitted, and approvals, certifications, or disapprovals that you have received should be recorded in Block 9. It is not necessary to obtain other Federal, state, and local permits before applying for a Corps of Engineers permit.

Block 10. Signature of applicant or agent. The application must be signed in Block 10 by the owner, lessee, or a duly authorized agent. The person named in Block 3 will be accepted as the officially designated agent of the applicant. The signature will be understood to be affirmation that the applicant possesses the requisite property interest to undertake the proposed activity.

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

(33 CFR 325)

OMB APPROVAL NO. 0702-0036
Expires 30 June 1986

The Department of the Army permit program is authorized by Section 10 of the River and Harbor Act of 1899, Section 404 of the Clean Water Act and Section 103 of the Marine, Protection, Research and Sanctuaries Act. These laws require permits authorizing activities in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Information provided on this form will be used in evaluating the application for a permit. Information in this application is made a matter of public record through issuance of a public notice. Disclosure of the information requested is voluntary; however, the data requested are necessary in order to communicate with the applicant and to evaluate the permit application. If necessary information is not provided, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application *(see sample drawings and instructions)* and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

1. APPLICATION NUMBER *(To be assigned by Corps)*

3. NAME, ADDRESS, AND TITLE OF AUTHORIZED AGENT

None

Telephone no. during business hours

A/C ( ) _____ *(Residence)*

A/C ( ) _____ *(Office)*

2. NAME AND ADDRESS OF APPLICANT

Fred R. Harris
852 West Branch Road
Blue Harbor, Maryland 21703

Telephone no. during business hours

A/C (301) 585-2779 *(Residence)*

A/C ( ) _____ *(Office)*

Statement of Authorization: I hereby designate and authorize _____ to act in my behalf as my agent in the processing of this permit application and to furnish, upon request, supplemental information in support of the application.

SIGNATURE OF APPLICANT | DATE

SAMPLE

4. DETAILED DESCRIPTION OF PROPOSED ACTIVITY

4a. ACTIVITY

Build timber bulkhead and pier and fill.

4b. PURPOSE

To provide boat access and prevent erosion of shoreline at my place of residence.

4c. DISCHARGE OF DREDGED OR FILL MATERIAL

Approximately 200 cubic yards of upland fill will be placed between new bulkhead and existing shoreline.

5. NAMES AND ADDRESSES OF ADJOINING PROPERTY OWNERS, LESSEES, ETC., WHOSE PROPERTY ALSO ADJOINS THE WATERWAY

Mary L. Clark
850 West Branch Road
Blue Harbor, Maryland 21703

(301) 585-8830

Harry N. Hampton
854 West Branch Road
Blue Harbor, Maryland 21703

(301) 585-3676

6. WATERBODY AND LOCATION ON WATERBODY WHERE ACTIVITY EXISTS OR IS PROPOSED

West Branch of the Haven River on Blue Harbor.

7. LOCATION ON LAND WHERE ACTIVITY EXISTS OR IS PROPOSED

ADDRESS:

852 West Branch Road
STREET, ROAD, ROUTE OR OTHER DESCRIPTIVE LOCATION

King Edward, Maryland 21703
COUNTY STATE ZIP CODE

Town of Blue Harbor
LOCAL GOVERNING BODY WITH JURISDICTION OVER SITE

SAMPLE

8. Is any portion of the activity for which authorization is sought now complete? ☐ YES ☒ NO
If answer is "Yes" give reasons, month and year the activity was completed. Indicate the existing work on the drawings.

9. List all approvals or certifications and denials received from other federal, interstate, state or local agencies for any structures, construction, discharges or other activities described in this application.

ISSUING AGENCY	TYPE APPROVAL	IDENTIFICATION NO.	DATE OF APPLICATION	DATE OF APPROVAL	DATE OF DENIAL
Town of Blue Harbor	Zoning	BH25172	6/20/82	6/30/82	
Md DNR	Certification	DNR258WQ	6/11/82	8/12/82	

10. Application is hereby made for a permit or permits to authorize the activities described herein. I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities or I am acting as the duly authorized agent of the applicant.

Fred R. Harris — Oct. 15, 1982
SIGNATURE OF APPLICANT — DATE

SIGNATURE OF AGENT — DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in Block 3 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of The United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false,fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years, or both.

Do not send a permit processing fee with this application. The appropriate fee will be assessed when a permit is issued.

General Information

Three types of drawings—Vicinity, Plan, and Elevation—are required to accurately depict activities (See sample drawings on pages 16 and 17).

Submit one original, or good quality copy, of all drawings on 8½ × 11 inch white paper (tracing cloth or film may be used). Submit the fewest number of sheets necessary to adequately show the proposed activity. Drawings should be prepared in accordance with the general format of the samples, using block style lettering. Each page should have a title block. See check list below. Drawings do not have to be prepared by an engineer, but professional assistance may become necessary if the project is large or complex.

Leave a 1-inch margin at the top edge of each sheet for purposes of reproduction and binding.

In the title block of each sheet of drawings identify the proposed activity and include the name of the body of water; river mile (if applicable); name of county and state; name of applicant; number of the sheet and total number of sheets in set; and date the drawing was prepared.

Since drawings must be reproduced, use heavy dark lines. Color shading cannot be used; however, dot shading, hatching, or similar graphic symbols may be used to clarify line drawings.

Vicinity Map

The vicinity map you provide will be printed in any public notice that is issued and used by the Corps of Engineers and other reviewing agencies to locate the site of the proposed activity. You may use an existing road map or U.S. Geological Survey topographic map (scale 1:24,000) as the vicinity map. Please include sufficient details to simplify locating the site from both the waterbody and from land. Identify the source of the map or chart from which the vicinity map was taken and, if not already shown, add the following:

- ☐ location of activity site (draw an arrow showing the exact location of the site on the map).
- ☐ latitude, longitude, river mile, if known, and/or other information that coincides with Block 6 on the application form.
- ☐ name of waterbody and the name of the larger creek, river, bay, etc., that the waterbody is immediately tributary to.
- ☐ names, descriptions and location of landmarks.
- ☐ name of all applicable political (county, parish, borough, town, city, etc.) jurisdictions.
- ☐ name of and distance to nearest town, community, or other identifying locations.
- ☐ names or numbers of all roads in the vicinity of the site.
- ☐ north arrow.
- ☐ scale.

Plan View

The plan view shows the proposed activity as if you were looking straight down on it from above. Your plan view should clearly show the following:

- ☐ Name of waterbody (river, creek, lake, wetland, etc.) and river mile (if known) at location of activity.
- ☐ Existing shorelines.
- ☐ Mean high and mean low water lines and maximum (spring) high tide line in tidal areas.
- ☐ Ordinary high water line and ordinary low water line if the proposed activity is located on a non-tidal waterbody.

- ☐ Average water depths around the activity.
- ☐ Dimensions of the activity and distance it extends from the high water line into the water.
- ☐ Distances to nearby Federal projects, if applicable.
- ☐ Distance between proposed activity and navigation channel, where applicable.
- ☐ Location of structures, if any, in navigable waters immediately adjacent to the proposed activity.
- ☐ Location of any wetlands (marshes, swamps, tidal flats, etc.)
- ☐ North arrow.
- ☐ Scale.
- ☐ If dredged material is involved, you must describe the type of material, number of cubic yards, method of handling, and the location of fill and spoil disposal area. The drawing should show proposed retention levees, weirs, and/or other means for retaining hydraulically placed materials.
- ☐ Mark the drawing to indicate previously completed portions of the activity.

Elevation and/or Cross Section View

The elevation and/or cross section view is a scale drawing that shows the side, front, or rear of the proposed activity. If a section view is shown, it represents the proposed structure as it would appear if cut internally for display. Your elevation should clearly show the following:

- ☐ Water elevations as shown in the plan view.
- ☐ Water depth at waterward face of proposed activity or, if dredging is proposed, dredging and estimated disposal grades.
- ☐ Dimensions from mean high water line (in tidal waters) for proposed fill or float, or high tide line for pile supported platform. Describe any structures to be built on the platform.
- ☐ Cross section of excavation or fill, including approximate side slopes.
- ☐ Graphic or numerical scale.
- ☐ Principal dimensions of the activity.

Notes on Drawings*

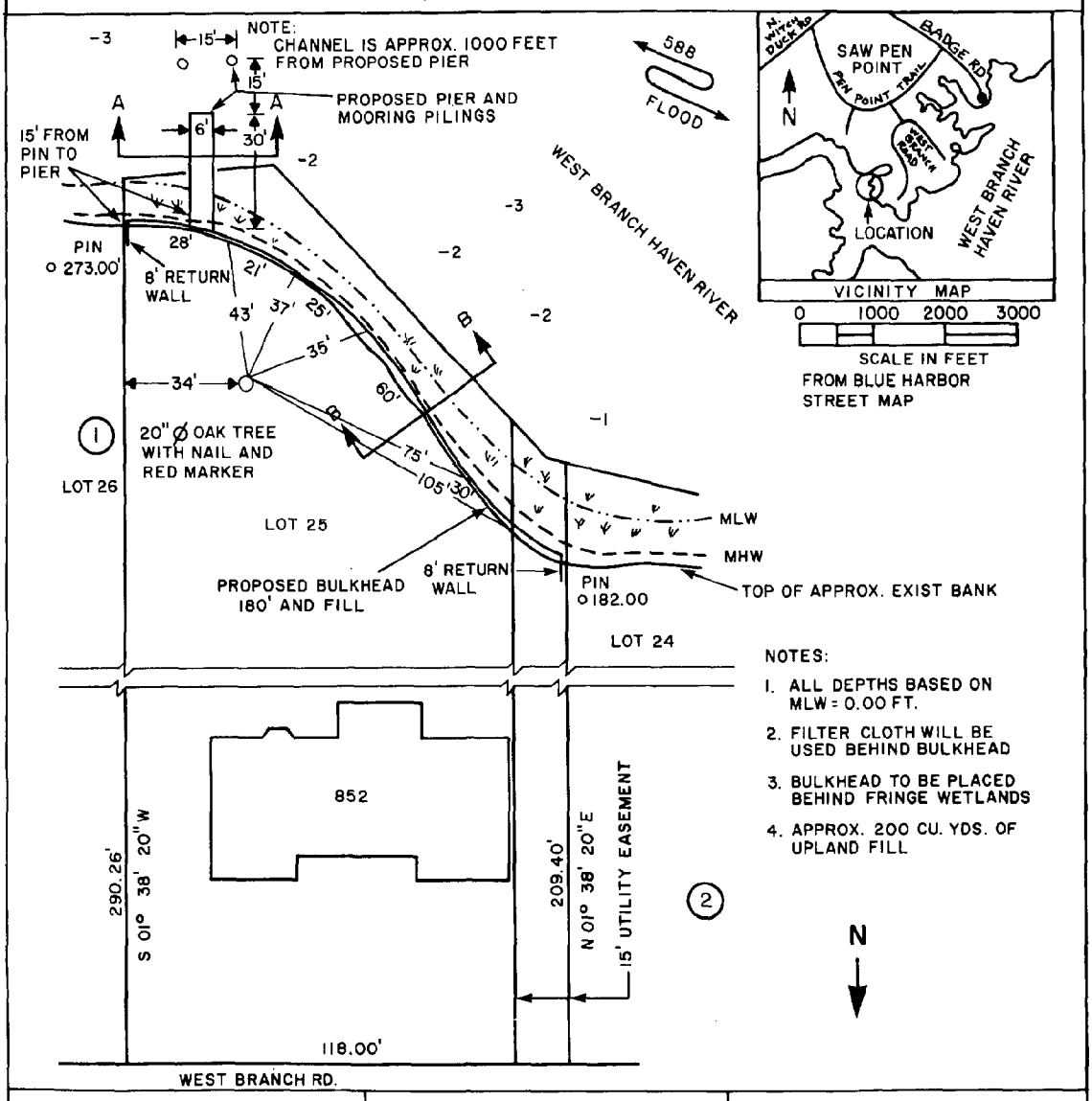
- ☐ Names of adjacent property owners who may be affected. Complete names and addresses should be shown in Block 5 on ENG Form 4345.
- ☐ Legal property description: Number, name of subdivision, block and lot number. Section, Township and Range (if applicable) from plot, deed or tax assessment.
- ☐ Photographs of the site of the proposed activity are not required; however, pictures are helpful and may be submitted as part of any application.

**Drawings should be as clear and simple as possible (i.e., not too "busy").*

16

SAMPLE DRAWINGS FOR A PERMIT APPLICATION

NOTE: THE DRAWINGS SUBMITTED NEED NOT BE PREPARED BY A PROFESSIONAL DRAFTSMAN AS IN THESE SAMPLES.



PURPOSE: PREVENT EROSION AND PROVIDE BOATING ACCESS

DATUM: MLW

ADJACENT PROPERTY OWNERS:

1. MARY L. CLARK
2. HARRY N. HAMPTON
3.

PLAN VIEW

0 40 80

1" = 40'

FRED R. HARRIS
852 WEST BRANCH ROAD
BLUE HARBOR, MD 21703

PROPOSED BULKHEAD PIER AND FILL

IN: WEST BRANCH HAVEN RIVER

AT: BLUE HARBOR

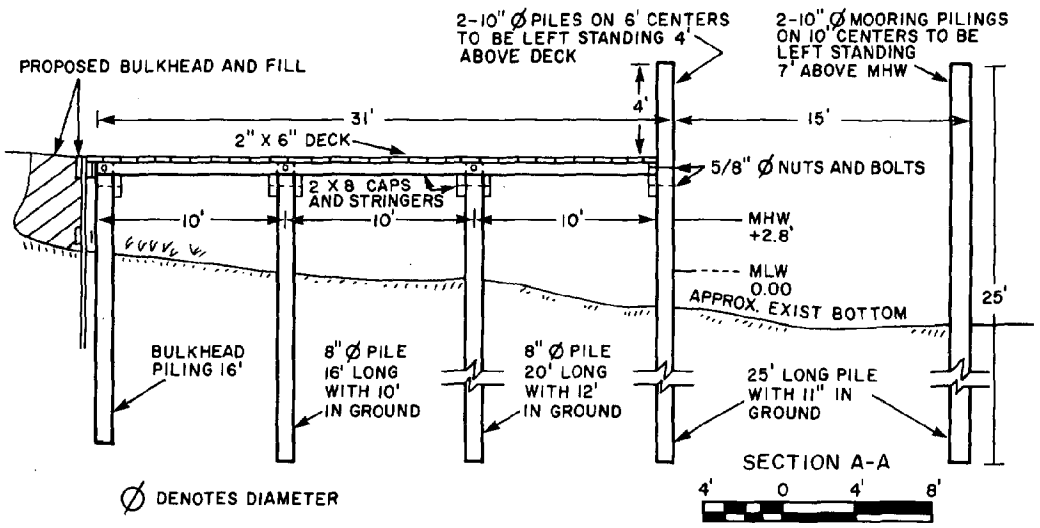
COUNTY OF: KING EDWARD STATE: MD

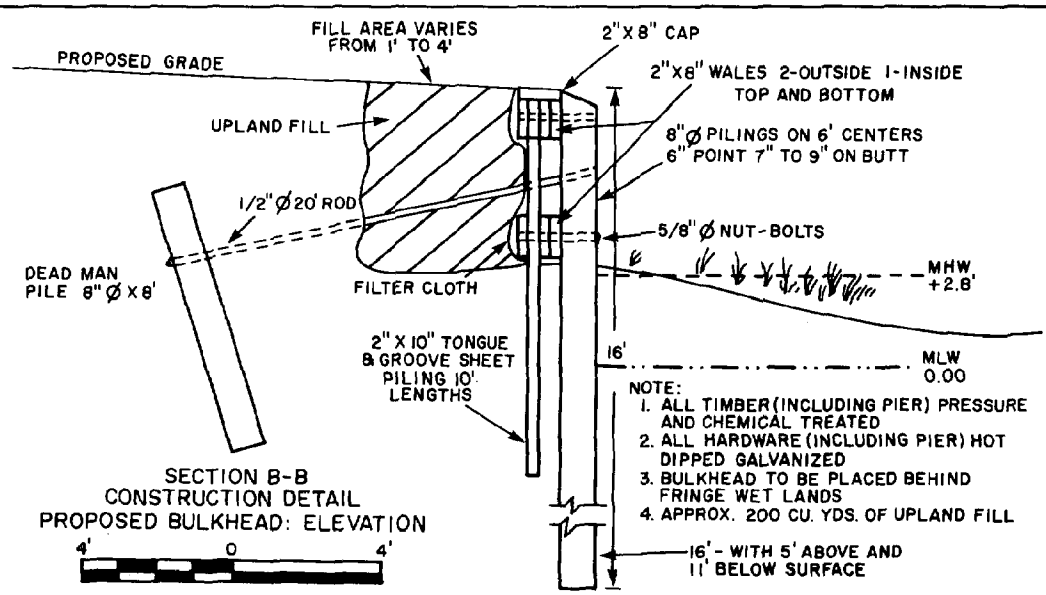
APPLICATION BY: FRED R. HARRIS

SHEET 1 OF 2 DATE 10-16-82

REV. 11-28-82

17





PURPOSE: PREVENT EROSION AND PROVIDE BOATING ACCESS

DATUM: MLW

ADJACENT PROPERTY OWNERS:

1. MARY L. CLARK
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3.

SECTION VIEWS

FRED R. HARRIS
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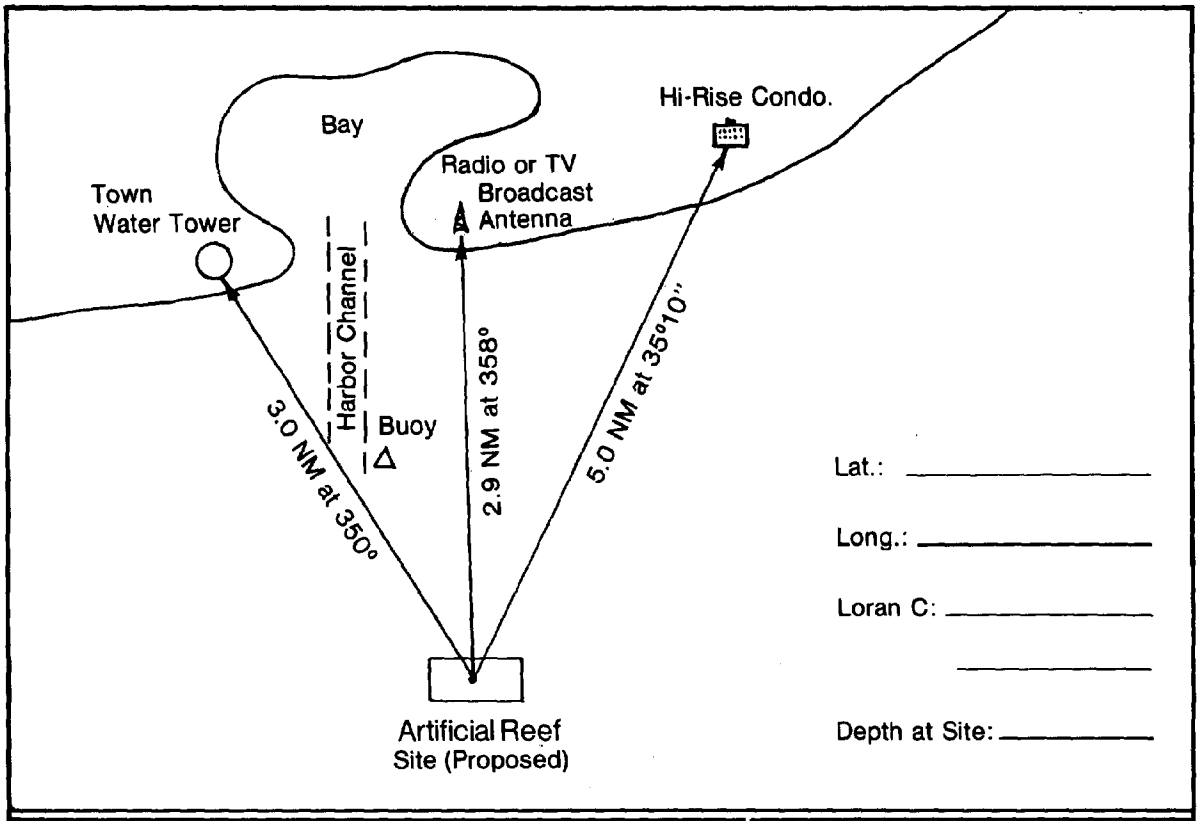


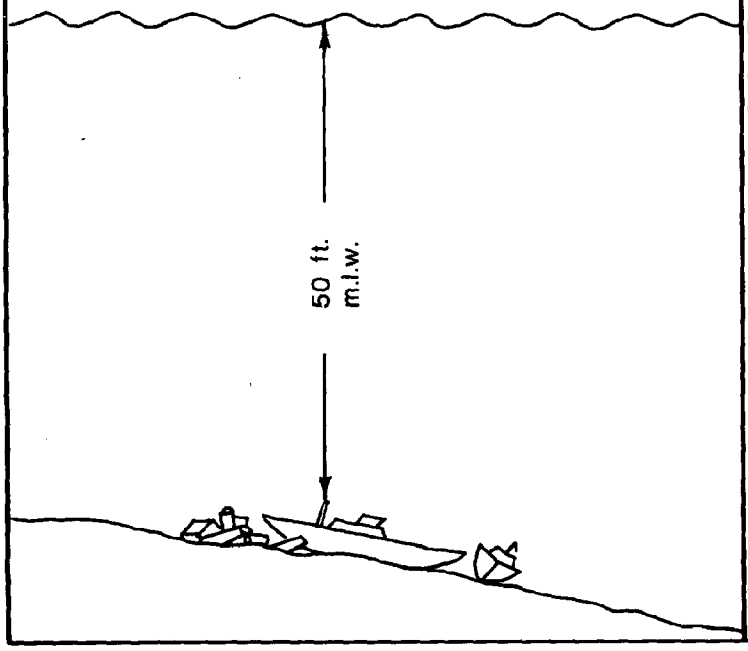
Lat.: _____

Long.: _____

Loran C: _____

_____

Depth at Site: _____



Corps Permit Application

Number _____

State Permit Application

Number _____

Applicant:

_____

_____

_____

Date: _____

Sheet: _____ of _____

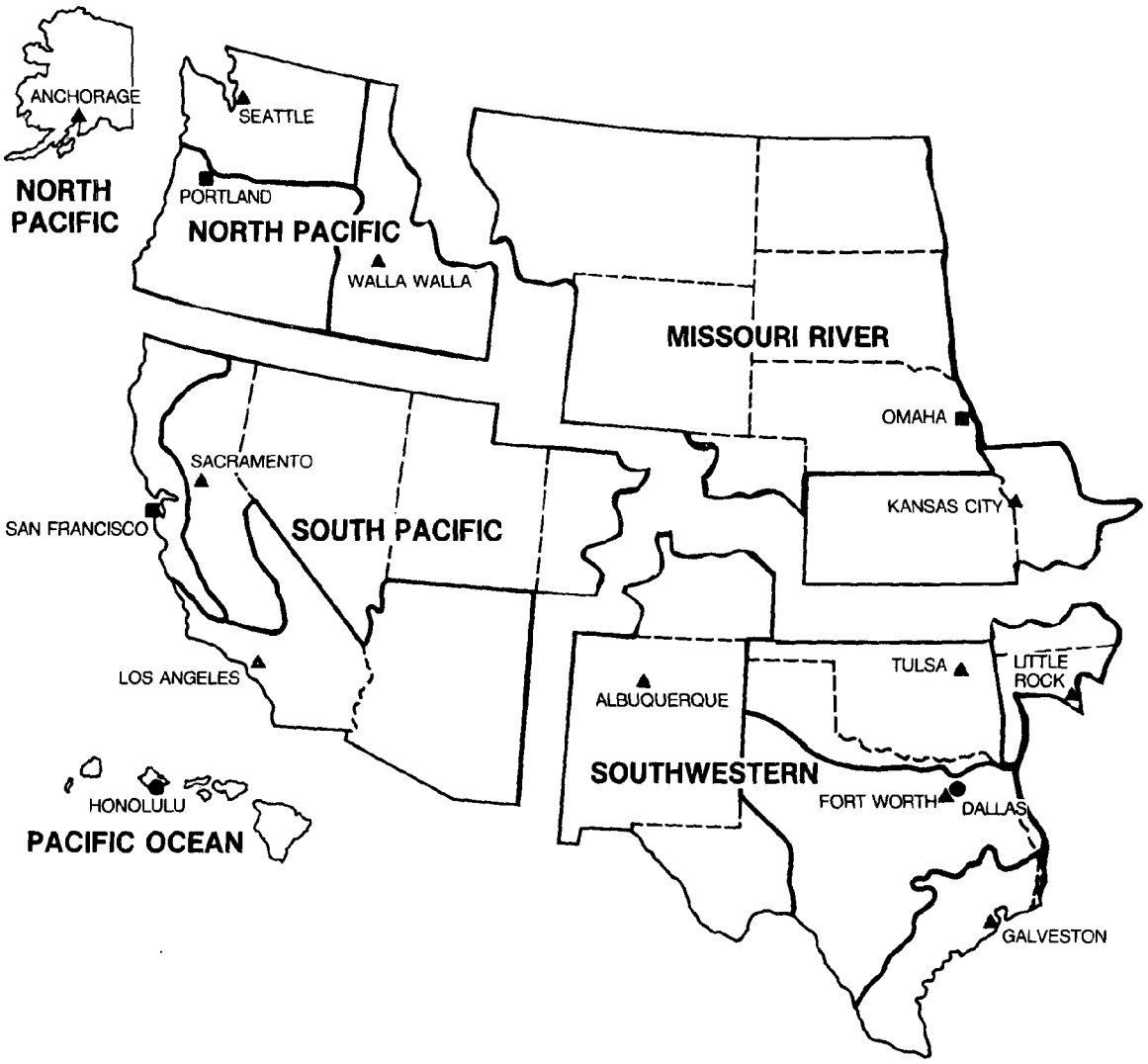
Materials Used for Reef:

_____

_____

_____

DIVISIONS AND DISTRICTS FOR REGULATORY ACTIVITIES



Note: In Iowa the eastern bank of the Missouri River is regulated by the Omaha office.

LOCATIONS OF REGULATORY OFFICES

Address correspondence to:

The District Engineer
U.S. Army Engineer
District
Please include attention line in address.

ALASKA
P.O. Box 898
Anchorage, AK
99506-0898
Attention: NPACO-RF
907/753-2712

ALBUQUERQUE
P.O. Box 1580
Albuquerque, NM
87103-1580
Attention: SWACO-OR
505/766-2776

BALTIMORE
P.O. Box 1715
Baltimore, MD 21203-1715
Attention: NABOP-R
301/962-3670
Joint application with New York, Maryland

BUFFALO
1776 Niagara Street
Buffalo, NY 14207-3199
Attention: NCBCO-S
716/876-5454 x2313
Joint application with New York

CHARLESTON
P.O. Box 919
Charleston, SC
29402-0919
Attention: SACCO-P
803/724-4330

CHICAGO
219 S. Dearborn Street
Chicago, IL 60604-1797
Attention: NCCCO-R
312/353-6428
Joint application with Illinois

DETROIT
P.O. Box 1027
Detroit, MI 48231-1027
Attention: NCECO-L
313/226-2218
Joint application with Michigan

FT. WORTH
P.O. Box 17300
Ft. Worth, TX 76102-0300
Attention: SWFOD-O
817/334-2681

GALVESTON
P.O. Box 1229
Galveston, TX 77553-1229
Attention: SWGCO-R
409/766-3925

HUNTINGTON
502 8th Street
Huntington, WV 25701-2070
Attention: ORHOP-F
304/529-5487
Joint application with West Virginia

HONOLULU
Building 230, Fort Shafter
Honolulu, HI 96858-5440
Attention: PODCO-O
808/438-9258

JACKSONVILLE
P.O. Box 4970
Jacksonville, FL 32232-0019
Attention: SAJRD
904/791-1659
Joint application with Florida, Virgin Islands

KANSAS CITY
700 Federal Building
601 E. 12th Street
Kansas City, MO 64106-2896
Attention: MRKOD-P
816/374-3645

LITTLE ROCK
P.O. Box 867
Little Rock, AR
72203-0867
Attention: SWLCO-P
501/378-5295

LOS ANGELES
P.O. Box 2711
Los Angeles, CA 90053-2325
Attention: SPLCO-R
213/688-5606

LOUISVILLE
P.O. Box 59
Louisville, KY 40201-0059
Attention: ORLOP-F
502/582-5452
Joint application with Illinois

MEMPHIS
Clifford Davis Federal
Building
Room B-202
Memphis, TN 38103-1894
Attention: LMMCO-G
901/521-3471
Joint application with Missouri, Tennessee, Kentucky

MOBILE
P.O. Box 2288
Mobile, AL 36628-00001
Attention: SAMOP-S
205/690-2658
Joint application with Mississippi

NASHVILLE
P.O. Box 1070
Nashville, TN 37202-1070
Attention: ORNOR-F
615/251-5181
Joint application with TVA, Tennessee, Alabama

NEW ORLEANS
P.O. Box 60267
New Orleans, LA
70160-0267
Attention: LMNOD-S
504/838-2255

NEW YORK
26 Federal Plaza
New York, NY 10278-0090
Attention: NANOP-R
212/264-3996

NORFOLK
803 Front Street
Norfolk, VA 23510-1096
Attention: NAOOP-P
804/446-3652
Joint application with Virginia

OMAHA
P.O. Box 5
Omaha, NE 68101-0005
Attention: MROOP-N
402/221-4133

PHILADELPHIA
U.S. Custom House
2nd and Chestnut Street
Philadelphia, PA
19106-2991
Attention: NAPOP-R
215/597-2812

PITTSBURGH
Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222-4186
Attention: ORPOP-F
412/644-4204
Joint application with New York

PORTLAND
P.O. Box 2946
Portland, OR 97208-2946
Attention: NPPND-RF
503/221-6995
Joint application with Oregon

ROCK ISLAND
Clock Tower Building
Rock Island, IL 61201-2004
Attention: NCROD-S
309/788-6361 x6370
Joint application with Illinois

SACRAMENTO
650 Capitol Mall
Sacramento, CA 95814-4794
Attention: SPKCO-O
916/440-2842

ST. LOUIS
210 Tucker Blvd., N
St. Louis, MO 63101-1986
Attention: LMSOD-F
314/263-5703
Joint application with Illinois, Missouri

ST. PAUL
1135 USPO & Custom House
St. Paul, MN 55101-1479
Attention: NCSCO-RF
612/725-5819

SAN FRANCISCO
211 Main Street
San Francisco, CA 94105-1905
Attention: SPNCO-R
415/974-0416

SAVANNAH
P.O. Box 889
Savannah, GA 31402-0889
Attention: SASOP-F
912/944-5347
Joint application with Georgia

SEATTLE
P.O. Box C-3755
Seattle, WA 98124-2255
Attention: NPSOP-RF
206/764-3495
Joint application with Idaho

TULSA
P.O. Box 61
Tulsa, OK 74121-0061
Attention: SWTOD-RF
918/581-7261

VICKSBURG
P.O. Box 60
Vicksburg, MS 39180-0060
Attention: LMKOD-F
601/634-5276
Joint application with Mississippi

WALLA WALLA
Building 602
City-County Airport
Walla Walla, WA
99362-9265
Attention: NPWOP-RF
509/522-6718
Joint application with Idaho

WILMINGTON
P.O. Box 1890
Wilmington, NC
28402-1890
Attention: SAWCO-E
919/343-4511
Joint application with North Carolina

The Division Engineer
U.S. Army Engineer Division
NEW ENGLAND
424 Trapelo Road
Waltham, MA 02254-9149
Attention: NEDOD-R
617/647-8338
Joint application with Massachusetts, Maine

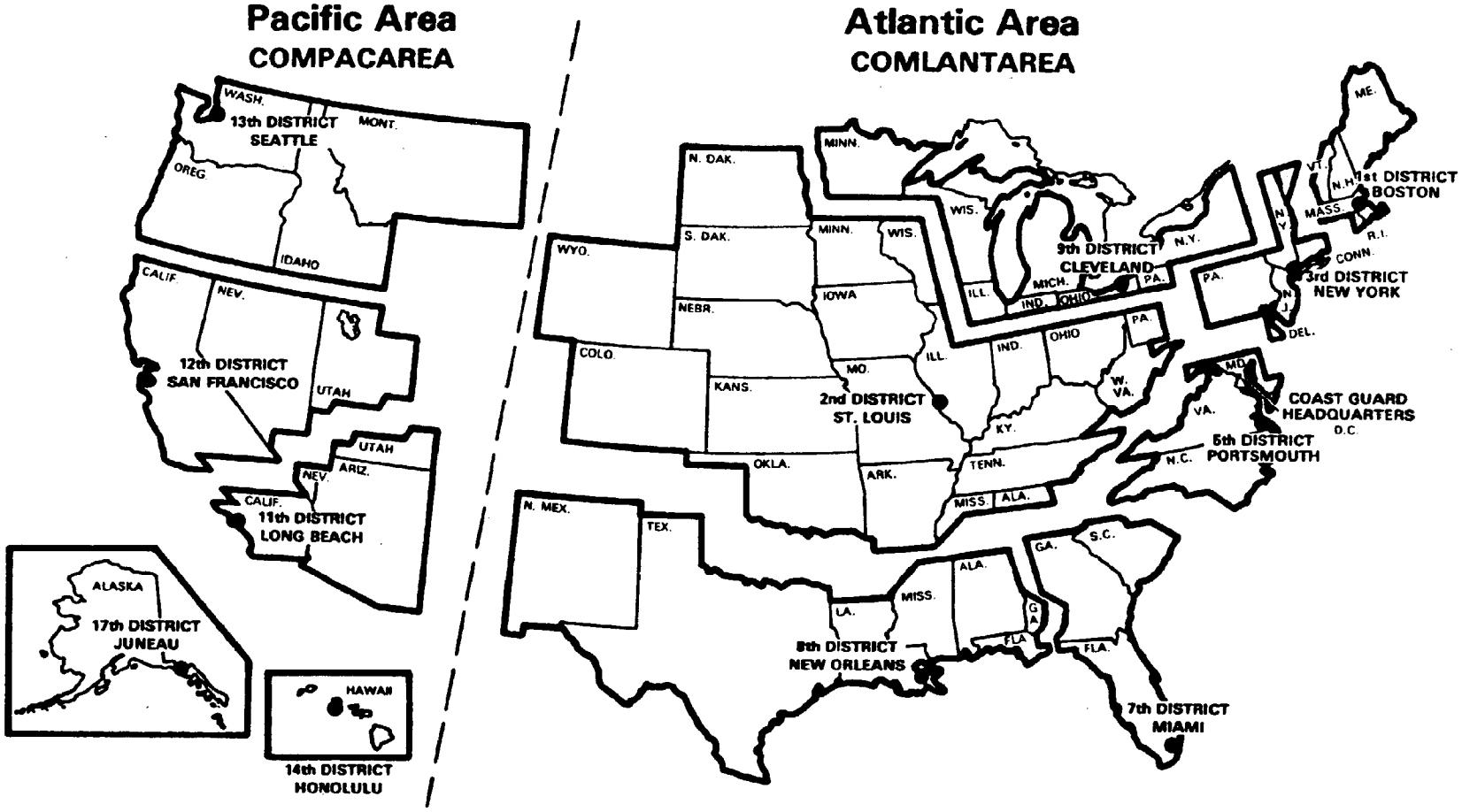
APPENDIX B

U. S. COAST GUARD

PRIVATE AIDS TO NAVIGATION

INFORMATION

U.S. Coast Guard Districts



ADDRESSES OF COAST GUARD DISTRICT COMMANDERS

Mailing Address and Telephone Number	Approximate Area
Commander, First Coast Guard District (oan) 150 Causeway Street Boston, MA 02114 (617) 223-3644	Maine, Rhode Island New Hampshire, Massachusetts
Commander, Second Coast Guard District (oan) 1430 Olive Street St. Louis, MO 63103 (314) 425-4601	Mississippi, Missouri, Ohio
Commander, Third Coast Guard District (oan) Governors Island New York, NY 10004 (212) 668-7192	Connecticut, New York New Jersey, Delaware Pennsylvania
Commander, Fifth Coast Guard District (oan) Federal Building 431 Crawford Street Portsmouth, VA 23705 (804) 398-6000	Maryland, Virginia, District of Columbia, North Carolina
Commander, Seventh Coast Guard District (oan) Federal Building 51 SW 1st Avenue Miami, FL 33130 (305) 350-5654	South Carolina, Georgia, Florida
Commander, Eighth Coast Guard District (oan) Hale Boggs Federal Building 500 Camp Street New Orleans, LA 70130 (504) 589-6298	Western Florida, Alabama, Mississippi Texas, Louisiana
Commander, Ninth Coast Guard District (oan) 1240 East 9th Street Cleveland, OH 44199 (216) 522-3910	Great Lakes States
Commander, Eleventh Coast Guard District (oan) Union Bank Building 400 Oceangate Blvd. Long Beach, CA 90802 (213) 590-2311	Southern California
Commander, Twelfth Coast Guard District (oan) Government Island Alameda, CA 94501 (415) 273-7141	Northern California
Commander, Thirteenth Coast Guard District (oan) Federal Building 915 Second Avenue Seattle, WA 98174 (206) 442-5864	Oregon, Washington, Idaho, Montana
Commander, Fourteenth Coast Guard District (oan) 300 Ala Moana Blvd., 9th Floor Honolulu, Hawaii 96850 (808) 546-7109	Hawaii
Commander, Seventeenth Coast Guard District (oan) P.O. Box 3-5000 Federal Building Juneau, Alaska 99802 (907) 586-2680	Alaska

§66.01—1 Basic provisions.

(a) No person, public body or instrumentality not under the control of the Commandant, exclusive of the Armed Forces, shall establish and maintain, discontinue, change or transfer ownership of any aid to maritime navigation, without first obtaining permission to do so from the Commandant.

(b) For the purposes of this subpart, the term private aids to navigation includes all marine aids to navigation operated in the navigable waters of the United States other than those operated by the Federal Government (Part 62 of this subchapter) or those operated in State waters for private aids to navigation (Subpart 66.05).

(c) Coast Guard authorization of a private aid to navigation does not authorize any invasion of private rights, nor grant any exclusive privileges, nor does it obviate the necessity of complying with any other Federal, State or local laws or regulations.

(d) With the exception of shore based radar stations, operation of electronic aids to navigation as private aids will not be authorized.

§66.01—3 Delegation of authority to District Commanders.

(a) Pursuant to the authority in 49 CFR 1.4(g), the Commandant delegates to the District Commanders within the confines of their respective districts (see Part 3 of this Chapter for descriptions) the authority to grant permission to establish and maintain, discontinue, change or transfer ownership of private aids to maritime navigation, and otherwise administer the requirements of this subpart.

(b) The decisions of the District Commander may be appealed within 30 days from the date of decision. The decision of the Commandant in any case is final.

§66.01—5 Application procedure.

Application to establish and maintain, discontinue, change, or transfer ownership of a private aid to navigation shall be made to the Commander of the Coast Guard District in which the private aid to navigation is or will be located. Application forms (CG-2554) will be provided upon request. The applicant shall complete all parts of the form applicable to the aid to navigation concerned, and shall forward the application in triplicate to the District Commander. The following information is required:

(a) The proposed position of the aid to navigation by two or more horizontal angles, or bearings and distance from charted landmarks. A section of chart or sketch showing the proposed location of the aid to navigation shall be included.

(b) The name and address of the person at whose expense the aid will be maintained.

(c) The name and address of the person who will maintain the aid to navigation.

(d) The time and dates during which it is proposed to operate the aid.

(e) The necessity for the aid.

(f) For lights: The color, characteristic, height above water, and description of illuminating apparatus.

(g) For fog signals: Type (whistle, horn, bell, etc.) and characteristic.

(h) For buoys or daybeacons: Shape, color, number, or letter, depth of water in which located or height above water.

§66.01—10 Characteristics.

The characteristics of a private aid to navigation shall conform to the standard U.S. system of aids to navigation characteristics described in subpart 62.25 of Part 62 of this subchapter, except that only tungsten-incandescent light sources will be approved for electric lights.

§66.01—15 Action by Coast Guard.

(a) The District Commander receiving the application will review it for completeness and will assign the aid one of the following classifications:

Class I: Aids to navigation on marine structures or other works which the owners are legally obligated to establish, maintain and operate as prescribed by the Coast Guard.

Class II: Aids to navigation exclusive of Class I located in waters used by general navigation.

Class III: Aids to navigation exclusive of Class I located in waters not ordinarily used by general navigation.

(b) Upon approval by the District Commander, a signed copy of the application will be returned to the applicant.

§66.01—20 Inspection.

All classes of private aids to navigation shall be maintained in proper operating condition. They are subject to inspection by the Coast Guard at any time and without prior notice.

§66.01—25 Discontinuance and removal.

(a) No person, public body or instrumentality shall change, move or discontinue any authorized private aid to navigation required by statute or regulation (Class I § 66.01—15) without first obtaining permission to do so from the District Commander.

(b) Any authorized private aid to navigation not required by statute or regulation (Classes II and III, §66.01—15) may be discontinued and removed by the owner after 30 days' notice to the District Commander to whom the original request for authorization for establishment of the aid was submitted.

(c) Private aids to navigation which have been authorized pursuant to this part shall be discontinued and removed without expense to the United States by the person, public body or instrumentality establishing or maintaining such aids when so directed by the District Commander.

§66.01—30 Corps of Engineers' approval.

(a) Before any private aid to navigation consisting of a fixed structure is placed in the navigable waters of the United States, authorization to erect such structure shall first be obtained from the District Engineer, U.S. Army Corps of Engineers in whose district the aid will be located.

(b) The application to establish any private aid to navigation consisting of a fixed structure shall show evidence of the required permit having been issued by the Corps of Engineers.

§66.01—35 Marking of structures and floating obstructions.

Any structure, mooring, mooring buoy, or dam, in or over the navigable waters of the United States shall display the lights and other signals for the protection of maritime navigation as may be prescribed by the Commandant. The prescribed lights and signals shall be installed, maintained and operated by and at the expense of the owner, or operator. After obtaining such approval or a statement of no objection from the Corps of Engineers as is required by law, the owner or operator shall apply in accordance with § 66.01—5 to the District Commander having jurisdiction over the waters in which the structure or floating obstruction will be located for a determination of the lights and other signals to be displayed. This requirement includes the temporary lights and signals to be displayed during the construction of a structure. If no regulation exists prescribing the lights or other signals required to mark any work or obstruction, each case shall be considered individually by the District Commander, who will prescribe such lights and signals as he considers necessary for the safety of navigation.

§66.01—40 Exemptions.

(a) Nothing in the preceding sections of this subpart shall be construed to interfere with or nullify the requirements of existing laws and regulations pertaining to the marking of vessels and other obstructions sunk in the navigable waters of the United States (Part 64 of this subchapter), the marking of artificial islands and structures which are erected on or over the seabed and subsoil of the outer Continental Shelf (Part 67 of this subchapter), or the lighting of bridges over navigable waters of the United States (Part 68 of this subchapter).

(b) Persons marking structures pursuant to Part 64 or Part 68 of this subchapter are exempted from the provisions of §66.01—5 and 66.01—35.

§66.01—45 Penalties.

Any person, public body or instrumentality, excluding the armed forces, who shall establish, erect or maintain any aid to maritime navigation without first obtaining authority to do so from the Coast Guard or who shall violate the regulations relative thereto issued in this part, is subject to the provisions of 14 U.S.C. 83. Any owner or operator of a fixed structure, excluding an agency of the United States, who violates any of the rules or regulations prescribed with respect to lights and other signals for fixed structures, is subject to the provisions of 14 U.S.C. 85.

§66.01—50 Protection of private aids to navigation.

Private aids to navigation lawfully maintained under these regulations are entitled to same protection against interference or obstruction as is afforded by law to Coast Guard aids to navigation (Part 70 of this subchapter). If interference or obstruction occurs, a prompt report containing all the evidence available should be made to the Commander of the Coast Guard District in which the aids are located.

§66.01—55 Transfer of ownership.

(a) When any private aid to navigation authorized by the District Commander, or the essential real estate or facility with which the aid is associated, is sold or transferred, both parties to the transaction shall submit application (§66.01—5) to the Commander of the Coast Guard District in which the aid is located requesting authority to transfer responsibility for maintenance of the aid.

(b) The party relinquishing responsibility for maintenance of the private aid to navigation shall indicate on the application form (CG—2554) both the discontinuance and the change of ownership of the aid sold or transferred.

(c) The party accepting responsibility for maintenance of the private aid to navigation shall indicate on the application form (CG—2554) both the establishment and the change of ownership of the aid sold or transferred.

(d) In the event the new owner of the essential real estate or facility with which the aid is associated refuses to accept responsibility for maintenance of the aid, the former owner shall be required to remove the aid without expense to the United States. This requirement shall not apply in the case of any authorized private aid to navigation required by statute or regulation (Class I, § 66.01—15) which shall be maintained by the new owner until the conditions which made the aid necessary have been eliminated.

U.S. COAST GUARD

PRIVATE AIDS TO NAVIGATION APPLICATION

INSTRUCTIONS

1. The rules, regulations, and procedures pertaining to private aids to navigation are set forth in the copy of Code of Federal Regulations; Title 33, Chapter 1, Part 66, on the back of this page.

2. Three copies of the application for private aids shall be forwarded to the Commander of the Coast Guard District in which the aids will be located 30 days in advance of the proposed action. Sections of charts or sketches showing the work proposed shall accompany each application.

3. When making application for private aids to mark structures and mooring buoys in navigable waters or to mark the excavating or depositing of material therein, evidence is required of the authorization obtained from Corps of Engineers, Department of the Army, for such work. (Code of Federal Regulations; Title 33, Part 209.120.)

4. The applicant shall complete all of Blocks 1, 2, 3, 4, 5, 9 and 10 for all new applications. When an aid is being discontinued, Block 3 need not be completed. Block 6 shall be completed whenever authorization is required to be obtained from Corps of Engineers (See Instruction No. 3). Columns of Block 7 will be completed as follows:

a. Unlighted buoys - 7a, 7e, 7f, and 7j.
b. Lighted buoys - 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, and 7j.
c. Daybeacons - 7a, 7e, 7f (if applicable), 7h, 7i, and 7j.
d. Light on a structure - 7a, 7b, 7c, 7d, 7e, 7f (if applicable), 7g, 7h, 7i, and 7j.

When an aid is being changed, Block 8 shall be used to describe the nature of the change.

5. The required information for each column includes the following:

(7a) Proposed number or letter to be assigned to the aid.
(7b) Period of light (time in seconds for one complete cycle).
(7c) Flash length in seconds. For complex or multiple flashes, explain in column (7j).
(7d) Color of light.
(7e) Position by two or more horizontal angles, or bearing and distance from a prominent charted landmark. If a prominent charted landmark is not available, show latitude and longitude as precisely as the chart permits.
(7f) Depth of water at buoy or structure (if marine site). All depths are measured from mean low water except on Great Lakes where depths are measured from low water datum.
(7g) Candlepower, if known; otherwise, include the following information in column (7j); lens size, lamp voltage and amperage if electric, or details of other illuminant to be used.
(7h) Height of light or unlighted structure above water. Height is measured from mean high water except in the Great Lakes where heights are measured from low water datum shown on U.S. Lake Survey Charts. The height of a light on a buoy is measured from the water line.
(7i) Include details of structure (type, color).
(7j) Used for the following specific information, plus any other useful details: a. buoys - size, shape, color, and reflective material used; b. structures - daymark shape and color; c. fog signal on a buoy or structure - type and model, audible range, and characteristic (number of strokes or blasts, period and blast length).

6. This form may be used to cover more than one aid in the same geographic area. Draw a line between each aid as indicated in example. Attach separate sheet if additional space is required.

7. Attach a section of chart showing the proposed location of the aid(s) to navigation.

8. a. After receipt of the approved form the applicant will advise the District Commander by telegram or other rapid means of communications when the work authorized is actually accomplished.

b. If the aids have not been installed within one year of the approval date, the approved application is automatically cancelled.

c. Any discrepancy in the operation of the aid(s) at any time shall be reported to the District Commander by telegram or other rapid means of communication in order that Notices to Mariners may be issued. A discrepancy exists whenever the aid is not as described in the approved application, i.e., lack of signal, incorrect light characteristic, or improper color, shape or position of shore structure or buoy. The correction of the discrepancy will also be reported by the same method.

9. All classes of private aids to navigation shall be maintained in proper condition. They are subject to inspection by the Coast Guard at any time and without prior notice to the maintainer.

7. APPLICANT WILL FILL IN APPLICABLE REMAINING COLUMNS

FOR DISTRICT COMMANDERS ONLY		EXAMPLE OF USE OF APPLICATION									
LIGHT LIST NUMBER OR PAGE	NAME OF AID	NO. OR LTR. (7a)	LIGHT PER. (7b)	LIGHT FLASH LGTH. (7c)	LIGHT COLOR (7d)	POSITION (7e)	DEPTH OF WATER (7f)	CANDLE POWER (7g)	HT. ABOVE WATER (7h)	STRUCTURE TYPE, COLOR, AND HEIGHT (7i)	REMARKS *(See Instructions)* (7j)
		1	4s	0.4s	WHITE	205°T, 3540 yds from tank, Bayview, Va.	9 Ft.	20	6 Ft.		5' Lighted buoy - black
		2				200°T, 3425 yds from tank, Bayview, Va.	7 FT				Nun buoy - Red White Reflector
		3				210°T, 2810 yds from tank, Bayview, Va.	2 Ft.		7 Ft.	Single pile	2' square daymark - black
		5	2.5s	0.5s	WHITE	218.5°T, 330 yds from tank, Bayview, Va.	8 Ft.	20	13 Ft.	5 - pile	3' square daymark - black

Dept. of Transp., USCG, CG-2554 (Rev. 7-76)

DEPARTMENT OF TRANSPORTATION
U.S. COAST GUARD
CG-2554 (Rev. 7-76)

PRIVATE AIDS TO NAVIGATION APPLICATION

(See attached instructions and copy of Code of Fed. Reg., Title 33, Chap. 1, Part 66)

Form Approved
OMB-004-R5681

NO PRIVATE AID TO NAVIGATION MAY BE AUTHORIZED UNLESS A COMPLETED APPLICATION FORM HAS BEEN RECEIVED (14 U.S.C. 83; 33 C.F.R. 66.01-5).

1. ACTION REQUESTED FOR PRIVATE AIDS TO NAVIGATION: A. ☐ ESTABLISH AND MAINTAIN B. ☐ DISCONTINUE C. ☐ CHANGE D. ☐ TRANSFER OWNERSHIP

2. DATE ACTION TO START

3. AIDS WILL BE OPERATED: A. ☐ THROUGHOUT YEAR B. ☐ TEMPORARILY UNTIL _____ C. ☐ ANNUALLY FROM _____ TO _____

4. NECESSITY FOR AID *(Continue in Block 8)*

5. GENERAL LOCALITY

6. CORPS OF ENGINEERS AUTHORIZED THIS STRUCTURE OR BUOY BY ☐ PERMIT OR ☐ LETTER *(file and date)*

FOR DISTRICT COMMANDERS ONLY

7. APPLICANT WILL FILL IN APPLICABLE REMAINING COLUMNS

LIGHT LIST NUMBER OR PAGE	NAME OF AID	LIGHT				POSITION (7e)	DEPTH OF WATER (7f)	CANDLE POWER (7g)	HT. ABOVE WATER (7h)	STRUCTURE	REMARKS *(See Instructions)* (7j)
		NO. OR LTR. (7a)	PER. (7b)	FLASH LGTH. (7c)	COLOR (7d)					TYPE, COLOR, AND HEIGHT ABOVE GROUND (7i)	

8. ADDITIONAL COMMENTS

9a. NAME AND ADDRESS OF PERSON IN DIRECT CHARGE OF AID

9b. TELEPHONE NO.

10a. NAME AND ADDRESS OF PERSON OR CORPORATION AT WHOSE EXPENSE AID IS MAINTAINED

10b. THE APPLICANT AGREES TO SAVE THE COAST GUARD HARMLESS WITH RESPECT TO ANY CLAIM OR CLAIMS THAT MAY RESULT ARISING FROM THE ALLEGED NEGLIGENCE OF THE MAINTENANCE OR OPERATION OF THE APPROVED AID(S).

10c. DATE

10d. SIGNATURE AND TITLE OF OFFICIAL SIGNING

FOR USE BY DISTRICT COMMANDER

SERIAL NO.

CLASSIFICATION OF AIDS

Class

RECD.

CHART

L. N. M.

DATE APPROVED

SIGNATURE *(By direction)*

PREVIOUS EDITIONS ARE OBSOLETE

SN 7530-00-F01-1340

Reverse of CG-2554 (Rev. 7-76)

REMARKS

DATE	REFERENCE	ACTION AND REMARKS

	J	F	M	A	M	J	J	A	S	O	N	D	

NAME OF AID	LIGHT LIST NO.	PAGE

DEPARTMENT OF TRANSPORTATION
U. S. COAST GUARD
CG-4143 (Rev. 3-84)

APPLICATION FOR CLASS I PRIVATE AIDS TO NAVIGATION ON ARTIFICIAL ISLANDS AND FIXED STRUCTURES

(Please read instructions on reverse)

OMB APPROVED
2115-0038

1. NAME AND ADDRESS *(including zip code)* OF CORPORATION OR PERSON MAKING APPLICATION

2. ACTION REQUESTED FOR PRIVATE AIDS TO NAVIGATION

- A. ☐ ESTABLISH AND MAINTAIN
- B. ☐ CHANGE OWNERSHIP
- C. ☐ CHANGE EQUIPMENT
- D. ☐ MOVE
- E. ☐ DISCONTINUE
- F. DATE OF ACTION _____

3. POSITION

A. GENERAL LOCALITY AND GRID AREA		B. LATITUDE	C. LONGITUDE
D. BLOCK NUMBER	E. SIGN	F. LEASE NUMBER	G. WELL NUMBER

4. LIGHT

A. CHARACTERISTICS — COLOR WHITE ☐ RED ☐ — FLASH ____ SECONDS — ECLIPSE ____ SECONDS	B. NUMBER INSTALLED	C. ILLUMINANT *(Check)* ☐ ELECTRICITY ☐ GAS ☐ OIL ☐ OTHER *(Specify)* ____	
D. HEIGHT ABOVE MEAN HIGH WATER	E. VOLTS	F. AMPERES	G. INSIDE DIAMETER — LENS / GLOBE	H. CANDLEPOWER *(If known)*

5. FOG SIGNAL *(Characteristic will be one two-second blast every twenty seconds)*

A. CLASS ☐ A *(2-Mile)* ☐ B *(½-Mile)*	B. MANUFACTURED BY	C. MODEL NUMBER

6. STRUCTURE

A. COLOR	B. HEIGHT ABOVE MEAN HIGH WATER	C. DEPTH OF WATER BELOW MEAN LOW WATER

7. AUTHORIZED BY CORPS OF ENGINEERS, U. S. ARMY, PERMIT NO.

8. PERSON IN DIRECT CHARGE OF AID

A. NAME	C. ADDRESS
B. TELEPHONE NUMBER	

9. The applicant agrees to save the Coast Guard harmless with respect to any claim or claims that may result arising from the alleged negligence of the operation of the approved aids.

Attached to this application are:

- A. ☐ LOCATION PLAT
- B. ☐ PRINT OF STRUCTURE
- C. ☐ AIDS TO NAVIGATION EQUIPMENT LIST
- D. ☐ CERTIFICATE REQUIRED BY 33 CFR 67.10-1(4)

DATE	SIGNATURE
	TITLE

FOR COAST GUARD USE

10. FROM: Commander Coast Guard District

A. THE ACTION DESCRIBED ABOVE IS ☐ APPROVED ☐ APPROVED SUBJECT TO THE COMMENTS IN BLOCK 11 ON REVERSE	B. NOTICE TO MARINERS ☐ WILL BE ISSUED ☐ WILL NOT BE ISSUED
C. CHARTS AFFECTED	D. NAME OF AID(S)
E. DATE	F. SIGNATURE *(By direction in accordance with 33 CFR 67)*

PREVIOUS EDITION IS USABLE

SN-7530-00-FO1-6210

INSTRUCTIONS

1. The applicant will complete items 1 through 9.

2. Submit in triplicate to the Coast Guard District Commander, Attach a location plat, print of the structure showing positions of the aids, a complete Aids to Navigation Equipment List, and when establishing or changing a fog signal, the certificate required by 33 CFR 67.10-1(4).

3. You may obtain from the Coast Guard District Commander copies of Title 33—Navigation and Navigable Waters, Chapter 1—Coast Guard, Department of Transportation, Subchapter C—Aids to Navigation, Part 67—Private Aids to Navigation, Outer Continental Shelf and Waters Under the Jurisdiction of the United States.

11. REMARKS

APPENDIX C

NATIONAL FISHING ENHANCEMENT ACT

OF 1984

TITLE II—ARTIFICIAL REEFS

SEC. 201. SHORT TITLE.

This title may be cited as the "National Fishing Enhancement Act of 1984".

SEC. 202. FINDINGS AND CONCLUSIONS.

(a) FINDINGS.—The Congress finds that—

(1) although fishery products provide an important source of protein and industrial products for United States consumption, United States fishery production annually falls far short of satisfying United States demand;

(2) overfishing and the degradation of vital fishery resource habitats have caused a reduction in the abundance and diversity of United States fishery resources;

(3) escalated energy costs have had a negative effect on the economics of United States commercial and recreational fisheries;

(4) commercial and recreational fisheries are a prominent factor in United States coastal economies and the direct and indirect returns to the United States economy from commercial and recreational fishing expenditures are threefold; and

(5) properly designed, constructed, and located artificial reefs in waters covered under this title can enhance the habitat and diversity of fishery resources; en-

hance United States recreational and commercial fishing opportunities; increase the production of fishery products in the United States; increase the energy efficiency of recreational and commercial fisheries; and contribute to the United States and coastal economies.

(b) PURPOSE.—The purpose of this title is to promote and facilitate responsible and effective efforts to establish artificial reefs in waters covered under this title.

SEC. 203. ESTABLISHMENT OF STANDARDS.

Based on the best scientific information available, artificial reefs in waters covered under this title shall be sited and constructed, and subsequently monitored and managed in a manner which will—

(1) enhance fishery resources to the maximum extent practicable;

(2) facilitate access and utilization by United States recreational and commercial fishermen;

(3) minimize conflicts among competing uses of waters covered under this title and the resources in such waters;

(4) minimize environmental risks and risks to personal health and property; and

(5) be consistent with generally accepted principles of international law and shall not create any unreasonable obstruction to navigation.

SEC. 204. NATIONAL ARTIFICIAL REEF PLAN.

Not later than one year after the date of enactment of this title, the Secretary of Commerce, in consultation with the Secretary of the Interior, the Secretary of Defense, the Administrator of the Environmental Protection Agency, the Secretary of the Department in which the Coast Guard is operating, the Regional Fishery Managment Councils, interested States, Interstate Fishery Commissions, and representatives of the private sector, shall develop and publish a long-term plan which will meet the purpose of this title and be consistent with the standards established under section 203. The plan must include—

(1) geographic, hydrographic, geologic, biological, ecological, social, economic, and other criteria for siting artificial reefs;

(2) design, material, and other criteria for constructing artificial reefs;

(3) mechanisms and methodologies for monitoring the compliance of artificial reefs with the requirements of permits issued under section 205;

(4) mechanisms and methodologies for managing the use of artificial reefs;

(5) a synopsis of existing information on artificial reefs and needs for further research on artificial reef technology and management strategies; and

(6) an evaluation of alternatives for facilitating the transfer of artificial reef construction materials to persons holding permits issued pursuant to section 205, including, but not limited to, credits for environmental mitigation and modified tax obligations.

SEC. 205. PERMITS FOR THE CONSTRUCTION AND MANAGEMENT OF ARTIFICIAL REEFS.

(a) SECRETARIAL ACTION ON PERMITS.—In issuing a permit for artificial reefs under section 10 of the Rivers and Harbors Act of 1899, section 404 of the Federal Water Pollution Control Act, or section 4(e) of the Outer Continental Shelf Lands Act, the Secretary of the Army (hereinafter in this section referred to as the "Secretary") shall—

(1) consult with and consider the views of appropriate Federal agencies, States, local governments, and other interested parties;

(2) ensure that the provisions for siting, constructing, monitoring, and managing the artificial reef are consistent with the criteria and standards established under this title;

(3) ensure that the title to the artificial reef construction material is unambiguous, and that responsibility for maintenance and the financial ability to assume liability for future damages are clearly established; and

(4) consider the plan developed under section 204 and notify the Secretary of Commerce of any need to deviate from that plan.

(b) TERMS AND CONDITIONS OF PERMITS.—(1) Each permit issued by the Secretary subject to this section shall specify the design and location for construction of the artificial reef and the types and quantities of materials that may be used in constructing such artificial reef. In addition, each such permit shall specify such terms and conditions for the construction, operation, maintenance, monitoring, and managing the use of the artificial reef as are necessary for compliance with all applicable provisions of law and as are necessary to ensure the protection of the environment and human safety and property.

(2) Before issuing a permit under section 402 of the Federal Water Pollution Control Act for any activity relating to the siting, design, construction, operation, maintenance, monitoring, or managing of an artificial reef, the Administrator of the Environmental Protection Agency shall consult with the Secretary to ensure that such permit is consistent with any permit issued by the Secretary subject to this section.

(c) LIABILITY OF PERMITTEE.—(1) A person to whom a permit is issued in accordance with subsection (a) and any insurer of that person shall not be liable for damages caused

by activities required to be undertaken under any terms and conditions of the permit, if the permittee is in compliance with such terms and conditions.

(2) A person to whom a permit is issued in accordance with subsection (a) and any insurer of that person shall be liable, to the exent determined under applicable law, for damages to which paragraph (1) does not apply.

(3) The Secretary may not issue a permit subject to this section to a person unless that person demonstrates to the Secretary the financial ability to assume liability for all damages that may arise with respect to an artificial reef and for which such permittee may be liable.

(4) Any person who has transferred title to artificial reef construction materials to a person to whom a permit is issued in accordance with subsection (a) shall not be liable for damages arising from the use of such materials in an artificial reef, if such materials meet applicable requirements of the plan published under section 204 and are not otherwise defective at the time title is transferred.

(d) LIABILITY OF THE UNITED STATES.—Nothing in this title creates any liability on the part of the United States.

(e) CIVIL PENALTY.—Any person who, after notice and an opportunity for a hearing, is found to have violated any provision of a permit issued in accordance with subsection (a) shall be liable to the United States for a civil penalty, not to

exceed $10,000 for each violation. The amount of the civil penalty shall be assessed by the Secretary by written notice. In determining the amount of such penalty, the Secretary shall take into account the nature, circumstances, extent, and gravity of the violation. The Secretary may compromise, modify, or remit with or without conditions, any civil penalty which is subject to imposition or which has been imposed under this section. If any person fails to pay as assessment of a civil penalty after it has become final, the Secretary may refer the matter to the Attorney General for collection.

SEC. 206. DEFINITIONS.

For purposes of this title—

(1) The term "artificial reef" means a structure which is constructed or placed in waters covered under this title for the purpose of enhancing fishery resources and commercial and recreational fishing opportunities.

(2) The term "State" means a State of the United States, the District of Columbia, Puerto Rico, the United States Virgin Islands, American Samoa, Guam, Johnston Island, Midway Island, and Wake Island.

(3) The term "waters covered under this title" means the navigable waters of the United States and the waters superjacent to the outer Continental Shelf as defined in section 2 of the Outer Continental Shelf

Lands Act (43 U.S.C. section 1331), to the extent such waters exist in or are adjacent to any State.

SEC. 207. USE OF CERTAIN VESSELS AS ARTIFICIAL REEFS.

The Act entitled "An Act to authorize appropriations for the fiscal year 1973 for certain maritime programs of the Department of Commerce and for other purposes", approved August 22, 1972 (16 U.S.C. 1220–1220c), is amended—

(1) by striking out "Liberty" each place it appears in sections 3, 4, 5, and 6 and inserting in lieu thereof "obsolete";

(2) by striking out "Commerce" in section 3 and inserting in lieu thereof "Transportation";

(3) by striking out "shall" in the matter preceding paragraph (1) in section 4 and inserting in lieu thereof "may", and

(4) by adding at the end thereof the following new section:

"SEC. 7. For purposes of sections 3, 4, 5, and 6, the term "obsolete ship' means any vessel owned by the Department of Transportation that has been determined to be of insufficient value for commercial or national defense purposes to warrant its maintenance and preservation in the national defense reserve fleet and has been designated as an artificial reef candidate.".

SEC. 208. SAVINGS CLAUSES.

(a) TENNESSEE VALLEY AUTHORITY JURISDICTION.—Nothing in this title shall be construed as replacing or superseding section 26a of the Tennessee Valley Authority Act of 1933, as amended (16 U.S.C. 831y-1).

(b) STATE JURISDICTION.—Nothing in this title shall be construed as extending or diminishing the jurisdiction or authority of any State over the siting, construction, monitoring, or managing of artificial reefs within its boundaries.

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