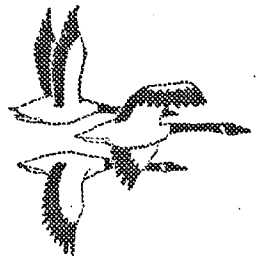
Virginia Department of Conservation and Recreation
Maryland Department of Natural Resources
District of Columbia Department of Recreation and Parks
Pennsylvania Fish Commission
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency

Chesapeake Bay Area Public Access Technical Assistance Report



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Virginia Department of Conservation and Recreation;
Maryland Department of Natural Resources;
District of Columbia Department of Recreation and Parks;
Pennsylvania Fish Commission;
U.S. Fish and Wildlife Service; and
U.S. Environmental Protection Agency

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and other participating federal agencies.

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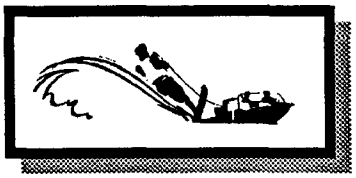

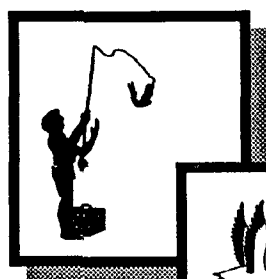

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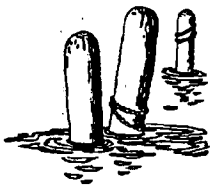

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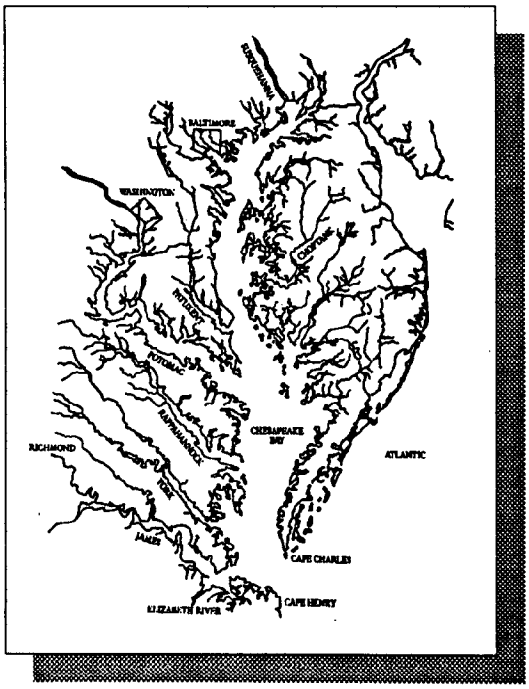
I. Introduction



The Chesapeake Bay and the smaller surrounding bays and estuaries cover almost 2,400 square miles in Virginia, Maryland, Pennsylvania, and the District of Columbia. Although there is an abundance of water and open space in the region, public access opportunities are limited. In fact, less than one percent of the Bay shoreline is currently in the public domain. Public recreational access to the Bay and its tributaries consists primarily of marinas and other private sites which are not in public ownership. As user demand has risen over the last decade, the inadequacy of access opportunities has dramatically increased. Consequently, state and local officials need to concentrate their efforts to meet the need for public water access sites.

A. BACKGROUND AND REPORT PURPOSE

In 1987, the Governors of the Bay states, the mayor of Washington, D.C., the Environmental Protection Agency, and the Chesapeake Bay Commission entered into the Chesapeake Bay Agreement to improve the quality of the Bay and its tidal tributaries. One of the major initiatives of the agreement involves the improvement of public access to the tidal waters of the Bay. It is anticipated that this commitment will increase resources for the improvement of water dependent and water enhanced recreational opportunities in the coming years. Increased public awareness through expanded Bay access opportunities is considered essential in gaining public support and commitment for the preservation of the Chesapeake Bay. The Agreement outlines four general objectives to support the initiatives:

- Improve and maintain access to the Bay, including public beaches, parks, and forested lands.
- Improve opportunities for recreational and commercial fishing.
- Secure shoreline acreage to maintain open space and provide opportunities for passive recreation.
- Secure necessary acreage to protect unique habitat and environmentally-sensitive areas.

This report will help meet these objectives by providing a guide for use by localities for locating and developing access sites. The report will identify potential sources of technical

assistance to aid the localities with the acquisition and development of public access. The four types of public access to be considered include beaches and swimming areas, boating access, fishing pier and bank access, and access to natural areas. For each type of access, recommendations for site selection, design criteria, and management considerations are provided.

The first step in developing public access is to determine the need for the various types of access to the Bay. Once the needs have been assessed, the site selection criteria, specific design criteria, and site management considerations should be evaluated for the type of site to be developed. This report describes the planning process recommended in establishing the four types of Bay access areas.

B. REPORT ORGANIZATION AND PLANNING METHODOLOGY

This technical report has been organized to address various types of public access opportunities. A consistent planning approach is recommended regardless of the type of site or area considered for development. The planning process and issues discussed for each type of public access is intended to serve as a guide and checklist for the successful planning and development of Bay area access sites.

1. Types of Public Access Considered

Public access includes water-dependent and water-related facilities which are located along the Chesapeake Bay and its tributaries. Marinas, boat launch ramps, beaches, and public water-oriented recreation areas are considered water-dependent facilities. Water-related activities could include picnicking, facilities for education, camping, hiking, hunting, wildlife observation, and other passive recreational uses. For this report, types of public access have been categorized as follows:

- Boat-Related Access - Boat ramps, cartop boat launches, and support facilities.
- Swimming Access - Includes beaches and designated areas appropriate for swimming.
- Fishing Access - Piers, bank fishing, and parking adjacent to tidal waters.
- Natural Area Access - Wildlife management areas, natural area preserves, wildlife observation areas, nature trails, and educational facilities contiguous to tidal waters.

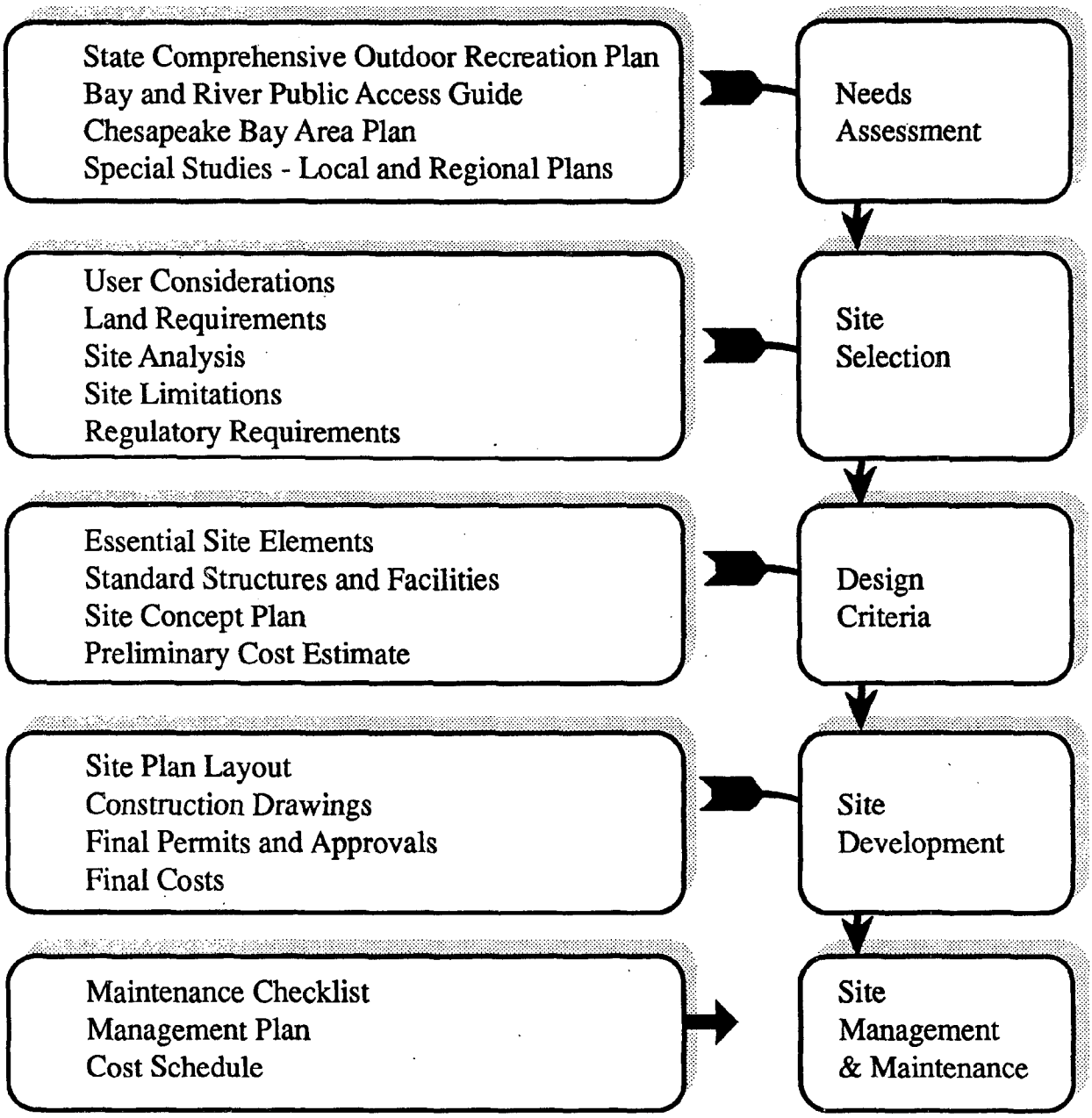
Access areas may be established as one or a combination of these types. Access points may be developed by local, state, federal, or private entities or a cooperative agreement between two or more parties.

2. Recommended Planning Process

The diagram shown in **Figure: I-1** outlines the recommended methodology for planning public access. The initial component of the process is assessment of the need and determination of the appropriate type of public access. Following the needs assessment, the site should be selected, design criteria established, and potential management and maintenance issues evaluated.

Figure: I-1

Planning Process Chart



a) Needs Assessment

The assessment of public access needs should be based on number of existing sites, level of use along the waterways or river reaches, demographic considerations, carrying capacity of the site/area, and trends in boat ownership. Several sources of information which are listed in the appendix are available from the appropriate states and the District of Columbia. These sources of information may be useful in determining the need for additional Bay access within a locality.

The Chesapeake Bay and Susquehanna River Public Access Guide was published in 1989 as a guide to publicly-owned access points surrounding the Bay area, its tidal tributaries, and the Susquehanna River. The guide includes educational and conservation-oriented information, as well as location and facility-specific information for the identified access points. The existing and future recreational demands for Maryland, Pennsylvania, Virginia, and the District of Columbia may be found in each respective State Comprehensive Outdoor Recreation Plan (SCORP). The SCORP for each state is referenced in the appendix.

Additionally, the "Chesapeake Bay Area Public Access Plan" will be published in December of 1990. This plan will identify opportunities for public access in four major categories: boating facilities, fishing piers and bank fishing, swimming areas, and natural study areas. The plan will be presented in a map format to provide localities and regional planners with existing public and private access information. The plan will also identify areas which show a need for the development of access sites and recognize potential access areas. Localities will be encouraged to incorporate the public access plan recommendations into their planning processes. The "Chesapeake Bay Area Public Access Plan" should be consulted when preparing local demand data.

b) Site Selection

User considerations, land requirements, and environmental limitations should be assessed during the site selection phase. User considerations include the location of an adequate transportation network to the proposed site and its proximity to other similar types of public access. Acreage and water quality considerations should be assessed when evaluating the land requirements necessary for the various types of public access. The determination of potential environmental impacts should include an assessment of potential site limitations, presence of environmentally sensitive areas, and an evaluation of potential impacts caused by the development of the particular type of public access. Also, the compatibility of adjacent land uses, potential boating and vehicular traffic conflicts, and the possible effects of development on nearby cultural resources, natural areas, oyster beds, fishing grounds, and other living resources should be considered during the evaluation process.

c) Design Criteria

Design criteria will be specifically established for each of the types of public access being addressed. Elements to be considered during the design phase of the various types of public access should include the site layout, vehicular and pedestrian access requirements, site carrying capacity, and environmental management measures. Site layouts should include the location of required facilities and site features, a landscape scheme or planting plan if appropriate, the

identification of sensitive lands and designated protection areas, user access and activity areas, and maintenance or service areas. Vehicular and pedestrian access considerations should address parking, restrooms, pedestrian walkways, vehicular roadways, shelters, interpretive site enhancements, and handicapped access. Environmental management may include erosion control options, maintenance of water quality, replacement of impacted wetlands, and special construction techniques. Planning, design, and construction details and drawings for the identified site features should be prepared to show the requirements and recommended construction techniques for the development of the public access site. Finally, an estimate of the design cost for site development should be based on the site design selected for a specific site.

d) Site Management Considerations

Management of the site should be considered during the site selection and design phases. Routine management and maintenance efforts should be identified for the public access site being developed. Management techniques should be defined and a maintenance plan including cost should be prepared prior to site development.

e) Permitting and Regulations

Required permits and applicable regulations for each state and the District of Columbia vary. For example, Maryland and Virginia have both enacted legislation and regulations which significantly effect land use and development of the shoreline. Local public access goals in these states should be consistent with the water quality objectives of the Chesapeake Bay Preservation Act and Chesapeake Bay Critical Areas Program.

A brief summary of permitting requirements, the permitting process, and the agencies overseeing these requirements as well as regulations which affect the development of public access within the Bay area follows.

Applications for all permits should precede a project start date. Issuance of a permit will be based on an impact evaluation of the proposed work with regard to public interest.

Following is a sampling of the types of uses that need permits:

- Proposed construction on site
- Filling on state-owned, sub-aqueous bottom
- Installation of shoreline erosion control structures
- Construction of trails, piers, docks, ramps, etc.
- Removal of existing vegetation
- Entranceways onto site
- Impacts to wetlands or waterways

Permitting Process

Once permit applications are submitted to the Corps of Engineers (COE), the COE will determine if the project meets a general permit criteria. If so, the applicant is notified and instructed to pursue any necessary state and local approvals. The affected state/local agencies may then prepare a Public Notice for the project and place this notice in a local newspaper at the applicant's expense. If the project does not meet the COE's general permit criteria, it may go

through a joint federal/state permit application process and be circulated to appropriate federal and state agencies for comment before the project is approved.

Property owners adjacent to the proposed project site and others who have asked to be mailed any public notice involving work in their area are sent a copy of the public notice. Anyone may make a comment on a public notice.

Public Hearings

At the close of the Public Notice comment period, Public Hearings may be held by local, state, or federal agencies. The applicant will be contacted by those agencies when a Public Hearing is scheduled.

Federal Hearing Procedure

Most projects usually affect only the applicant and the surrounding neighborhood. When issues are raised, the COE staff discusses the issues with the applicant. Attempts are made to resolve the issues in question informally; in most cases this is successful. Very few projects require a public hearing. When a hearing is required, a 30 day public notice is sent to the public announcing the date, time, and place of the hearing. A decision on the project will not be made at the hearing. A 10 day comment period will follow the hearing to allow for any additional facts or information to be submitted before the District Engineer makes a final decision. The purpose of a Federal public hearing is to acquire information and provide the public an opportunity to express their views and opinions on the proposed project.

State and Local Hearing Procedures

Projects affecting state and locally protected wetlands will fall under the laws and regulations established by the local and state entities.

Finalization of Process

Each agency will make every effort to process the application as quickly as possible. If a project is approved, the necessary permit will be forwarded the applicant. In some cases, the applicant's notarized signature will be required and fees and royalties paid before the permit is validated by the appropriate regulatory agency.

The permitting process may vary by state. If there are questions about processing procedures, applications, or project drawings, the permitting agency may be contacted for further information.

VIRGINIA

After an access site has been located and the facilities to be constructed have been determined, the next step in Virginia is to apply for the necessary permits. To learn what permits will be required contact the following:

Marine Resources Commission
2600 Washington Avenue
P.O. Box 756
Newport News, VA 23607
(804) 247-2200
Fax (804) 247-2020
TDD (804) 247-2292
TDD 1-800-541-4646

State Water Control Board
P.O. Box 11143
Richmond, VA 23607
(804) 367-0056
Fax (804) 367-0067
TDD (804) 367-9763

U.S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, VA 23510
(804) 441-7650

In addition, permits may be required by the State Historic Preservation Office, local wetland board, and local building inspector.

MARYLAND

In Maryland, there are three main permitting authorities associated with the types of waterfront activities which are related to public access. Some of the permitting and regulatory issues pertinent to these agencies include tidal wetlands; the harvesting, cutting, or removal of submerged aquatic vegetation; water quality regulations; boating facility pumpout requirements; on-site sewage disposal; and water supply systems. It must also be noted that local governments are responsible for enacting the Chesapeake Bay Critical Area regulations within their jurisdiction.

For more information regarding permitting and regulations contact:

Chesapeake Bay Critical Areas Commission
Suite 320
275 West Street
Annapolis, MD 21401
(301) 974-2426

Department of the Environment
Water Management Administration
Division of Standards and Certification
2500 Broenig Highway
Baltimore, MD 21224
(301) 631-3902

Department of Natural Resources
Water Resources Administration
Tidal Wetlands Division
Tawes State Office Building
Annapolis, MD 21401
(301) 974-3871

U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, MD 21203
(301) 962-2515

PENNSYLVANIA

In Pennsylvania, a plan of mitigation will be required if a proposed site is classified as a regulated wetland. Other issues which may require special action include erosion and sedimentation, water quality, impacts on historical resources, and highway occupancy. The agencies to contact concerning permitting and regulations are listed below.

Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
P.O. Box 1026
Harrisburg, PA 17108

Susquehanna River Basin Commission
1721 Front St.
Harrisburg, PA 17102

Cumberland County Conservation District
313 S. Hanover St.
Carlisle, PA 17013
District Manager
(717) 249-8632

Commonwealth of Pennsylvania
Department of Environmental Resources
Division of Waterways and Storm Water Management
P.O. Box 2357
Harrisburg, PA 17120
(717) 787-6823

Commonwealth of Pennsylvania
Department of Environmental Resources
Harrisburg Regional Office
One Ararat Blvd.
Harrisburg, PA 17110
Regional Water Quality Manager
(717) 657-4590

Commonwealth of Pennsylvania
Pennsylvania Department of Transportation
Engineering District
Harrisburg, PA 17103-1699
(717) 787-6653

DISTRICT OF COLUMBIA

Within the District of Columbia, the principal authority to contact for information concerning permitting and regulation is:

Associate Director for Land Use Coordination
National Park Service
National Capitol Region
1100 Ohio Drive SW
Washington, D.C. 20242
(202) 619-7025

f) Impact Assessment

In accurately assessing the impact of the project, the following factors should be included in the assessment report:

1) Description of the proposed action

- State the major objective of the proposed development.
- State who is proposing the development, the contact person, and what is to be accomplished through this project.
- Identify location of the project, when the development is to take place, and its interrelationships with other federal, state, or local recreation-oriented projects or proposals.
- Describe the demand for the project and how it complies with the current SCORP.

2) Description of the existing environment

- Describe the overall topography.
- Identify name and location of any historic or archaeological sites which will be affected.
- State whether or not the project is located within the 100-year floodplain.
- Describe the site's surface and subsurface geological characteristics.

- Describe the soil types in the area. (Contact a local Soil Conservation Service representative.)

- Describe the area's flora and fauna with special reference to rare, threatened, and endangered species.

3) Environmental impact of the proposed action

- Identify any direct or indirect changes to the existing environment, whether beneficial or adverse.

- Describe effects the proposed project will have on adjacent land uses.

- Identify potential impacts on wetlands and aquatic resources.

- Describe the waste management system planned for the project and its impact.

- Describe how water resources will be affected, e.g., increased runoff.

- Discuss proposed management plan for the project.

4) Mitigation measures included in the proposed action

- Discuss measures and methods which are proposed or will be required to mitigate adverse environmental impacts.

5) Adverse environmental effects which cannot be avoided

- Analyze who or what is affected and to what degree, e.g., wildlife or vegetation, adjacent properties, erosion, compaction and sedimentation of soil, etc.

6) Relationship between short-term and long-term impacts

- Identify short-term impacts such as loss of wildlife habitat, changes in traffic volumes and patterns, etc.

- Identify long-term impacts such as dedication of land to public recreation and open space for present and future use.

7) Irreversible and irretrievable commitments of resources which would be involved in the proposed development

- Identify the extent to which the development restricts or enhances the range of resource uses.

- Identify factors such as erosion, destruction of archaeological or historic sites, elimination of wildlife habitat, particularly of threatened or endangered species.

- Identify significant changes in land use with regard to natural resources such as forest land, minerals, soils, water, etc.

8) Alternatives to the proposed action

- Discuss modifications of the present proposal with different approaches to gaining the same result.
- Describe beneficial and adverse effects of the alternatives along with the reasons for the rejections of the alternatives.
- Explain of the final choice of action and the plan for achieving the initial objective.

In preparing the environmental information, narrative explanations should be written for each category, and whenever possible, impacts should be quantified. For example, record the number of trees to be removed, cubic yards of fill to be required, etc. All subject matter should be discussed in as much detail as is relevant, especially when specific facts or professional opinions are available. Government agencies who are involved in the project will be incorporating their comments into the Assessment Report.

The impact assessment should involve a comparison of the land requirements determined for a particular access site and the environmental factors identified during the inventory. A checklist of facility requirements and site factors to be included in the site assessment would vary depending on type of access being considered. Following is a list of factors which could be included:

Facility Requirements

- Access roads (internal and external)
- Parking spaces
- Dock facilities
- Walkways
- Service and maintenance areas
- Adjacent recreation areas
- Water depth
- Subsurface conditions
- Location of boating acess within the waterway
- Electricity
- Signage
- Solid waste disposal
- Public safety and emergency safety facilities
- Water supply and distribution
- Sewage disposal
- Pumpout facilities
- Stormwater drainage
- Restrooms

Site Factors

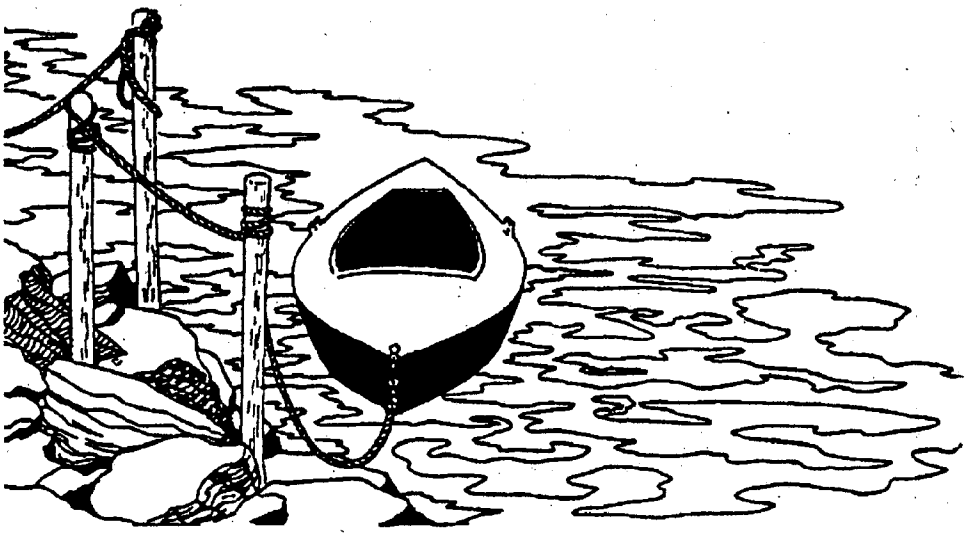
- Topograpy - avoid 15% or greater slopes
- Shoreline erosion - avoid areas with erosion rates greater than 2 feet/year
- Floodplains - when construction is necessary, use appropriate design
- Soils and substrate materials - locate facilities on buildable soils
- Surface water hydrology - needs vary with projected use
- Existing vegetation - preserve existing vegetation to greatest extent possible
- Cultural resources
- Plant and wildlife habitat areas - minimize disturbance
- Existing water quality - monitor and assess potential impact
- Shellfish grounds - avoid location near shellfish grounds/minimize impact
- Wetlands - avoid/minimize impact
- Submerged aquatic vegetation - avoid/minimize impact
- Scenic and visual opportunities - preserve and enhance aesthetic environment
- Existing and potential noise - monitor existing levels and project impact based on planned uses

- Existing and potential boating traffic - avoid placing new access in highly trafficked boating areas
- Compatiblity of adjacent land uses - locate near population centers and services which provide amenities to access sites
- Carrying capacity of site
- Proximity to existing or potential scenic resources such as designated or candidate byways or scenic rivers.

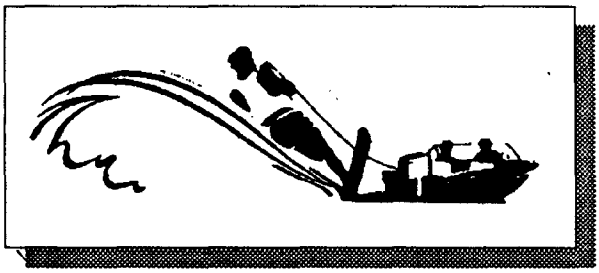
3. Technical Report Limitations

The issues which should be addressed in developing the various types of public access are defined in this report. Each site must be individually evaluated to determine its suitability for development based on the anticipated level of use, site-specific factors, and potential environmental impacts to the site. There may be issues and situations which are not directly addressed in this report, but may become evident during the site investigation and analysis which will need to be addressed. Site conditions which are discussed and recommended in this report are based on ideal conditions; however, optimum conditions should be sought during site selection

and development so that most critical factors are satisfied. This technical assistance report should provide localities with a checklist of issues to consider, a planning methodology, and basic concepts for the design and construction of the various types of public access.



II. Boating Access



A. SITE SELECTION

Environmental factors, suitability of the water body for boat operation, and adequate shore frontage must be considered when locating a boat launch ramp. With proper siting and consideration of environmental factors, many permitting problems and costly delays can be avoided. Almost any site adjacent to a water body can be made into an access area, but generally, the more extensive the required modification, the greater the construction costs and potential for adverse environmental impacts. Whenever possible, alternative sites on a water body should be evaluated.

In selecting a boat launch ramp site, several features must be met regardless of the size of the launch ramp or where it is to be located. The site must have safe navigational access to boating waters, shoreline protection, adequate access to the site, adequate interior access, parking, and a launch ramp. Proximity of the site to population centers, accessibility of the launch ramp from the land side and easy access to desired boating areas are important evaluation and site selection factors.

1. User Considerations

The planning of public boating access sites should consider public needs along with the level of boating activity, facility requirements, and management duties required to fulfill those needs. Section I of this report described the process and resources available for assessing the need for public access.

2. Environmental Considerations

Potential environmental impacts due to boating activity and related facility development must be considered prior to the development of access sites. The evaluation of environmental factors should begin with a thorough inventory of the potential access site. Data which relates to the topography, soils, surface water hydrology, vegetation, wildlife habitat areas and existing wetlands should be collected. This information should then be reviewed to verify the suitability of a site for development. The results of the assessment will likely be incorporated in the permits required to pursue site development.

a) Topography

Shoreline areas with flat to rolling slopes of less than 15% and with suitable soils based on standard classifications related to proposed uses are generally acceptable for facility development.

The 100-year storm criteria should be used to define floodplains since this is the criteria used in the federal flood insurance program in which most local governments participate. Floodplains are land areas that are occasionally inundated by the overflow of streams and rivers and have been determined to have a one percent probability of flood occurrence in any given

year. Floodplains act as natural sediment traps which allow stormwater to disperse and slow down, causing suspended materials that have washed off upland areas to settle. Hence, the development and disturbance of floodplains should be limited to properly designed facilities necessary for the planned access.

b) Soils and Substrate Materials

Physical considerations at the site include the assessment of soil geology and substrate materials. The nature, extent, and cost of the substructures necessary for site facilities must be determined based on the soil types. Test piles and direct soil evaluation tests are two commonly used methods for determining the resistive quality of subsoils. Soil conditions should provide suitable foundation support and waste water treatment capacity, if existing sewage facilities are not already available to the site.

Shoreline erosion should be a major consideration in siting boat ramp access. Developments along shoreline areas should be avoided where existing erosion rates exceed 2 feet/year. These areas are more susceptible to boat wakes. Facility structures located within or near these highly erodible shorelines are probably impacted by wave action which will require continuous maintenance and protective measures.

To minimize the adverse effects of human activities on access sites, a buffer area of vegetation is recommended. This buffer is effective in retarding runoff, preventing erosion, filtering nonpoint pollution, and reducing sediments.

c) Surface Water Hydrology

Normal precipitation presents no serious problem in boat launch access site design, provided an adequate surface drainage plan is adopted. A drainage plan must provide a facility with the capability of draining the waters from a maximum probable rainfall without eroding the adjacent land or causing additional runoff in the Bay and its tributaries. Inflows from surrounding lands may also be diverted as a part of the drainage plan.

Wave characteristics are important to boating access sites. Larger waves are generated in large water bodies by offshore storms, while other waves are generated by winds, boat traffic, and tides. Ideally, boating access sites should be in a protected location (i.e., a cove, tributary, boat basin, etc.) in order to decrease the open water distance over which wind blows unimpeded (fetch). This consideration will help decrease wave action at the site and thus reduce erosion at the facility. Waves can create additional waves by reflecting and resonating off waterside structures. Shoreline vegetation is a good energy dissipater as well as a preventer of wave induced erosion along the shoreline. Boat wakes can be controlled by proper access site orientation, control of boat traffic speed, and route regulation. Establishing boundaries for speed limit zones may be critical to the control of boat wakes as wakes generated during acceleration and deceleration can be significant.

d) Vegetation/Wildlife/Habitat Areas

The Natural Heritage Programs within each jurisdiction can help to identify significant habitat areas and can provide land management recommendations for the protection of these communities. Site selection should be considered in areas that will not affect rare, threatened or endangered plants, animals, or unique natural communities or significant finfish spawning and nursery areas. The protection of high quality habitats and the relationships between biological communities may be incorporated into natural areas or buffer zones adjacent to the access site. Construction practices which avoid direct and indirect impacts to sensitive habitats should be implemented. Sensitive areas and the limits of construction should be clearly marked prior to construction.

e) Water Quality

Boating related facilities such as bulkheads, jetties, or other structural measures may encroach on narrow waterways. Water quality may decrease when encroachment restricts flushing and mixing of waters in small tributaries or inlets. These changes affect wildlife habitats and substrate conditions of marine organisms which may cause a reduction in the diversity of species.

The volume of the water body and tidal action is significant to water quality. For example, small bodies of water can take much less contamination than larger ones. Existing and projected water quality conditions within the vicinity of the access site should be assessed to determine the potential for adverse changes being caused by access related factors. The thickness and the fineness of existing bottom sediments is important as a thick layer of very fine particles can be eroded away by prop-wash from boat traffic and become suspended in the water, thus deteriorating water clarity and quality.

An understanding of sediment depostion, littoral transport, and fetch is important to the development of any site. A flushing study to be submitted for review during the permitting process is encouraged.

f) Wetland Delineation

The delineation of wetlands boundaries should ordinarily be determined by an on-site visit. In most cases, the local delineation map or map series will be used in order to identify the general location of wetlands. The National Wetland Inventory maps produced by the U.S. Fish and Wildlife Service may also be useful in the general location of existing wetlands. The Combined Federal Wetland Delineation approach should be followed for the site specific designation of wetland areas. This approach is a systematic approach which considers soils, hydrology, and vegetative characteristics of a site.

g) Cultural Resources

Cultural resources should be evaluated on each potential access site. A site may be listed, nominated, or eligible for listing on the National Register of Historic Places. The historic or archaeological significance of a site may not be obvious; therefore, during the site evaluation the appropriate State Historic Preservation Officer should be contacted. Information regarding the National Register of Historic Places may be obtained from the National Park Service, National Registry Programs (see **Appendix A-4**).

h) Other Considerations

Other site features and related off shore conditions appropriate for inclusion in the environmental inventory may relate to:

Sand Dunes

These are fragile resources and require special planning so that points of access are well defined and properly constructed. Foot and vehicular traffic on dunes should be discouraged.

Shellfish Beds

The location of active shellfish beds should be identified. The introduction of a boat ramp facility could impact the water quality near these areas enough to affect the productivity of the beds.

Submerged Aquatic Vegetation (SAV)

SAV areas near the shoreline of a proposed boating access development site should be delineated and avoided. There has been a decline in the distribution and abundance of underwater grasses since the late 1960s. These areas are important to marine life for shelter, propagation, and food.

Scenic and Visual Opportunities

The identification of good and poor views both on-site and off-site should be considered. An overall visual analysis of the site may be necessary for the ultimate preservation of visual quality.

Noise

The existing and projected noise levels at the development site and in the surrounding area should be assessed, particularly in areas with anticipated high increases in boating traffic resulting from site development.

Storms

The history of storms, their frequency, and intensity may be significant information in considering a site for development, particularly along unprotected waterways. The National Weather Bureau may be contacted to determine the vulnerability an area has with regard to storms. The state agency administering the federal flood insurance program can also provide valuable information.

Wind

Predominant wind patterns and the orientation of the shoreline are extremely important, as these factors can combine to create an area that is not conducive for navigation of boats and can also cause accelerated erosion or wave damage to the boating facility.

i) Site Limitations

Site limitations should be identified based on the inventory and analysis of natural factors and environmental considerations. The capacity a site has for the development of boating access is also directly related to the conditions and characteristics of the adjacent waterway. For example, the constriction of narrow coves and waterways by the encroachment of boat slips, private piers, and open moorings or anchorages can be a problem in developing boating facilities.

These facilities reduce the water surface area available for boating activity, and in narrow passages may create a "bottleneck" situation. Careful siting and maintenance of boating facilities can avoid or minimize this type of problem.

A site analysis which outlines the physical opportunities and constraints for a property should be conducted to facilitate the assessment of the site. This analysis may simply involve overlaying the identified environmental factors and evaluating the overall conditions of the site, noting areas which are not suitable for development.

Desirable Site Characteristics Include:

- Easy access to open water, population centers, and necessary utilities.
- Accessibility from existing roads and waterways.
- Location near existing state or federally maintained channels.
- High tidal range or flow and high flushing rates along the cutting side of the water body.
- Location in areas free of severe shoreline erosion or steep slopes.
- Compatibility with existing land and water uses.
- Location away from shellfish beds used for harvesting for human consumption.
- Access road that meets Department of Transportation secondary road standards.
- Variable turn around area (size determined by design but must be able to accommodate a combined vehicle and trailer length of 40')
- Buffer zone at shoreline for facilities which are not water-dependent.
- 4 foot minimum width for walkways located apart from vehicular routes.
- Compatibility with local comprehensive plans.

Undesirable Site Characterics Include:

- Too shallow or with inadequate water or land area for intended use, requiring extensive dredging or filling.
- Low tidal range or flow and low flushing rates, such as dead-end canals or the upper reaches of tidal creeks.
- Location with poor water quality, marginally meeting state water quality standards.
- Location at the mouths of tidal creeks and other tributaries may not be advisable due to lower water quality and higher sedimentation rates at these areas.
- Location near designated fish or wildlife protection areas, shellfish beds, or SAVs.

- Location which inhibits public access to navigable waters or hinders safe navigation by requiring structures that would extend into existing channels.

- Location near areas of heavy boating traffic.

j) Compatibility Issues

External compatibility of boating access facilities with adjacent land uses is an important consideration. In general, boating access should be located in areas convenient to population centers. Support facilities, such as shopping, restaurants, grocery stores, emergency services, boating supply houses, repair shops, service stations, and utilities, should be located along the primary access route to the site or in an accessible docking area off the waterway being proposed for access.

Additional boating access should only be introduced in areas where there is a demand or an increased demand is projected based on current user trends. Boating access can create conflicts in sensitive environmental areas; therefore, avoid placing boating access in areas with identified concentrations of rare, threatened, or endangered species.

Several passive recreational or access-related uses may be planned for a single access site within a boating access facility. However, the compatibility of these uses with one another should be considered to avoid potential on-site activity conflicts. Compatibility of related recreational activities is important during site selection and planning for the appropriate site facilities and amenities.

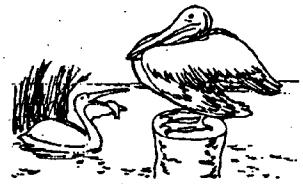
k) Boating Traffic Conflicts

Competition among boating participants for use of the Bay is considerable at peak periods in certain areas. The characteristics of recreational boats, including size, speed, maneuverability and function may intensify this boating conflict on the waterways. The physical characteristics of the water body along with environmental constraints such as shoreline erodibility, fish and wildlife habitat, and spawning areas contribute to the magnitude of these conflicts. As the number of boaters increase, problems such as congestion on the water surface and conflicts between different water-related activities competing for the same water space may become more evident. Some small water bodies may be best suited for cartop boat launches and pier fishing, thus minimizing conflicts with larger, faster boats.

B. DESIGN CRITERIA

1. Site Plan Layout

The site plan layout should be correlated directly with the needs assessment or determination of facilities required to support the desired user groups. The land requirements determined for these proposed facilities may then be appropriately applied to the site based on the environmental considerations and site limitations considered during the site inventory and assessment.



2. Essential Elements and Desired Relationships

Because each site is unique and has different environmental and natural features as well as varying land requirements based on the determined need, a standard site layout for boating access sites is not feasible. The essential elements which will most likely be included for all boating access sites include access to the site, parking, a launch ramp, support facilities, and direct access to the water. These elements and their preferred relationships are depicted in **Figure: II-1**. Of these essential elements, it is necessary for only the boat launch ramp to have direct access to the water. The remaining elements may be lined by pedestrian connections, vehicular connections or both pedestrian and vehicular connections. For example, pedestrian access from the support facilities should be directly connected with the parking and boat launch ramp and there should be a direct pedestrian connection developed between the boat launch and water access. Vehicular connections are most important in relation to the site access which generally leads to designated parking areas. The parking area and internal access should provide a direct vehicular connection to the boat launch ramp. Support facilities which are planned on a site should be accessible to vehicles for service and maintenance. Often this necessitates a limited type of vehicular access.

A concept plan depicting the general relationship of the selected site elements may be helpful to establish the overall site plan layout. A concept plan which expresses preferred site relationships is shown in **Figure: II-2**.

Recommendations which can enhance the relationships between the essential elements shown on the concept plan include:

- Location of parking and support facilities which are not water-dependent on higher ground outside the recommended shoreline buffer areas.

- For large and highly visible facilities, parking areas can be enhanced by shrub and tree islands with little loss of storage capacity.

- Where steeper slopes exist, locate parking areas above the crests and maintain or reestablish the natural vegetation on the slopes. This will preserve a natural shoreline appearance and also will avoid extensive regrading. The toe of the slope must also be stabilized to prevent further slope erosion.

- The scale, species, and spacing of plants should be compatible with those of surrounding shoreline areas.

- In grading of the site, the slope gradients and scale of mounds, swales and berms should be appropriately designed where possible to create rounded earth forms compatible with those of the natural shoreline. In general, all development of access areas shall be constructed in a way that will protect and enhance views and visual access to water and shorelines without compromising the vegetated buffer.

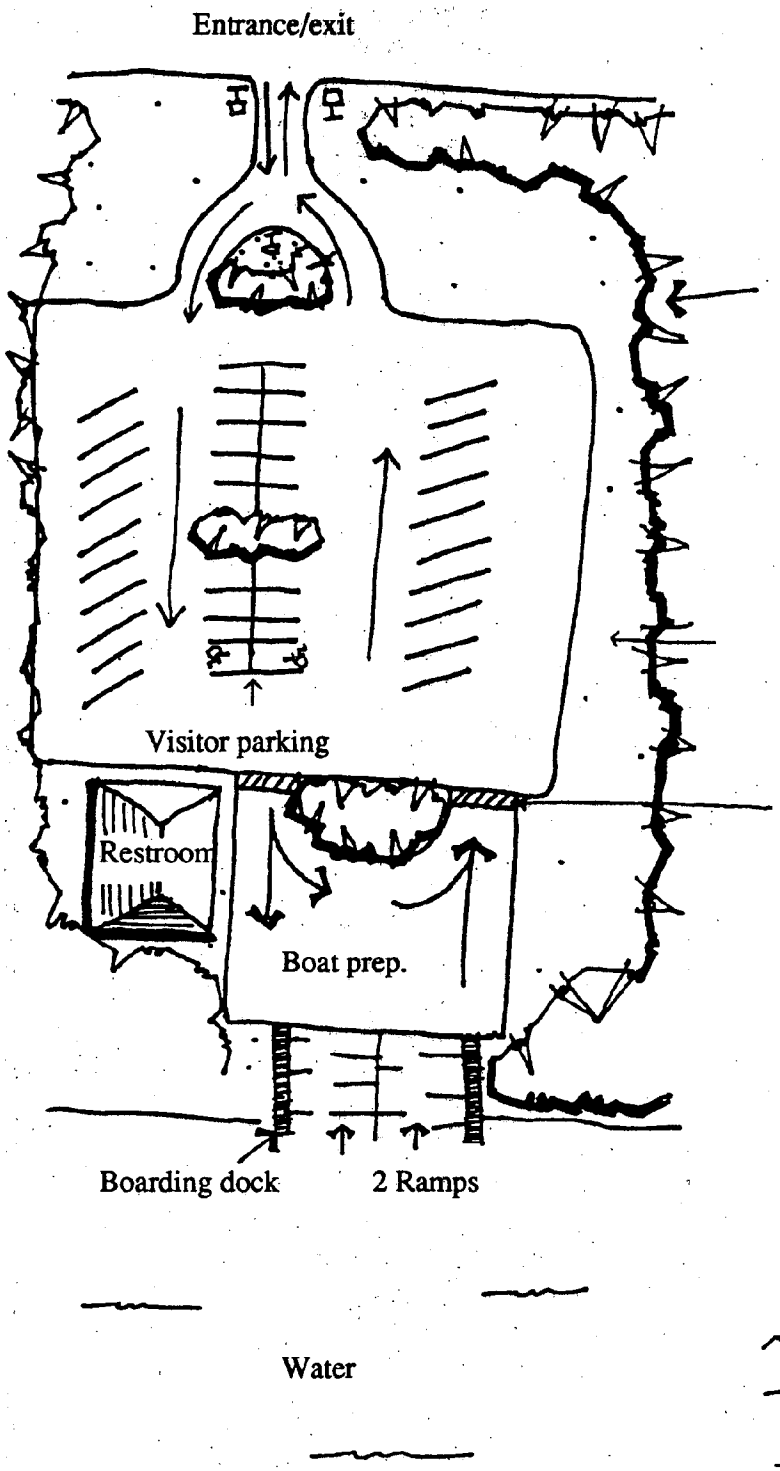


Figure: II-1
Boating Access
Schematic Plan

Retain or plant vegetation to create buffer between parking and adjacent land

Recreation support area

Pedestrian crossing clearly marked.

Note: Pull through parking at 60 and 90 degrees

Legend:

Buffer

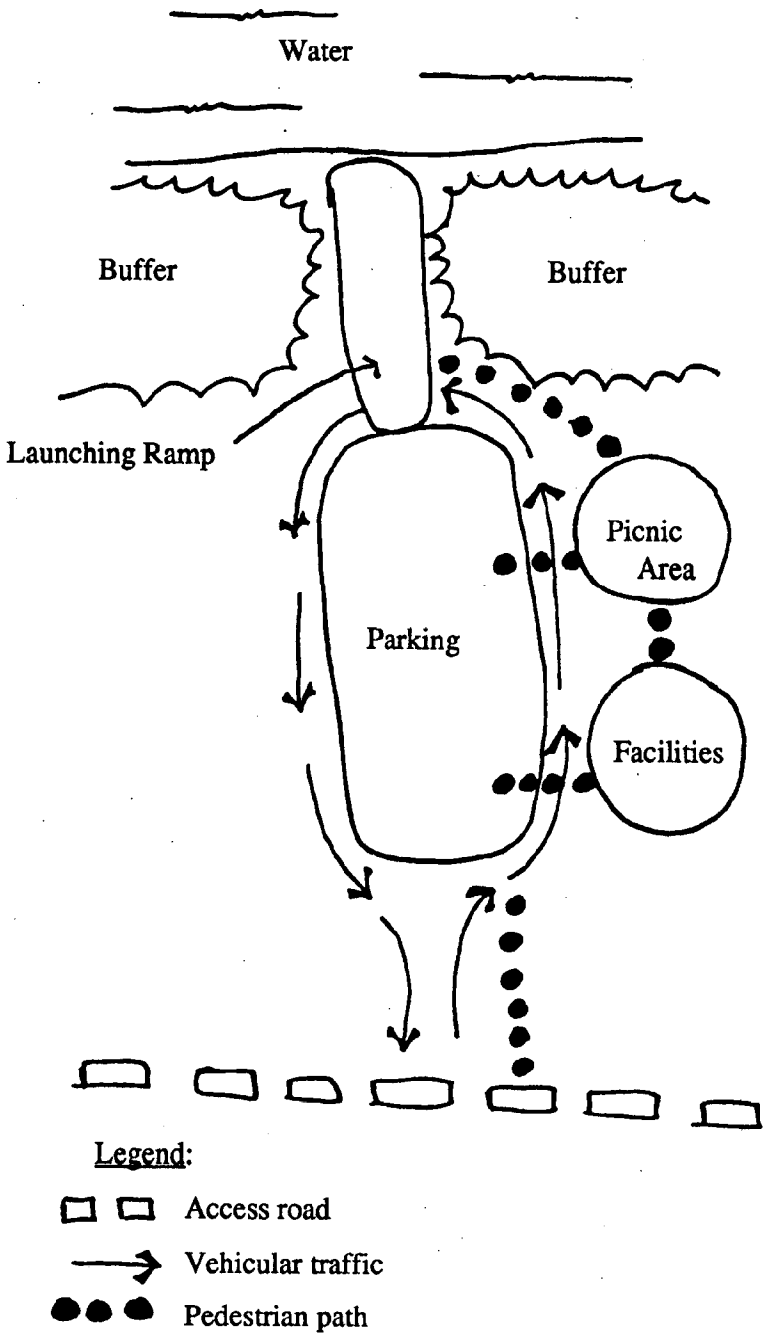
Signage

Courtesy dock

Pedestrian crosing

Source: Recreation Planning & Design Criteria, U.S. Army Corps of Engineers, July, 1987.

Figure: II-2
Concept Layout for Boating Access



- In developing an access site, the effects of human interaction must be considered. Pollution factors should be examined and addressed as should the availability of utilities to the site.

3. Land Requirements

The type of boating access facility planned will determine the land requirements for the facility. Site conditions, land availability, environmental factors and regulations, and proposed degree of use must be factored in the final determination of land requirements for a particular facility.

a) Area Requirements

Typical area requirements for boating access facilities will vary with the number of launch lanes and other recreational facilities and amenities planned at the site. A boating access facility may include access from the main road, parking for trailered boats, restroom facilities, launch ramp, courtesy pier, turn around, buffer zone, and entrance area. Additional amenities such as picnicking areas, overflow parking, and other recreation related facilities may be desired at certain sites and would require additional land.

If a site is identified for boating access facilities that may have environmental impacts on adjacent property, additional land may also be required for a buffer. A single lane ramp will require a site of approximately 2.5 acres. For each additional lane an additional 1.5 acres is recommended. A single lane boat launch ramp may have the following land requirements:

- 30-50, 10' x 40' parking spaces (pull through parking spaces are preferable). Plan for a minimum of 35 parking spaces.
- Allow 400 square feet for each vehicle and allow 25' for pull out.
- 20' wide aisles for one-way traffic
- 24' wide aisles for two-way traffic
- Access road which meets secondary road standards
- Variable turn area (size determined by design, but should accommodate a 40' trailer and vehicle combination)
- 100' buffer zone at the shoreline
- Maintenance and service areas
- Minimum water frontage required for a cartop boat/canoe launch is 50'
- Minimum water frontage required for trailable boat craft is 100'

b) Water Depth and Subsurface Conditions

The area being considered for a launch ramp should be a minimum of 3' deep at the end of the ramp at mean low water (M.L.W.). This will lessen the effects of prop wash and allow a wider variety of boats to use the ramp. The proposed launching fairway and the channel should be clear of debris and have a minimum depth of 4' and be approximately 30-50' wide.

A boat launch ramp should be located in an area which will not accumulate debris and cause maintenance problems (see **Figure: II-3**). For example, it is most desirable for a ramp to be located in a protected area off the main water body. If this is not possible the outside of a meander or the stretch of water immediately following a bend should be selected. The inside of a bend should be avoided as this area generally accumulates the most debris.

c) Vehicular Considerations

The external access to a site should be less than one mile from a maintained public roadway, which has at least 13'6" of vertical clearance. The external access road should meet traffic flow generated by the access site. A 175' minimum sight distance along the access road and a 300' minimum sight distance should be provided at intersections.

External access roads should meet secondary road standards providing a 20' to 22' wide pavement with a 3' to 5' shoulder to accommodate boat trailers. The entrance drive should intersect the access road at a 90° angle. If this is not possible, the angle should be no less than 80° and no more than 100°. The entrance drive and internal site access roads should be 20' to 22' wide with a 3' to 5' shoulder to facilitate the movement of two way traffic and 18' to 20' with a 2' to 3' shoulder for one way traffic. Guardrails or posts should be provided on 6' centers for embankments over 6' in height. The entrance drive should not be directly aligned with the launch ramp and should provide easy access to the parking aisles. Proper traffic, informational, and directional signage should be posted.

It is important that the location of the entrance road off of the public highway be carefully coordinated with state highway officials. This will assure that adequate site distance can be provided. Also, if turning lanes are needed, it will be known early in the process and necessary land can be acquired.

Parking

Where possible, parking areas should be located within convenient walking distance of the launch ramp, but outside the buffer area. There should be adequate parking spaces to meet the expected demand on a peak day during the boating season. Parking stalls for trailered vehicles should be pull through in design (see **Figures: II-4 to II-6**). Parking design may vary with the use of 90°, 60°, or 45° parking spaces. (see **Table: II-1**)

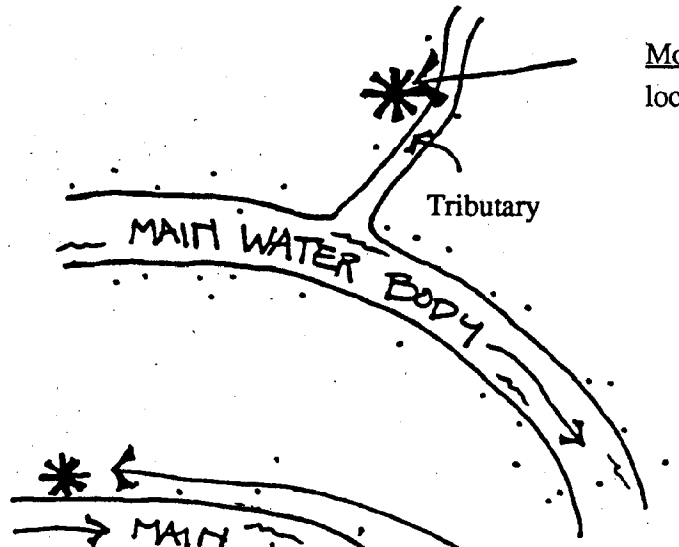
Parking lots should have a finished grade of no less than 1% and no greater than 5%. A turn around to accommodate a 40' combination of vehicle and trailer should be provided at the head of the ramp.

Ramps

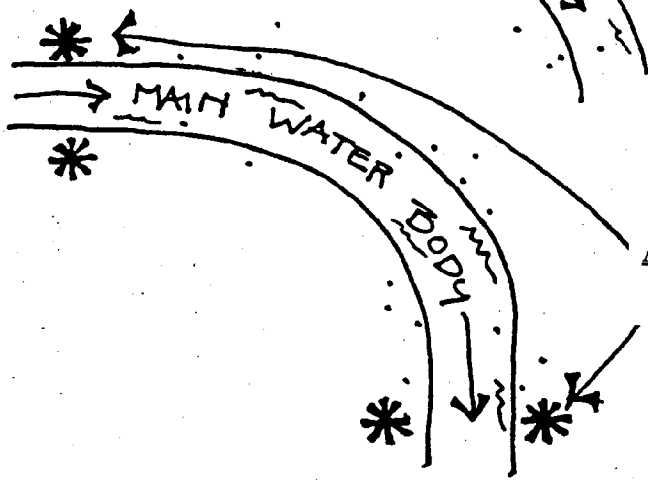
The ramp for launching should ideally consist of two or more lanes. The lanes should be a minimum of 15' wide; the slope of the ramp must be uniform and between 12% and 15%. A smooth transition with a vertical curve should be made between the head of the ramp and the approach areas to the ramp. The pavement should be concrete, scored for traction, and a wheel stop placed at the toe of the ramp. All ramps should have adequate erosion protection to prevent undercutting by wave and current action. (see **Figure: II-7**)

Figure: II-3

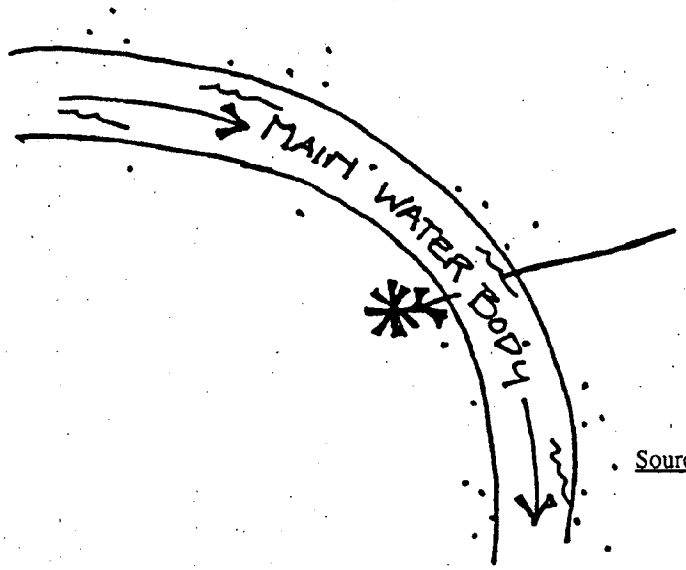
Ramp Locations Related to Water Flow



Most Desirable Ramp Location - located off of main water body



Acceptable Ramp Location - located away from curve of main water body



Least Desirable Ramp Location - due to siltation accumulating at inside curve of main water body

Source: Handbook for the Location, Design, Construction, Operation, and Maintenance of Boat Launching Facilities, State Organization for Boating Access (SOBA), March, 1989.

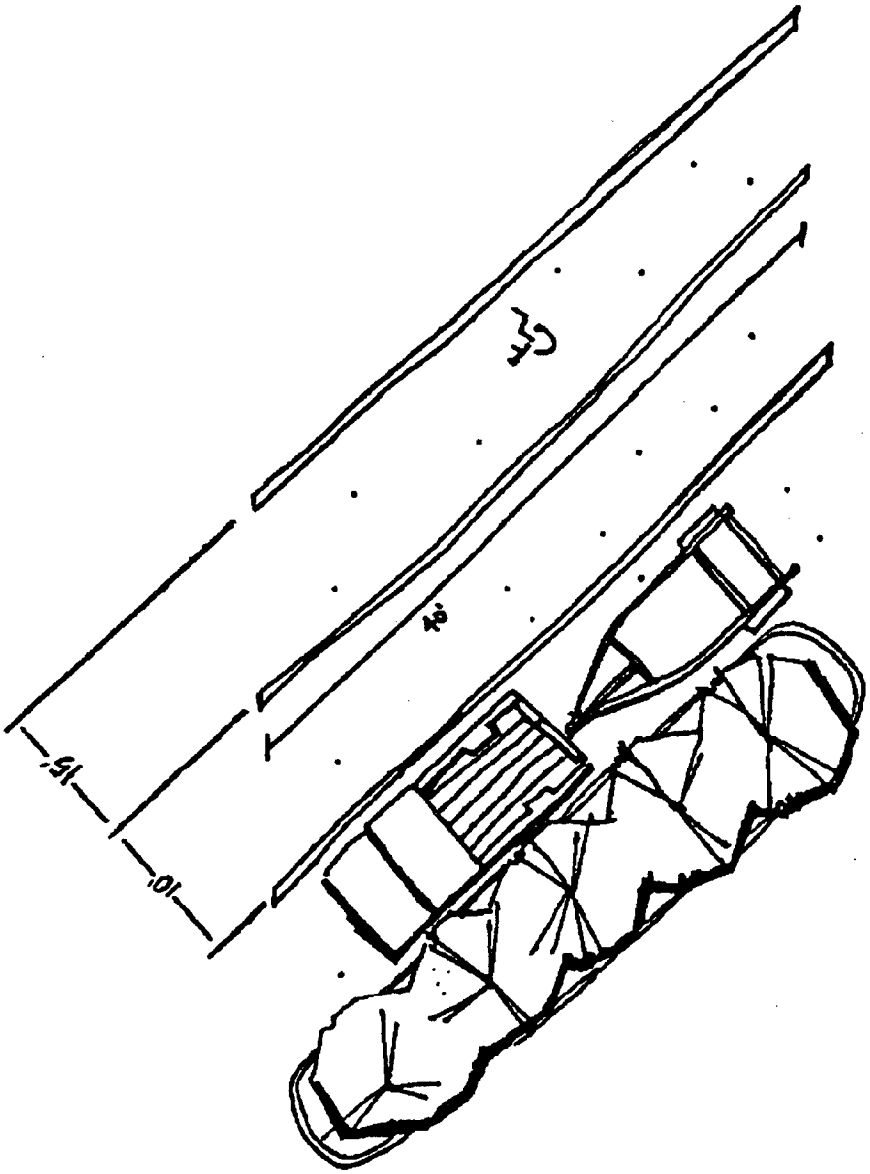


Figure: II-4
45 Degree Parking

Source: Handbook for the Location, Design, Construction, Operations, and Maintenance of Boat Launching Facilities, SOBA, Wilson, K., March, 1989.

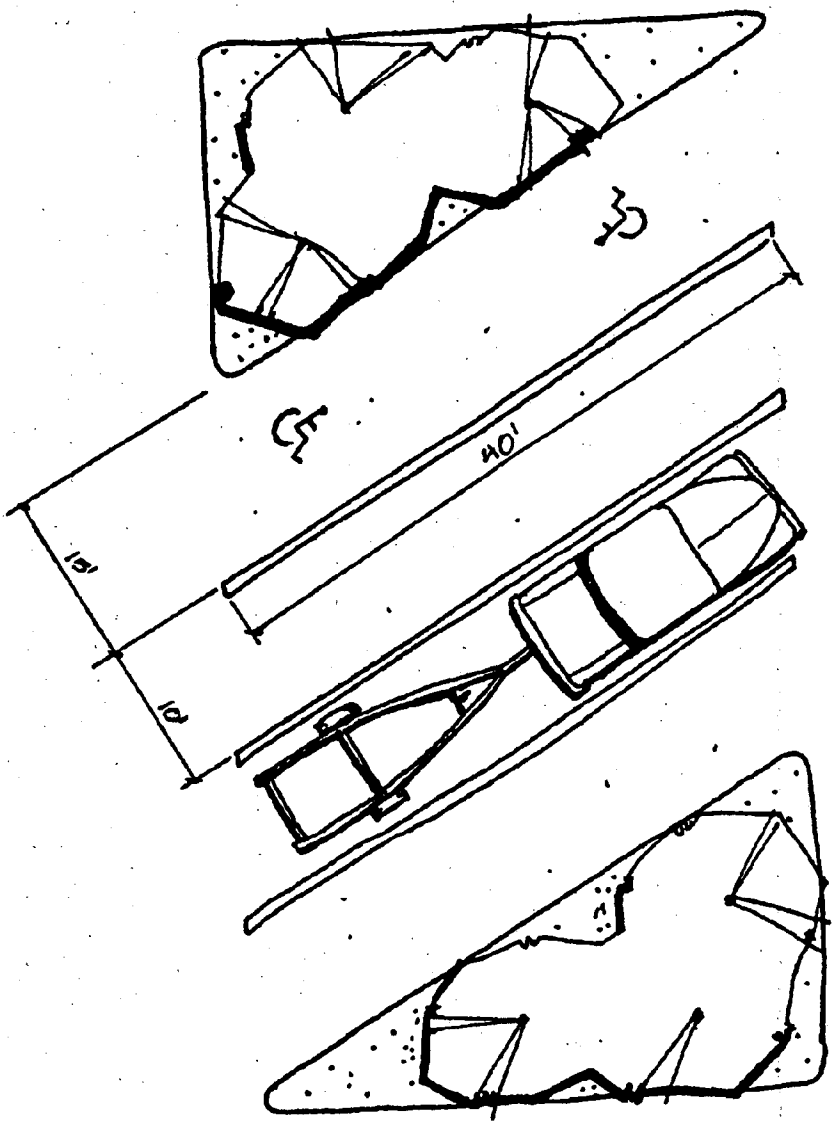


Figure: II-5
60 Degree Parking

Source: Handbook for the Location, Design, Construction, Operations, and Maintenance of Boat Launching Facilities, SOBA, Wilson, K., March, 1989.

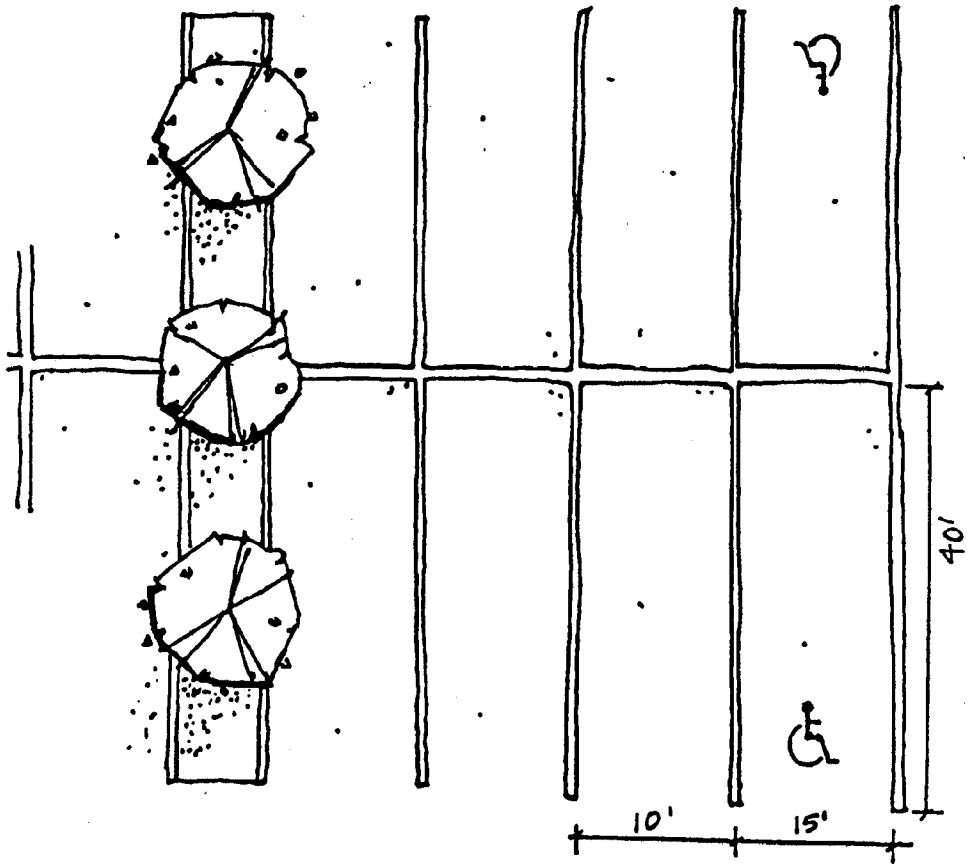
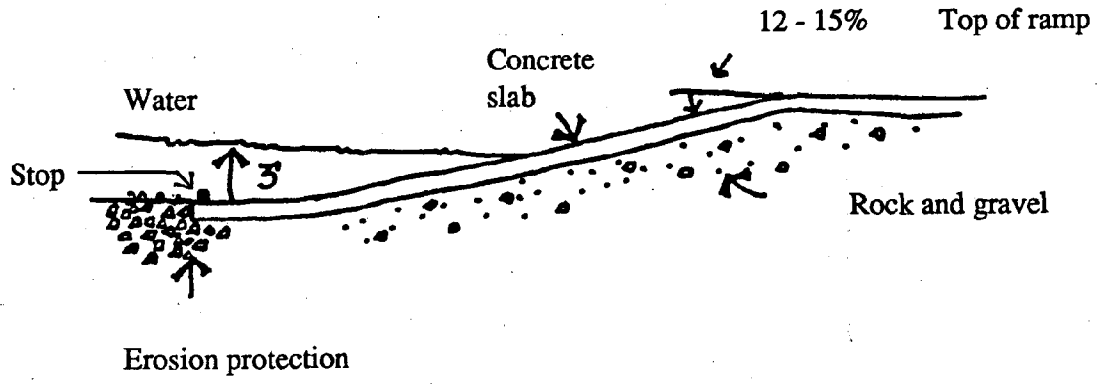


Figure: II-6

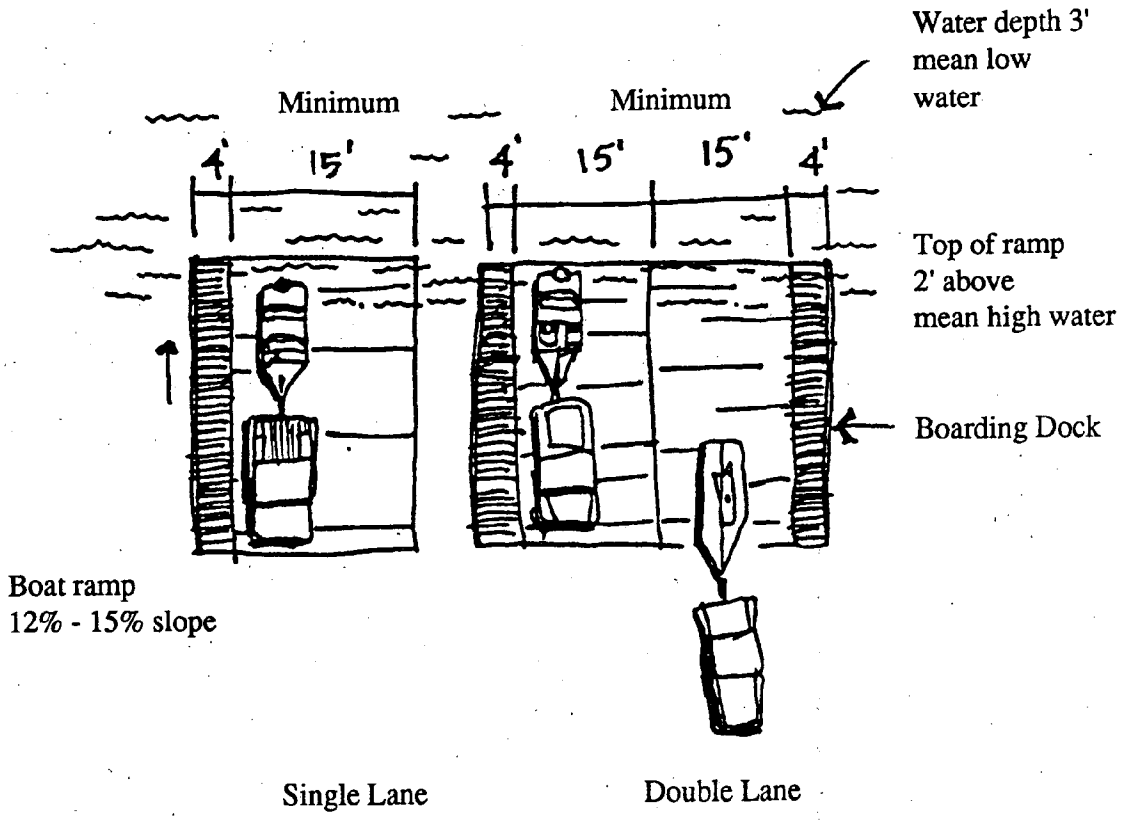
90 Degree Parking

Source: Handbook for the Location, Design, Construction, Operations, and Maintenance of Boat Launching Facilities, SOBA, Wilson, K., March, 1989.

Figure: II-7
Boat Launch Ramps



Cross Section



Source: Handbook for the Location, Design, Construction, Operations, and Maintenance of Boat Launching Facilities; SOBA, Wilson, K., March, 1989.

Parking Stall Dimensions - Table II-1

	No. for Single Lane Ramp	Each Additional Lane	Size 90°	60°	45°
Trailered Vehicle	35	20	10' x 40'	10' x 40'	10' x 40'
Vehicle Only	8	Varies	10' x 20'	10' x 20'	10' x 20'
Handicapped Trailered Vehicle	2	4	15' x 40'	15' x 40'	15' x 40'

Source: Handbook for the Location, Design, Construction, Operation and Maintenance of Boat Launching Facilities, State Organization for Boating Access, Wilson, K., March 1989.

Access to the launching ramp should be designed as a one-way system and will require a separate turn-off from the approach onto the ramp. Traffic control devices, such as barricades, traffic islands, or berms, may be used to ensure that access roads are not in direct alignment with the ramp. Overhead power and communication lines are not permitted across boat launching access roads, parking lots, or areas where sailboats are rigged.

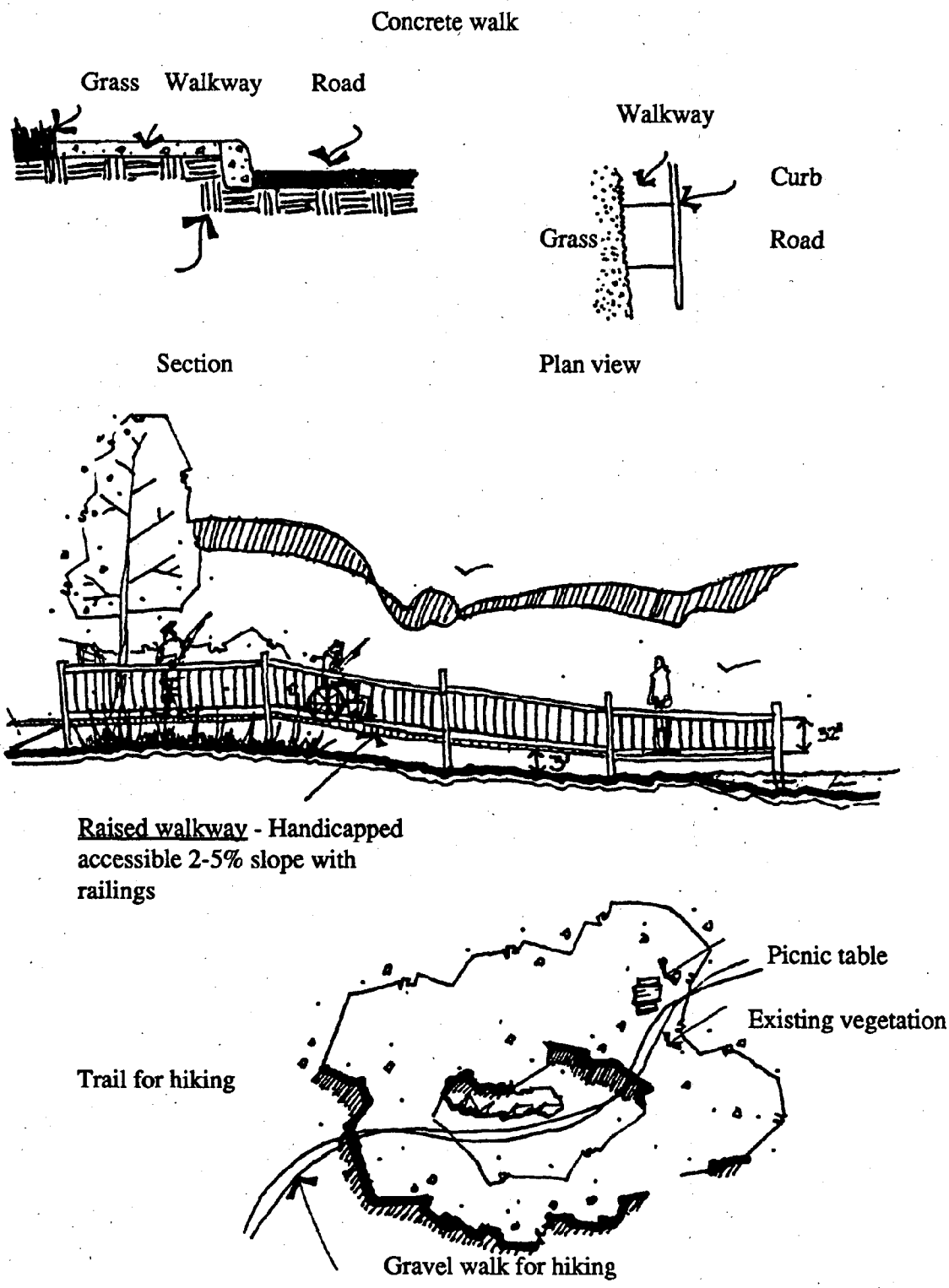
d) Pedestrian Considerations

Pedestrian access should be designated to provide safe connections to site facilities. Pedestrian walkways between service areas, such as parking lots, restrooms, community buildings, and courtesy docks are essential. Those areas receiving high levels of pedestrian use should be physically separated from vehicular traffic as a safety precaution. Heavily trafficked areas should be surfaced with durable material (see **Figure: II-8**). The walkways should be designed with well defined edges and should be a minimum of 4' in width.

Trails may be recommended in areas receiving less use. Trails may have varying widths and be constructed of several materials, provided the resulting path has a suitable surface for street shoes and is handicapped accessible (see **Figure: II-8**).

Raised walkways and docks (see **Figure: II-8**) are generally appropriate for courtesy piers at boat launch facilities. These walkways should be a minimum of 4' wide and constructed of treated wood or other marine-related material such as fiberglass, aluminum, or concrete. The walkways should also be handicapped accessible with railings. Walkways should be sloped 5% or less for handicapped access. When the on-site grade change is greater than 5%, handicap ramps should be provided to enhance accessibility to the site facilities. Crosswalks should be constructed with curb ramps on each side whenever they cross vehicular roads.

Figure: II-8
Pedestrian Access for Boating Sites



Source: Recreation Planning & Design Criteria, U.S. Army Corps of Engineers, July, 1989.

e) Special Development Requirements

1) Unique Requirements

Each access site requires a different combination of development features which relate to the uses planned and the anticipated level of use for the site. The following elements should be considered during site development:

Deck Construction

The use of pier and platform construction for support facilities may be considered in marshes and wetlands. This type of construction preserves marsh vegetation and allows tidal circulation. All boat ramps should be designed to withstand typical storm action for the area, support vehicular loads, and facilitate backing, turning, and emergency vehicle access. Walkways, piers, and decks should be designed to accommodate safe pedestrian passage and to withstand typical storms for the area. Additionally, pier and platform construction for support facility walkways should be located landward of mean high water.

Signage

Adequate signage should be posted to inform the public of the layout and regulations for the access site.

Solid Waste

Trash and garbage collection should be furnished by the locality or by a privately-owned refuse company. The provision of appropriately designed refuse containers and an adequate maintenance program are essential.

Public Safety and Emergency Services

Local fire protection as well as local police security and emergency medical services should be available. Location of emergency services along with emergency telephone numbers should be posted in a visible area on the site and telephone service should be provided.

Traffic

The traffic generated by an access site relates to the size of the facility. Projected traffic volumes resulting from the access site should not exceed acceptable levels on the existing major highways or local secondary street systems.

Handicapped Facilities

An evaluation of appropriate measures to be taken for improved accessibility should be made for sites related to boating access. Contact appropriate state authorities for the design of handicapped facilities. Any application of federal funds in the design and/or construction of launch ramps requires handicapped accessibility.

2) Electricity

A facility should be adequately lit for public use and safety. In order to reduce the impacts of night lighting on adjacent land uses, a greater number of low-height lighting fixtures are recommended in the place of a smaller number of taller fixtures. If higher standards are used they should be well shielded to prevent light spread, especially out over the water. Lighting should be directed toward the facility use areas, shielded from adjacent properties, and vandal-proof.

3) Water Supply and Distribution System

An adequate water supply and distribution system may be desirable to provide public drinking water and fire protection and for the maintenance and operation of the access facility. It is recommended that the water supply, treatment, and distribution be planned at the same time as wastewater collection, treatment, and disposal. This will avoid conflicts caused by an increase in discharge into the sewer system.

It is recommended that wherever possible, boating access facilities be connected to an approved external public water system. This feature will eliminate the development cost and annual operational expenses of a water supply facility and treatment plant. If public water is not available at a site, an on-site well is desirable.

The water supply and distribution system should be planned under the direction of a sanitary engineer and should meet local planning and state health department requirements.

4) Sewage Disposal/Pumpout Facilities/Restrooms

The installation and use of sewage pump-out facilities at marinas and large boat ramp facilities is important. The location of pump-out facilities for boats is most desirable where gas is sold or at sites where large boats may be docked for extended periods of time, particularly overnight. A pump-out facility should not contribute more than 1/4 of the total volume into a septic tank because of the chemicals used in boats' toilet facilities. Another option to a septic tank may be a 1000 gallon holding tank which could be periodically emptied with the wastes disposed at a treatment plant.

The provision of port-a-potty dumping stations is desired at boat ramps, and designers should incorporate these features into their development plans. Permanent restroom facilities should be a priority at larger boat launch access sites. The on-shore toilet facilities must meet the public health requirements of local, state, and federal agencies within the jurisdiction they are to be built. A minimum of one toilet fixture and lavatory per sex for every 30 parking spaces is recommended. Restrooms should be designed to meet all requirements for access to and use by the handicapped and should be located on-site according to the appropriate state and local regulations. Waste-water from these facilities may be (1) tied into the local sewer system, (2) processed in an on-site septic system, or (3) collected on site in a holding tank and disposed off-site.

5) Stormwater Management

Parking areas and launching ramps may create potential environmental problems related to increased runoff and pollutant discharge. Best management practices should be implemented during site development and after construction is completed to avoid or mitigate these potential impacts. The following design measures may be incorporated into the site design for boating facilities to avoid or alleviate site runoff.

- Construction of a "bump" at the top of the launching ramps to divert parking lot runoff to suitable collection points.

- Installation of catch basins and filters to trap pollutants.

- Avoidance of direct channeling of runoff into tidal wetlands.
- Use of porous gravel or a perforated paving block surfacing.
- Use of porous pavement in lieu of traditional asphalt.

6) Estimated Design Cost

Specific design cost estimates will be determined on a general outline form relative to a general site design (see **Appendix B** - "Cost Estimate").

C. MANAGEMENT/ MAINTENANCE

Management and maintenance refers to agency actions needed to keep a facility in desirable condition for public use. Legal liabilities may be incurred in administering a boat launching facility; therefore, the facility should be maintained in a safe condition. The administering agency of a facility is obligated to remove dangers and warn users of dangerous conditions. The legal responsibilities of the administrator should be researched and discussed with counsel when establishing or expanding a boat access facility. Legal obligations may increase in proportion to potential dangers and if user fees are charged.

1. Maintenance Concerns

Good maintenance practices should be extended to the adjacent waters and shoreline in addition to the access site facilities. The maintenance plan may be established as a matrix outlining the types of maintenance tasks and the frequency with which a site would require this maintenance. Categories of maintenance frequency generally include frequent (weekly to daily), periodic (less than weekly), and special (as needed). The following maintenance duties should be considered in developing a maintenance plan:

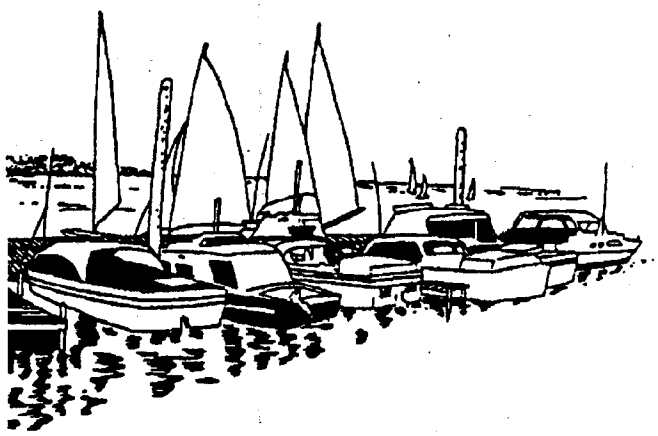
- Launch ramp, maneuvering and tie down areas
- Channel maintenance (may require additional permits)
- Removal of shoreline and beach debris
- Restroom clean-up
- Trash collection schedule maintenance
- Shoreline erosion control
- Parking/pavement access maintenance
- Signage maintenance
- Lighting maintenance
- Landscape maintenance/mowing
- Stormwater facility upkeep
- Seasonal upkeep - preseason inspections, regular inspection schedules, etc.
- Post-storm cleanup plan
- Removal of pumpout waste

The level of maintenance anticipated at a site is directly correlated with the use level at the facility and the location of the site. Maintenance at public sites is an extremely important issue as it relates directly to the safe use of the facility.

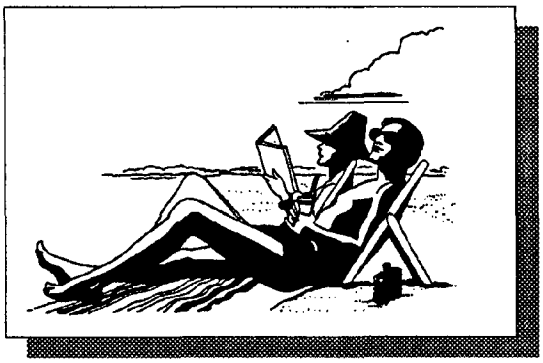
2. Management Concerns

The main objective for the efficient management of boating access facilities is to facilitate boater satisfaction and safety. This in turn can be accomplished through the promotion of diverse boating activity in specialized areas, boating safety, and reduction of boating conflict with other users. Sensitive environmental areas adjacent to or within a boating access area may be managed in such a way that recreational users and facilities do not adversely affect the productivity or value of such areas. A detailed explanation of management options should be considered on a site specific basis.

Overall management and maintenance requirements will be reduced through proper site planning efforts which consider environmental conditions and potential impacts to the site. Issues which relate to management and the cost of maintenance and management for a site may include the frequency of maintenance requirements, the types of facilities located on the site, the surrounding vegetation and habitat located in the vicinity of the site, and the establishment and enforcement of rules and regulations.



III. Beach/Swimming Access 1



A. SITE SELECTION

When selecting and evaluating a shoreline area as a potential beach site, considerations must be given to projected visitation, accessibility, topography, soil composition and stability, historical shoreline erosion rates, water temperature, water quality, wind and wave action, water level and tidal fluctuations, and the currents and tides prevalent for the area. The availability of land for parking, picnicking, other activities, and other support facilities should be considered during the evaluation, selection, and development of a beach site.

1. User Considerations

The planning of public beach access sites should consider public needs along with the level of user activity, facility requirements, and management duties required for the site. Section I of this report describes the process and resources available for assessing the need for public access. For swimming and beach access, the user considerations which are important to the location of a public access area include the existing transportation network, the surrounding land uses, existing services available near the potential site, and the quality and size of the beach area.

2. Environmental Considerations

Beaches are natural landforms which serve to absorb wave energy. Beaches are dynamic and should be evaluated and treated accordingly in planning public access. Natural forces and elements which have a significant effect on beaches include topography, wave action, soils and substrate materials, vegetation, winds, and storm activity.

a) Topography

The slope of the land both above and below the waterline is one of the determining factors in the selection of a good beach site. Underwater conditions and slopes are discussed in Section III.B.3.b. of this text. In general, a site is difficult to develop if the gradients exceed 15%. The beach area should gently slope to the water's edge at a maximum of 5% slope. A slope of 5% or less provides increased land area available for use adjacent to the water.

b) Soils and Substrate Materials

Although soil composition and stability varies locally, the proposed beach site should have a proper base for the beach sand or other acceptable top material which allows swimmers adequate footing upon entering the water. Beaches should not be located in areas where extensive siltation occurs or is anticipated. To avoid excessive siltation, a beach should not be located at the confluence of two water bodies.

A detailed inspection of the underwater portion of the beach will be necessary prior to the beach opening to the public. The inspection should reveal sinkholes, depressions, or dangerous drift material which should be

corrected prior to opening the beach and should be maintained during beach operation. All underwater obstructions, such as tree stumps, should be removed from the area. All swimming areas should be inspected for obstructions annually prior to opening, after flood events, as well as on a periodic basis.

c) Surface Water Hydrology

Shoreline erosion is the process of detachment and transportation of sediment particles from the shore, resulting in the retreat of the shoreline (see **Figure: III-1**). Although this process can be caused by the surface runoff of water, the most significant erosion agent on the shoreline is wave action.

The growth and height of waves is controlled by four factors: the water distance over which the wind is blowing, known as the fetch; the speed of the wind; the duration of the wind; and the depth of the water. Continued wave action will eventually erode the silt and clay material leaving the sand and gravel to form a beach deposit. The beach itself acts as a buffer to wave action as the waves break along the sloping shoreline. The size and shape of any given beach changes continuously as the accumulation of sand adjusts to the changing conditions. For any particular segment of shoreline, the source of sand is derived from an updrift erosion site. This is an important factor that must be considered in the planning of erosion control along the shoreline.

The degree of shoreline recession is dependent upon the following factors:

1) The intensity of wave action and the exposure to strong tidal currents.

2) The character of the sediments at the site and the amount of protection offered by vegetative cover, specifically marsh grass, at the shoreline.

3) The amount of sand moving along the shoreline from other eroding areas or from streams along the shoreline.

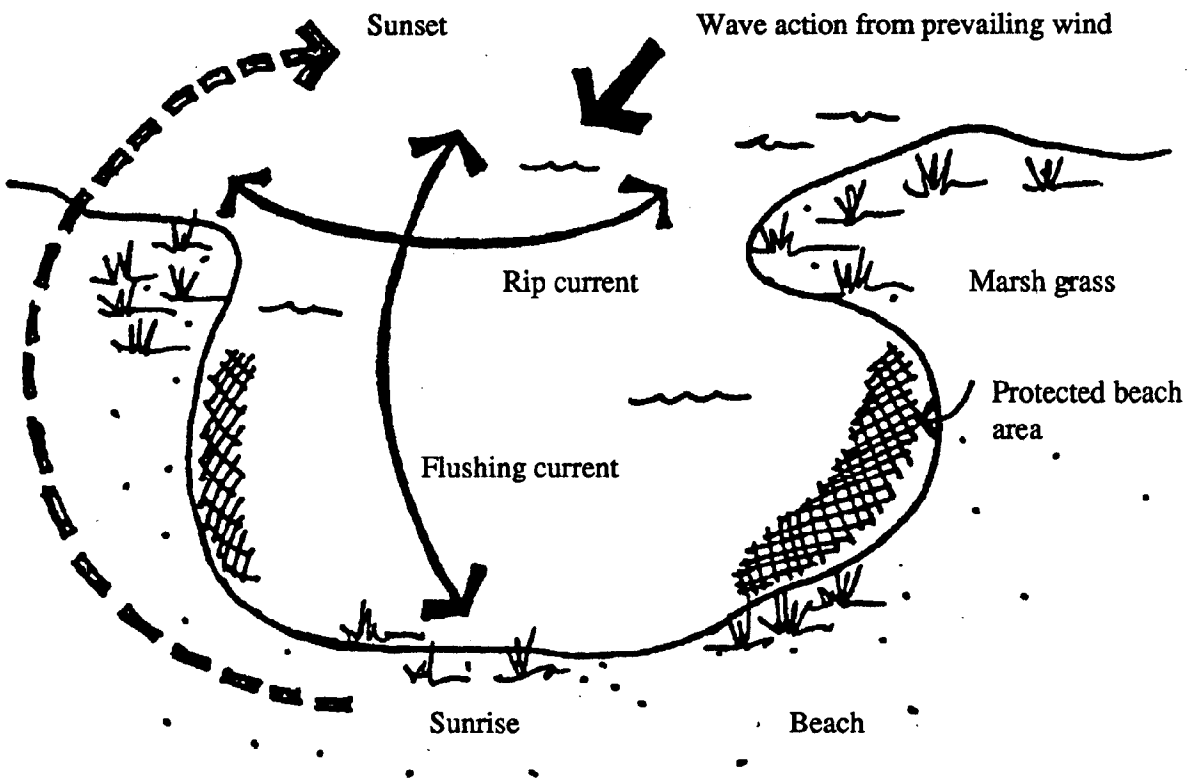
4) The slope of the land adjacent to the shoreline and the slope of the nearshore bottom.

d) Vegetation/Wildlife/Habitat Areas

Areas selected for development need to be assessed to determine if they contain rare, threatened, or endangered species or other species in need of conservation. Management for these species should be incorporated into the overall beach facility planning and development. Areas that could serve as future habitat or feeding, nesting, or resting areas for rare, threatened, or endangered or other significant species should be considered a potential resource during the site evaluation process.

Marsh grasses along the shoreline play an important role in stabilizing the shoreline and protecting it from erosion. The root system of the marsh grass binds the substrate soils while the grass itself slows the water flow and traps sand. Whenever possible, natural stands of grass should be retained. Planting marsh grass for erosion protection has proven successful in areas not receiving intense wave attack. It should

Figure: III-1
Surface Water Hydrology



Understand the existing shoreline conditions and water conditions in swimming areas in terms of prevailing winds currents, tide and surf.

Source: Recreation Management of Water Resources, REA, P., 1986.

be noted, however, that areas selected for recreational beaches, where signicant use is anticipated, should not have marsh grasses present on the beach face and intertidal zone.

e) Water Quality

The location of beach access and use as a swimming area may not effect the existing water quality if appropriate sanitary facilities are incorporated in the development of beach and swimming access areas. An assessment of existing water quality based on its desirability for swimming should be incorporated in the analysis for the location of beach access. Water samples should be analyzed by the local and/or state health department. Beaches should be located where there is adequate water circulation to maintain acceptable water quality. Adequate circulation frees the water of bacteria and pollutants which occur when a large number of swimmers use the beach. Well-circulated water and periodic tidal flows normally remove surface debris, such as weeds or other floating objects that would normally tend to be deposited on the beach.

If a beach is located near a major boat ramp, marina, industrial site, or other potential pollutant, it should be located such as to minimize or avoid the potential effects of fuel spills and other pollutants. Beaches should not be sited near or adjacent to areas used as roosting or nesting sites by waterfowl, since land and water contamination is likely due to droppings deposited in these areas.

f) Wetlands Delineation

Tidal and non-tidal wetlands should be identified and delineated on a site. The potential impact on these areas should be limited. In some cases this may require the construction of bridges, raised decks, and raised walkways to minimize the impact.

g) Cultural Resources

Many archaeological sites and some standing structures of historical significance may be located along the water's edge. These cultural resources should be evaluated for each potential beach and swimming access site. Although the historic or archaeological significance of an area may not be obvious, the State Historic Preservation Officer can provide relevant information relating to these resources.

h) Other Considerations

Other site features and related off-shore conditions appropriate for inclusion in the environmental inventory may relate to:

Sand Dunes

Sand dunes are primarily an accumulation of sand, often supporting rooted vegetation, formed by the interaction of wind and wave action on the sandy material along the shoreline. Sand moved on the beach during periods of relatively low wave energy progresses landward by the action of onshore winds. Vegetation along the dune line acts as a baffle, slowing wind speed and causing wind-borne sand to settle and be trapped in the vegetation, resulting in the growth of the dune. Sand dunes are protective buffers to the effects of flooding and erosion caused by storms and wave action. They also provide habitat for coastal fauna and make up an integral part of the coastal environment.

Sediment Movement

Sediments are eroded soils and other materials that are transported from the land into rivers and the Bay. The presence of sediments in the water gives it an cloudy appearance and causes turbidity. Turbid water blocks sunlight which is vital to the growth and sustenance of submerged aquatic vegetation (SAV). Shoreline areas composed of easily erodible sediments which are subject to high wave energy will have the greatest susceptibility to erosion. Also, shoreline areas subject to intense groundwater seepage will experience greater erosion. Characteristics affecting erosion differ throughout the Bay; consequently, the physical environment of each segment of shoreline must be evaluated independently.

Waves

Waves are generated by wind velocity and wind duration. Wave generation is generally greater in areas that are exposed to the open Bay than in tidal tributaries. A shallow bottom near shore will more effectively reduce wave energy than deep water near shore. Consequently, less wave energy is received by a shoreline if there is a shoal or tidal flat immediately offshore. Also, a wide beach is better than a narrow beach for wave energy dissipation.

Wind

Predominant wind patterns and the orientation of the shoreline are important considerations in developing swimming and beach access. These factors can combine to create an area that is not conducive for swimming and beach activities and can accelerate beach erosion as well.

Scenic and Visual Opportunities

The identification of good and poor views both on-site and off-site should be considered. An overall visual analysis of the site may be necessary for the ultimate preservation of visual quality.

i) Site Limitations

Site limitations should be based on a specific site inventory and analysis of natural factors and environmental considerations. For the development of a beach and swimming area, the site capacity is directly related to the size and condition of the beach resource. An inventory of the physical opportunities and constraints for a property should be conducted and summarized in a site analysis. The analysis may involve the overlaying of identified factors, evaluation of the site conditions, and the identification of areas which are conducive to development of beach access facilities.

<u>Desirable Site Characteristics Include:</u>

- Good transportation network and secondary road system to the site location.
- Location near the population need.
- Location near public water supply, sewage teatment, and other utilities.
- Accessibility from on-site to the beach resource.
- Beach areas receiving sand deposition.
- Natural protection for the beach resource such as a site protected by existing dunes or a location in a cove.

- Tidal and water current conditions which are safe for swimming.
- Locations which have not historically received severe storm activity.
- Good water circulation and flushing.

Undesirable Site Characteristics Include:

- Steep slopes (>15%) and areas receiving heavy drainage.
- Areas with highly erodible soils and shorelines which erode at a rate greater than two feet per year.
- Beaches which require shoreline erosion control structures as these structures may cause downstream impacts.
- Wind and wave patterns which cause erosion and/or hazardous swimming conditions.
- Areas which historically receive intense storm activity.
- Location near land uses or other conditions which have adverse affects on water quality.
- Location adjacent to SAV and shellfish beds.
- Beaches which have underwater hazards which cannot be corrected without grading or dredging.

j) Compatibility Issues

The internal compatiblity of a swimming beach access site with other types of public access is dependent on site characteristics and resource values. Beaches and swimming areas are most compatible with access areas which have been designated as natural area access.

External compatibility of swimming beach access facilities with adjacent land uses is also an important consideration. In general, beach access should be located in areas convenient to population centers. Support facilities, such as shopping, restaurants, grocery stores, emergency services, service stations, and utilities should be located along the primary access route to the site.

k) Impact on Off-Shore Aquatic Systems

The impact to the bottom of the shoreline area needs to be assessed for various reasons.

- When shore erosion control structures are implemented for a beach site they may have adverse impacts on fish spawning areas or shellfish beds, etc., due to the filling of wetlands or the placement of beach fill channelward of mean low water.
- The disturbance of bottom sediments and introduction of additional beach fill may adversely affect water quality which may impact productive fishery habitat and nearby SAV beds.
- Deposited beach sediments may negatively impact the sediment budget and coastal geomorphologic processes.

B. DESIGN CRITERIA

1. Site Plan Layout

Beach access sites will be provided at water resource development locations approved by state or local government agencies. The priorities in the design of a beach site include the safety of the user, the effects that the physical features of the site will have on the beach, and future operation and maintenance considerations. Beaches may be designed in support of multiple use activities or as a single use area. Small beaches may best be designed in conjunction with other facilities to disperse visitor use. The aesthetic compatibility of a facility with its surroundings, as seen from adjacent areas, and the water are also important considerations during the site layout and design.

2. Essential Elements and Desired Relationships

The essential elements for a beach access area may include access to the site, parking, picnicking areas, play areas, bath house, adequate beach frontage, designated swimming area, support and maintenance facilities, and a buffer zone. The schematic plan shown in **Figure: III-2** depicts preferred relationships for these elements. Of these essential site facilities, the beach and swimming area is the only water-dependent activity.

In **Figure: III-2**, the beach area is located directly adjacent to the water and is buffered from the remaining site facilities. The beach and activity areas are connected by pedestrian walkways which are separated from vehicular access and parking areas. Vehicular access is provided to the parking area with a separate service road to the maintenance facilities and for emergency access.

A concept plan depicting the general relationship of the selected site elements may be helpful to establish the overall site plan layout. A concept plan which expresses preferred site relationships is shown in **Figure: III-3**.

3. Land Requirements

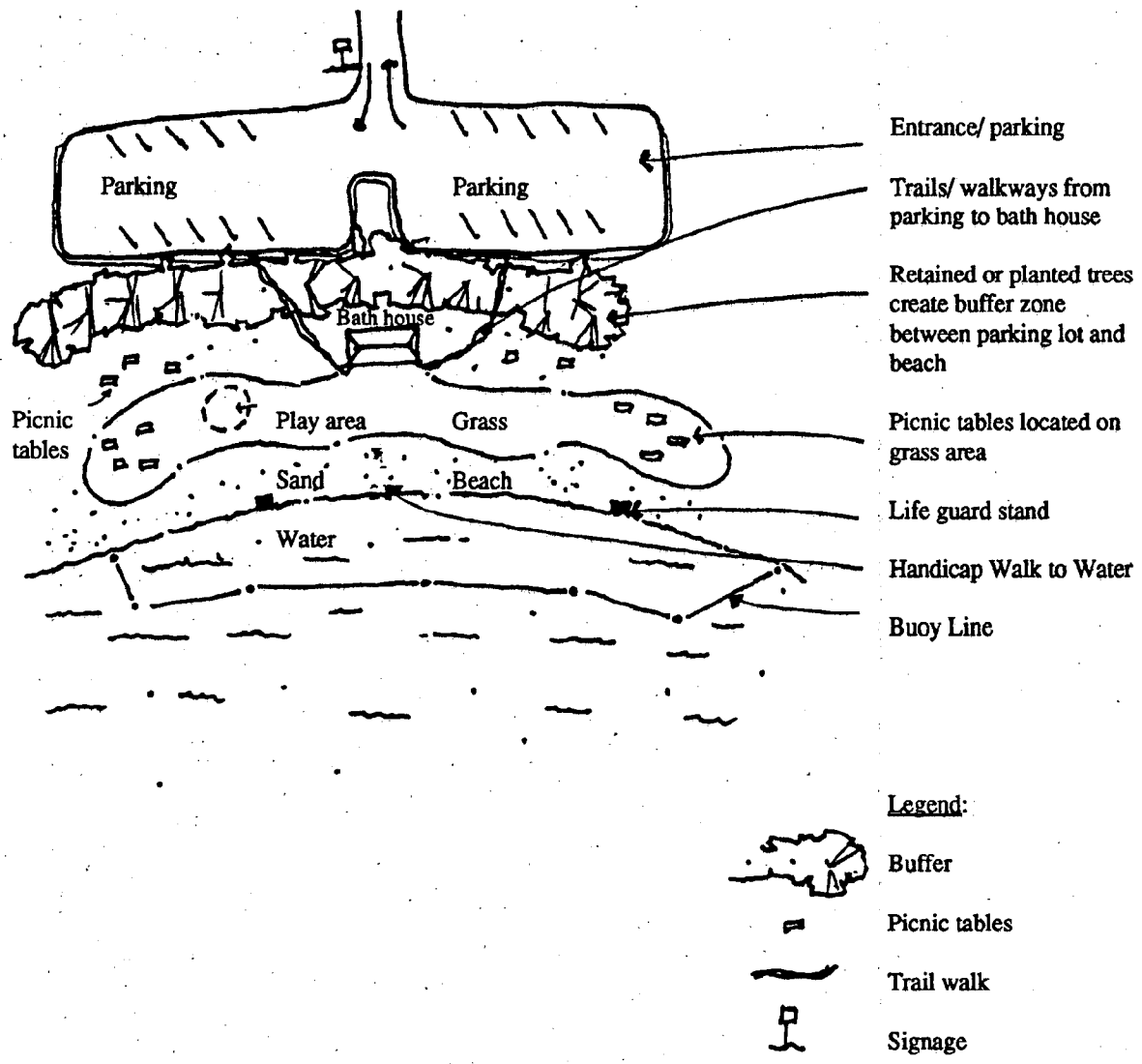
The land requirements for the development of beach access are entirely resource dependent. For example, the size and condition of the beach being considered for development determines the number of visitors and the size and type of support facilities which the site can effectively serve. In determining the land requirements for a potential beach access area, it is not only imperative to assess the potential capacity of the beach and adjacent support lands but also the anticipated use of the beach, i.e., as a "local" beach or a "tourist" beach.

a) <u>Area Requirements</u>

The anticipated visitation levels and user patterns can be determined from visitation records, observation of existing use, and user survey data sources at existing beaches. For new beach sites, the visitation trends at similar areas in other locations could be used to determine the appropriate size requirements for the beach site and support facilities. On the average, 50 square feet of sand and 50 square feet of swimming area per person are ideal. Thirty square feet per person for the swimming area is minimal.

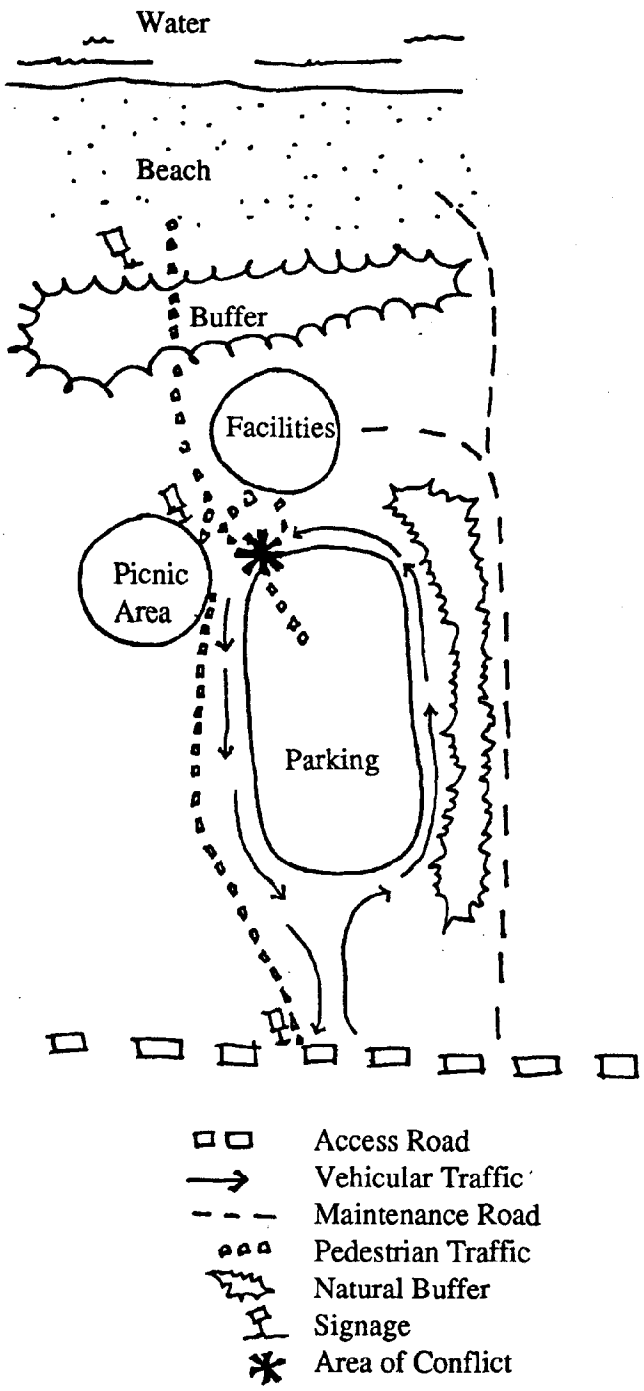
- Parking spaces
- Restroom facilities -

Figure: III-2
Beach/Swimming Access Schematic Plan



Source: Recreation Planning & Design Criteria, U.S. Army Corps of Engineers, July, 1989.

Figure: III-3
Concept Layout for Beach/Swimming Access



1 service sink/facility
toilets - 1/50 men
1/50 women
sinks - 1/50 men
1/50 women
1 drinking fountain/1,000

- Shower stalls -

for an outside shower,
1 per 50 visitors, or
for an inside shower,
1 per every 50 visitors of each sex

b) Water Depth and Subsurface Conditions

Figure: III-4 shows the desired subsurface conditions for swimming beaches. Slopes in the underwater portion of beaches should ideally range from 2% to 5%. Beach bottoms should exist or be designed to eliminate sudden changes in grade or drop-offs with depths of up to 5 feet. Steeper slopes tend to crowd swimmers together, making it more difficult for lifeguards to watch individual swimmers.

c) Vehicular Considerations

Proposed beach sites should only be developed where vehicle access is feasible and where the entrances can be controlled or separated from other area uses. Access to a beach in a multi-use area should not interfere with the other uses, create safety hazards, or adversely impact the area. Access roads to beach parking areas should meet appropriate secondary road standards. Width of roads should be at least 20 feet and shoulders or berms at least 3 feet wide. Guardrails or posts should be provided on 6 foot centers for embankments over six feet in height. Proper traffic signs should be posted. Vehicular access is also necessary to the lifeguard building and to beach areas for emergency vehicles.

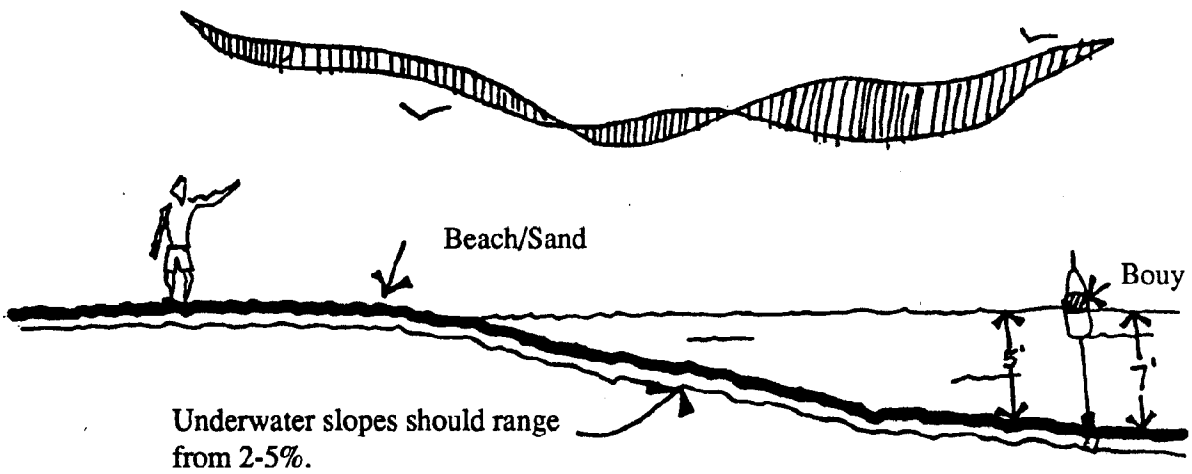
Parking

Parking areas should be located within 800 feet of the beach, with 500 feet being desirable provided the water resource and vegetation adjacent to the shoreline is protected. Parking should not impact the beach resource or vegetation which protects the shoreline area. The size of the parking should be determined from the projected visitor capacities and size of site. In general, one parking space should be provided for every three visitors. Additional parking may be required where multiple use activities are provided. The layout of the parking area should minimize pedestrian conflict with vehicular areas and circulation. The standard parking layout for compact and conventional types of automobiles is 150 cars per acre. The spacing of parking lanes should be 10 feet by 20 feet with a 25 foot turning strip between the two parking lanes for a total of 65 feet from end of car to end of car. Parking areas should be paved and marked with bumper blocks and guardrails or posts. An adequate number of parking spaces should be provided for the physically handicapped. These spaces should be connected to a walkway leading to the swimming area.

d) Pedestrian Consideration

Walkways, ramps, and stairs which are separate from vehicular circulation patterns should be provided between parking areas, other support facilities, and the beach area. Slope, width, and handrails should be considered when

Figure: III-4
Water Depth and Subsurface Condtions



Source: Recreation Planning & Design Criteria, U.S. Army Corps of Engineers, July, 1989.

designing these features. Access for the physically handicapped should be a walkway at least 4 feet wide with a slope not greater than 5 percent. A handrail should be provided to aid handicapped persons gain easy access to the swimming area. If appropriate, a swimming area for the physically handicapped should be marked off at the end of the walkway (**Figure: III-5**). To protect dunes along the shoreline, it may be necessary to provide a series of ramp walkways to accomodate pedestrian access across the dunes without disturbing the dune's natural features or the natural protection offered by the dune buffer.

e) Special Development Requirements

1) Unique Requirements

The beach should be sited to ensure maximum solar exposure. Western exposures, however, should be avoided if possible to reduce afternoon glare. Designated swimming areas should be planned to provide protection from boats, fuel spillage, and boat wakes. Consideration should also be given to siting the beach at an angle to the prevailing winds to prevent the accumulation of debris. The beach site should not be located in areas with strong currents that may cause sand loss, deposit silt, create drop-offs, or provide a hazard to swimmers.

*Beach Construction (**Figure: III-6**)*

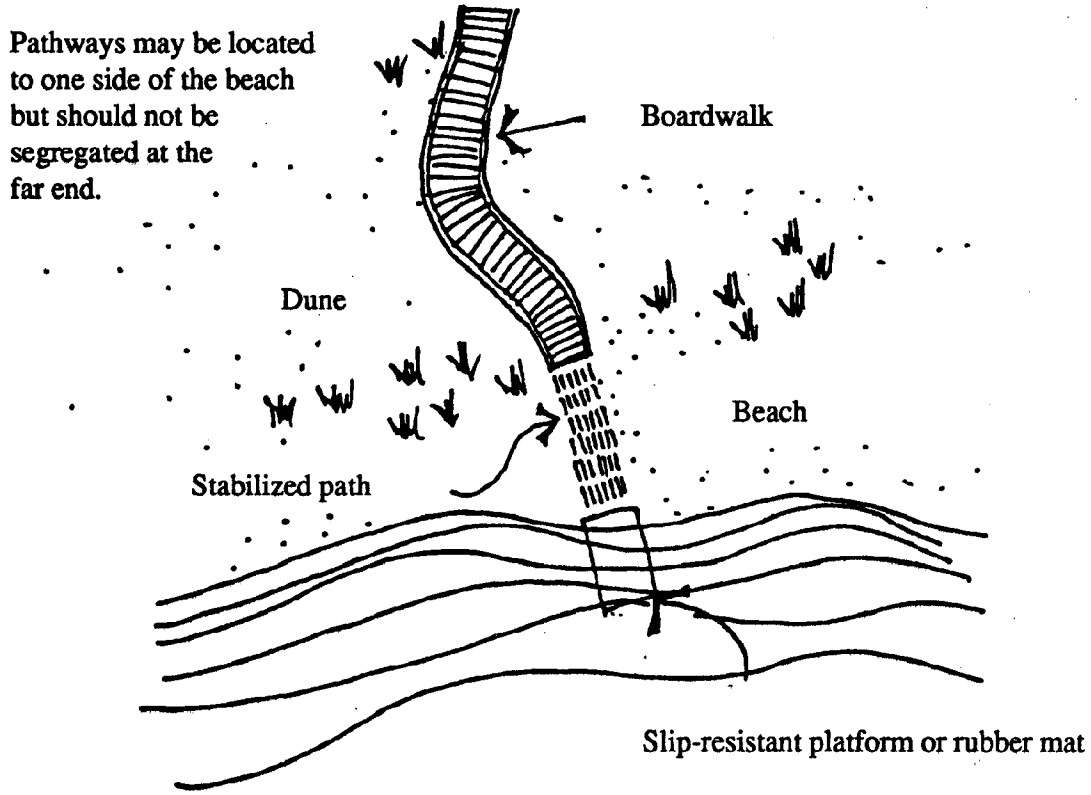
When a natural sandy tidal beach is not available, a beach may be constructed on an appropriate site. A detailed survey and inspection of the area is required upon which grading requirements will be established. All trees and stumps along the beach should be removed and holes and depressions filled with granular materials, such as sand, gravel, or crushed stone for adequate filtration. The upper limits of graded areas should be based on an analysis of the daily, seasonal, or yearly water level fluctuations. The lower limits should be 6 vertical feet below the M.L.W. The beach and adjacent underwater areas should be graded on a constant slope ranging from 2% to 5%. Underwater slopes should extend at least 10 horizontal feet beyond the lowest placement of buoy lines. Any fill required to bring the surface to proper grade should be constructed with granular material. Coarse sand shall be placed in areas that do not have adequate natural beach within the designated site. Six inches of sand in excess of the design thickness should be specified to control final grades. Sand should be placed on a stone base to a uniform thickness to reduce turbidity. A layer of non-woven filter fabric may be placed on the base prior to sand placement. A minimum depth of 2 feet of sand should be applied on all above water beach areas.

Beach Change Shelters

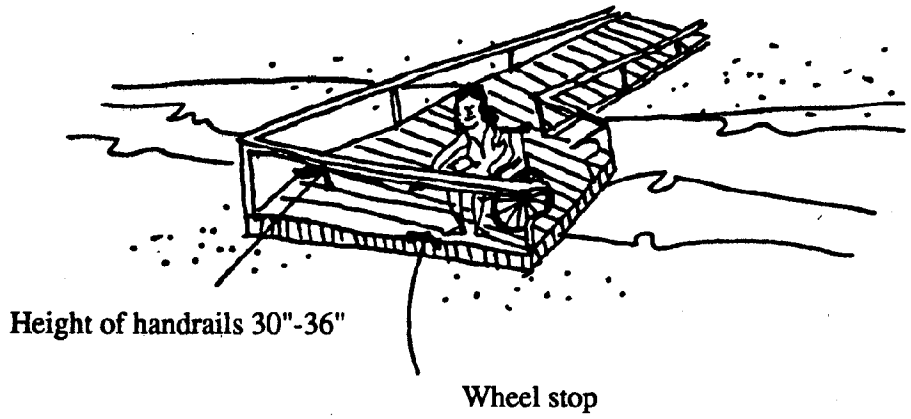
A minimum of one bath change shelter should be provided for each swimming area. These change houses should be between 200 and 500 feet from the water's edge and should meet local and state regulations relating to Bay development. Whenever possible, dressing rooms should be combined with, or located adjacent to sanitary facilities and showers. Interiors of bathhouses should be constructed of an easily cleaned material and floors should have a non-slip surface, impervious to moisture and sloped to drain. Open air or outdoor showers should be used where practical to reduce cost. If an open air facility is the only facility provided, a 3 to 4 foot roof shelter may be considered for protection from rain. All bathhouses or shelters should be designed for pressure hose cleaning.

Figure III-5
Pedestrian Access for Swimming/Beach Sites

Accessible Pathway From Parking to Beach

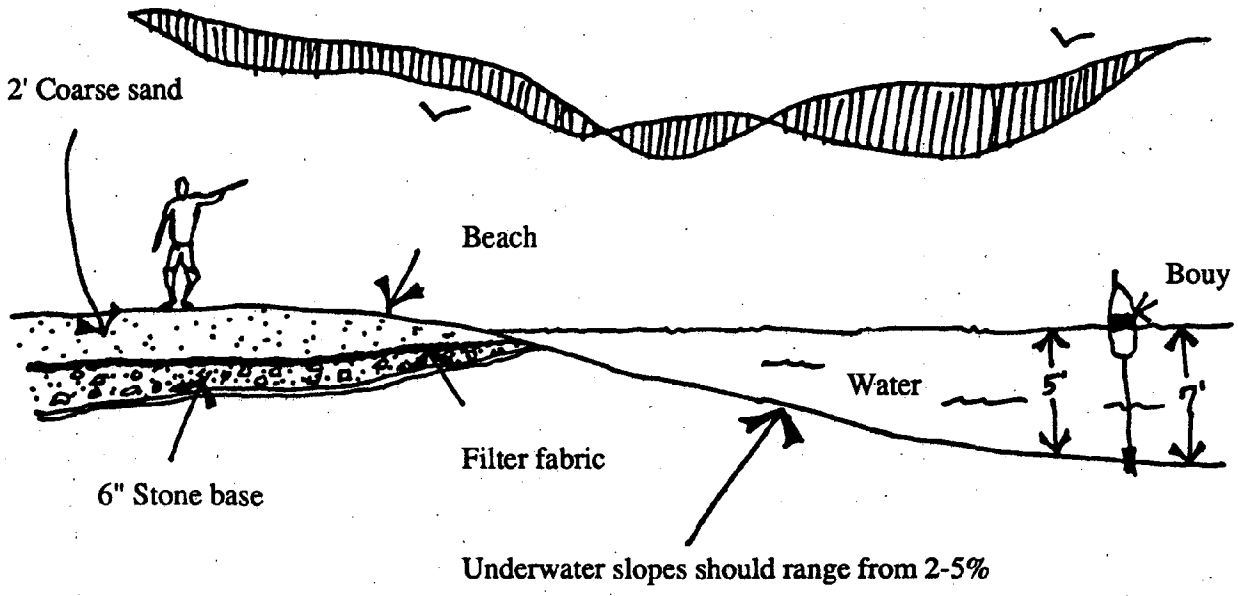


Accessible Swimming Platform



Source: A Guide to Designing Accessible Outdoor Recreation Facilities, Heritage Conservation and Recreation Service, Department of the Interior, January, 1980.

Figure: III-6
Beach Construction



Source: Recreation Planning & Design Criteria, U.S. Army Corps of Engineers, July, 1987.

Sports, Play Areas, and Pedestrian Walkways

Active play areas for all age groups, with consideration for the handicapped, may be desirable in conjunction with beaches. This provision can best be accomplished by designating the necessary space for users to participate or spectate in an area that will minimize impacts on the environment. Where feasible, these play areas should be located in conjunction with other supporting facilities such as parking, restrooms, water, and trash receptacles. Additional support items to consider are benches, water fountains, trails, fencing, etc.

Play areas should be designed and located in areas which do not require the pedestrian to cross vehicular roads to reach the facility. If road crossings cannot be avoided, play areas should be located so that necessary crossings occur where there is adequate stopping distance along the roadway. Pedestrian crossings should be adequately signed and well defined. Speed control devices such as rumble strips or speed bumps may be used if necessary. Deck construction may be implemented to avoid impact to environmentally sensitive areas particularly across vegetation, marshland, and dunes adjacent to the beach area.

Buffer Zones

Beaches including turf sunbathing areas should be separated from parking areas with an adequate grass buffer. Trees should be left to provide shade in the turf areas adjacent to sand beaches. If surface runoff is anticipated to be heavy, diversion contouring or ditches should be designed to divert flow toward stormwater management facilities. Picnicking facilities should not be located in the buffer area; however, if these facilities are included within the beach area, they should be located so as not to interfere with beach activities. In general, plant material should be used to effectively screen parking areas as well as adjacent residential and other potentially impacted land uses from exposed facility areas, and to maintain and enhance the natural character of the landscape.

Other Shelters/Lifeguard Stands

Lifeguard and first aid stations should be incorporated at all public beach sites. Elevated lifeguard stands should be located to provide a complete view of swimmers. A lifeguard stand or platform at least 6 feet high should be located at 200 foot intervals along the beach. It should be equipped with an umbrella and a storage compartment for a first aid kit and other supplies. Lifeguard facilities and first aid stations should be located in the same building, if possible. First aid equipment, a telephone, and emergency numbers should be accessible to the lifeguards and the public.

Buoys and Markers

The limits of the swimming area should be designated with buoy lines or foam filled floated pipe lines where feasible. The PVC pipe buoy is preferred in beach areas that will experience heavy traffic. Larger beaches may be divided into one or two sections so that the appropriate number of sections may be opened as needed during peak use hours or days. International orange colored floats should be provided every 15 feet on buoy lines or at all angles when PVC pipe is used. No lines should be anchored to trees, rocks, or walls. Hazardous areas such as shallow water should be marked off-limits for swimmers by buoy lines or floating pipelines.

Ideally, buoy lines used to mark the limit of the swimming area should be placed in water depths of 5 feet or less. However, where the water level fluctuates, the buoy line may need to be placed in a deeper area so that swimming areas would not be severely limited during low tide. In areas where the water level fluctuates significantly, buoy lines must be designed so they can be adjusted as necessary. A minimum of two warning marked buoys or floating signs indicating the "boats keep out" symbol (diamond shape and international orange) should be spaced at a maximum of 200 foot intervals to warn vessels approaching the swimming area. The buoys should be located between 100 and 300 feet from the swimming area buoy lines.

Signage

Signs should be provided only where needed to regulate traffic, warn of hazardous conditions, establish restrictions, or provide emergency contact information.

Additional Safety Measures

Life saving devices consisting of life jugs, a ring buoy and line, and one 10 to 12 foot pole (shepherd's hook) every 200 feet may be located in beaches where lifeguards are not provided. In larger beach areas a small craft or raft may also be located at the lifeguard station. Depth gauge poles should be placed at regular intervals along buoy lines. Bulletin boards or signs should be located where swimmers can see them before entering the area. Emergency phone numbers and safety messages should also be posted in conspicuous places.

2) Electricity

Electricity should be provided as necessary to support the safe use of the beach and swimming facility. The location of electrical lines may affect the aesthetics, costs, and management of the site. Consideration should be given to the costs of installing, operating, and maintaining the electrical systems. All proposed systems must meet state and local codes and standards for health and safety. Normally, all utility lines should be placed underground unless special conditions make such an installation prohibitive. Underground utilities should be located outside the roadway to avoid any disturbance to traffic during utility maintenance activities. If electric and telephone lines are located underground, they may be placed in a common trench.

Lines between use areas and lines from site boundaries to use areas can be placed above ground only if they do not interfere with safety, maintenance, or aesthetics. Overhead power lines should be aligned behind forest cover out of view where feasible.

Lighting for safety and security should be incorporated into the design of the facility. All major road intersections and major facilities such as parking areas, restrooms, group shelters, and walkways should have adequate lights when available.

Telephones should be available for emergency use. Public pay phones may also be provided in public use areas. If the lines must be located above ground and cross a road right-of-way, this should be considered in location and design of the road.

3) Water Supply and Distribution System

Water supply and distribution systems should be provided at all beach sites. Water supply systems serving recreational areas are similar in some respects to rural community systems. As a rule, they are rather compact, have branching type distribution piping, and must respond to widely varying water use rates which may be affected by many variables including state/local regulations, location, visitation, and seasonal requirements. Water lines should be located underground and should be outside the road right-of-way. Water supply and distribution systems must meet all federal, state, and local requirements for health and safety. Water lines should be placed in a separate trench from power and telephone lines. Potable water should be used in all supply systems with municipal or public systems supplying water whenever feasible. If municipal systems are not available, the second most desirable source of water is wells.

4) Sewage Disposal/Restrooms

All beaches with an expected visitor use of 400 or more per weekend day should have waterborne toilets. When such toilets are considered, a well or other water supply system must be provided to supply 10 gallons per user day. Where waterborne toilets and showers are present, the water supply requirements will increase to 25 gallons per user day. Sanitary sewers or sewage containment or treatment facilities should be adequately sized according to visitation data. All designs for water supply, sewer, and wastewater systems must be in accordance with state and local health requirements. User safety and environmental impacts should be considered in siting these structures in order to minimize the need for the user to cross roads.

The most desirable method for sewage disposal is to tie into a public or municipal system. Where municipal waste treatment systems are not available, an on-site treatment and disposal or a holding tank and pump out facility may be used. Land treatment should be evaluated as an alternative to any positive discharge treatment system. The design and specifications for sewage disposal systems is site specific. The selected system must be cost effective and meet all required state and local standards. Accurate visitation projections are required to determine sewage flow levels. Sewage disposal for beach access areas are generally associated with the restroom and shower facilities.

5) Stormwater Management

Stormwater runoff must be given special attention during the planning and design of a beach site. Surface runoff must not be allowed to drain across the beach area; therefore, the runoff from any area including parking areas upland of the beach must be diverted. Methods of diversion might include grassed swales, terracing, and inlets. The use of porous gravel or perforated block surfacing for parking and roadway areas is also encouraged. Any method used to divert the surface runoff away from the beach area should complement the beach development and minimize impact to the site.

Outfall of the diversion of the treated stormwater should be located downstream of the swimming beach or contained in a holding pond and allowed to percolate into the soil. The potential runoff from agricultural activities within the watershed should be considered when locating a beach site as these activities may impact the water quality for swimming.

C. MANAGEMENT/ MAINTENANCE

1. Maintenance Conerns

Beach areas, buildings, grounds, access facilities, and utilities require pre-seasonal and post-seasonal attention as well as peridoic maintenance during the bathing season. When beaches and support facilities are subject to frequent or sudden fluctuations of water level or flooding, particularly in the winter or early spring, the importance of regular maintenance is magnified.

Swimming Areas

The following is typical of the kind of maintenance performed at successful swimming facilities:

- Beach and swimming areas should be checked each day before opening, with areas that have been designated for wading, diving, or for use by the physically handicapped given particular attention.

- The swimming area should also be inspected at least weekly and after each severe storm or flood to assure safe slope and placement of sand and that the area is free of holes, drop-offs, or submerged debris which may endanger bathers. Immediate steps should be taken to remove a hazard or to rope off or sign potentially dangerous areas. Swimmers should be precluded from using any area which is not safe and should be notified of currents, waves, and storm conditions which may be hazardous.

- The swimming area facilities and equipment, including the cable buoy line or floating pipe line, depth indicators, "No Swimming Zone" buoys, first aid supplies, etc., should be inspected at least weekly to ensure they are in place and are in a safe condition.

- Seaweed and algae growth accumulations, as well as floating logs and other debris, should be removed from the swimming area.

- To prevent ice damage, floating structures should be removed from the water during the off season.

- Water samples shall be taken periodically and analyzed as required by the appropriate state and/or local health department. Beaches should be promptly closed when they are determined to be unsuitable for safe use.

- A light coating of sand should be placed on concreted swimming areas (if they are provided) to improve footing and break up the algae.

Buildings

- Use non-slip coatings to treat floors of bathhouses, concession areas, lifeguard stands, and offices.
- Clean public use areas in buildings at least daily during the recreation season. Bathhouse floors and sanitary facilities should be cleaned near closing time each day.
- Keep comfort stations equipped with disposable supplies.
- Periodically spray or otherwise treat buildings, inside and out, to control insects. Agents should not be used in such a manner as to be harmful to humans or pets.
- Inspect buildings periodically and lifeguard stands daily for structural defects and have them repaired promptly.
- Food processing, drinking water systems, and sewage systems shall be monitored and maintained to meet the appropriate state and local health requirements.

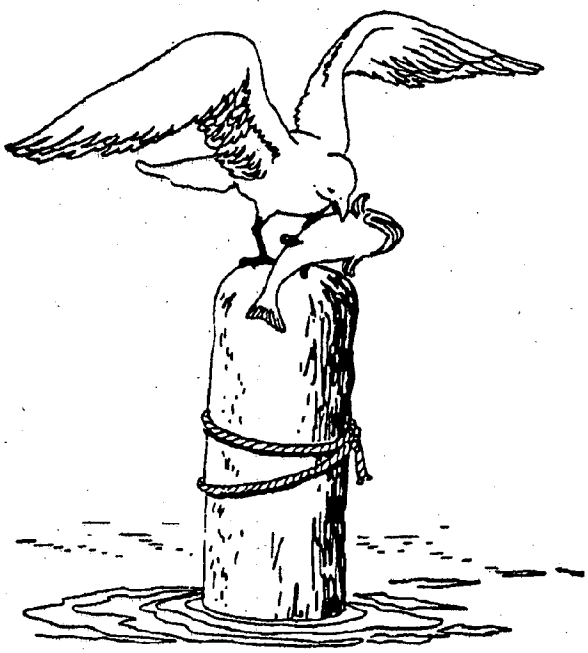
Grounds and Facilities

- Clean up litter as required, but usually not less than daily during the peak recreation season.
- Place trash containers at comfort stations and at convenient locations throughout the beach area.
- Provide and keep in place tight fitting lids on all trash containers.
- Keep grass cut to a height of 2 to 2 1/2 inches in turf areas and use only approved chemicals for weed control. Any use of chemicals to control weeds should be under the supervision of a trained and licensed person.
- Maintain and replenish sand beach surface each year or as needed to replace that which is washed away or displaced.
- Roads and parking lots shall be kept clean and in good repair, parking spaces defined, traffic regulatory signs in place, and traffic appropriately restricted from the beach area. Provisions should be made for emergency vehicles to be driven to the beach area, if needed.
- Insure that the public is not endangered by the operation of mechanical beach cleaners, lawn mowers, or other equipment used on the site.
- Inspect warning and information signs regularly, keeping them maintained,in place, in good repair, and legible.
- Ditching or contouring shall be arranged to divert surface run-off away from the beach.
- All utilities should be inspected before each season and regularly during the season with repairs made promptly by qualified personnel.

2. Management Concerns

Managers should develop year-round operating procedures to ensure safe and healthful beach conditions and to support facilities, such as comfort stations, bathhouses, concession buildings, parking areas, walkways, and access roads. Trained staff, including maintenance personnel and lifeguards (if provided), are required to ensure that adequate supervision, inspection, control, and enforcement are provided to ensure the safety of the public. Competent beach supervisors are essential to proper beach management. Periodic training for supervisors in beach management is strongly encouraged.

Perhaps the most critical factor in designing for minimal grounds maintenance is the selection of appropriate plant materials. Native trees and shrubs should be chosen and allowed to develop into their natural form without pruning or shearing. Areas naturally vegetated on-site should be retained as buffer areas which will require minimal upkeep.



IV. Pier and Bank Fishing Access 1

A. SITE SELECTION

The selection and evaluation of a site for fishing activities should consider environmental factors including the existing fish habitat, the amount of shore frontage, projected visitation, accessibility, slope gradient, historical shoreline erosion rates, wind and wave action, water level and tidal fluctuations, and the currents and tides. The availability of land for parking, picnicking, play areas, and other support facilities which are not water-dependent should also be considered during the evaluation, selection, and development of a fishing access site. In selecting an access site for pier and bank fishing, one of the most important criteria is the availability of fish for catch in the immediate vicinity of the site.

1. User Considerations

The planning of public fishing access sites should consider public needs along with the level of user activity, facility requirements, and management duties required to fulfill those needs. Section I of this report describes the process and resources available for assessing the general need for public access.

The user considerations in locating a fishing access site include an evaluation of the site to gain information on the extent, nature, location and quality of the existing water body and fish resources. Fish species, population, sizes, and characteristics should be determined prior to site development. An assessment is needed to determine if there are enough fish in the area and if the fish population may be sustained by natural reproduction, or will require stocking.

2. Environmental Considerations

Potential environmental impacts due to fishing activity and related facility development must be considered prior to the development of access sites. The evaluation of environmental factors should begin with a thorough inventory of the potential access site. Data which relates to the topography, soils, surface water hydrology, vegetation, wildlife habitat areas, and existing wetlands should be collected. This information should then be reviewed to verify the suitability of a site for development.

a) Topography

Shoreline areas with flat to rolling slopes of less than 15% and suitable soils based on standard classifications related to proposed uses are generally preferable for fishing access development.

b) Soils and Substrate Materials

Physical considerations at the site include the assessment of soil geology and substrate materials. The nature, extent, and cost of the substructures necessary for site facilities must be determined based on the soil types. Test piles and direct soil evaluation tests are two commonly used methods for determining the resistive quality

of subsoils. Soil conditions should provide suitable foundation support and waste water treatment capacity, if existing sewage facilities are not already available to the site.

Shoreline erosion should be a major consideration in siting locations for bank and pier fishing. Access sites along shoreline areas should be avoided where existing erosion rates exceed 2 feet/year. In general, banks that are composed of easily erodible sediments and are subjected to high wave energy will have the greatest susceptibility to erosion. Facility structures located within or near these highly erodible shorelines may be impacted by wave action and require continuous maintenance or the implementation of erosion protection.

c) Surface Water Hydrology

Provided an adequate surface drainage plan is adopted, normal precipitation presents no serious problem in fishing access site design. Waters from a maximum probable rainfall should drain from the site without eroding the adjacent land or causing additional runoff in the Bay and its tributaries. Inflows from surrounding lands may need to be diverted or retained on site for infiltration as a part of the drainage plan.

d) Vegetation/Wildlife/Habitat Areas

The potential for adverse impact is directly related to the proximity of the access point to existing vegetation, waterfowl, and wildlife habitat areas. State agencies dealing with wildlife and rare, threatened, and endangered species, as well as the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, can help to identify significant areas of habitat.

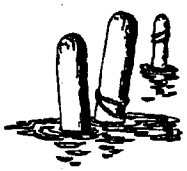
Adjacent to the water body, a 100 foot buffer area of vegetation is recommended. This buffer is effective in retarding runoff, preventing erosion, filtering nonpoint pollution from runoff, and reducing sediments which enter the water. The buffer area can also help to maintain established habitat on the site.

e) Water Quality

The location of a public fishing pier may not affect the existing water quality if appropriate sanitary facilities and fish cleaning areas are incorporated in the development of pier and bank fishing access areas. However, the existing water quality should be assessed based on its desirability for fishing prior to the development of the fishing access site.

f) Wetland Delineation

To avoid potential impacts, the identification and delineation of tidal and non-tidal wetlands should be determined by an on-site visit. The National Wetland Inventory maps produced by the U.S. Fish and Wildlife Service may also be useful in the general location of existing wetlands. The Combined Federal Wetland Delineation Methodology should then be followed for the site specific designation of wetland areas. This approach is a systematic approach which considers soils, hydrology, and vegetative characteristics of a site.



g) Cultural Resources

For each potential access site, cultural resources should be evaluated for historical significance. A site may be listed, nominated, or eligible for listing on the National Register of Historic Places. The historic or archaeological significance of a site may not be obvious; therefore, the State Historic Preservation Officer should be contacted prior to site development.

h) Other Considerations

Other site features and related off-shore conditions appropriate for inclusion in the environmental inventory may relate to:

Wading

Wading into the water creates a disturbance for other fishermen and disrupts banks and underwater surfaces, thus causing damage to aquatic life. Wading in areas with shellfish may also be hazardous to fishermen if they do not wear hard soled shoes.

Submerged Aquatic Vegetation (SAV)

SAV areas near the shoreline of a proposed bank fishing access development site should be delineated and avoided. These areas provide shelter and food to marine life and should not be disturbed.

Scenic and Visual Opportunities

The identification of good and poor views both on-site and off-site should be considered. An overall visual analysis of the site may be necessary for the ultimate preservation of visual quality.

Piers

Piers should be provided in high use areas and in areas where the shoreline is inappropriate for bank fishing due to shallow waters close to the shoreline or to banks with concentrated aquatic vegetation along the shoreline.

Storms

The history of storms, their frequency, and intensity may be significant information in considering a site for development, particularly along unprotected waterways. The National Weather Bureau may be contacted to determine the vulnerability an area has with regard to storms. The state agency administering the National Flood Insurance Program can also provide valuable information.

Wind

Predominant wind patterns and the orientation of the shoreline are extremely important, as these factors can combine to create an area that is not conducive for fishing and can also cause accelerated erosion to the shoreline.

i) Site Limitations

In order to determine the fishing capacity of a given area of the Bay, characteristics of the water body and the spatial requirements of the activity should be considered. Bank fishing capacity is affected by the size of the water body, depth closure, and shoreline configuration. Shoreline configuration determines the extent of usable space along the shoreline.

A site analysis which outlines the physical opportunities and constraints for a property should be conducted. This analysis may simply involve overlaying the identified environmental factors and evaluating the overall conditions of the site, noting areas which are not suitable for development.

Desirable Site Characteristics Include:

- Good transportation network and secondary road system to the site location.
- Location near the population need.
- Location near public water supply, sewage treatment, and other utilities.
- Ease of accessibility from on-site to the fishing resource.
- Natural protection for the fishing resource such as a site protected by existing vegetation or a location in a cove.
- Tidal and water current conditions which are acceptable for fishing.
- Location which has not historically received severe storm activity.
- Good water circulation and flushing.
- Location free of severe shoreline erosion or steep slopes.
- Natural buffer zone along shoreline for facilities which are not water-dependent.

Undesirable Site Characteristics Include:

- Location where the water is too shallow or the land area is unsuitable for intended use.
- Low tidal range or flow and low flushing rates, such as dead end channels or the upper reaches of tidal creeks.
- Steep slopes (>15%) and areas receiving heavy drainage.
- Highly erodible soils and shorelines which erode at a rate greater than 2 feet/year.
- Wind and wave patterns which cause erosion and/or unacceptable fishing conditions.
- Location near land uses or other conditions which may contribute to poor water quality.
- Location which has underwater hazards that cannot be corrected without grading or dredging.
- Locations near areas of heavy boating traffic.

j) Compatibility Issues

The internal compatibility of a fishing access site with other types of public access is dependent on site characteristics and resource values. Aquatic growth necessary for fish cover and

sustaining the aquatic food chain conflict with boating and swimming; therefore, pier and bank fishing are often most compatible with natural areas.

External compatibility of fishing access facilities with adjacent land uses is an important consideration. In general, fishing access should be located in areas convenient to population centers. Support facilities, such as shopping, restaurants, grocery stores, emergency services, bait and tackle shops, service stations, and utilities, should be located along the primary access route to the site.

k) Impact on Off-Shore Aquatic Systems

Impact to the bottom of the water body adjacent to the shoreline area should be assessed for the following reasons:

- When shore erosion control structures are implemented for a site they may have adverse impact on fish spawning areas or shellfish beds, etc., due to the filling of wetlands or the bottom of the shoreline.

- The disturbance of the bottom sediments may adversely affect water quality which impacts productive fishery habitat and SAV beds if they are located nearby.

B. DESIGN CRITERIA

1. Site Plan Layout

The priorities in the design and site layout for a fishing site include the enjoyment and safety of the user, the effects that the physical features of the site will have on the environment, and future operation and maintenance considerations. Provisions for preserving a high quality aquatic habitat on the site should include avoiding construction on or near the habitat areas, maintaining vegetative buffer strips along the waters, and revegetating disturbed areas.

2. Essential Elements and Desired Relationships

The essential elements which will most likely be included for all fishing access sites include access to the site, adequate shore frontage, direct access to the water, adequate parking, picnicking areas, and support and maintenance facilities. These elements and their preferred relationships are depicted in a schematic plan, **Figure: IV-1**.

A concept plan depicting the general relationship of the selected site elements may be helpful to establish the overall site plan layout. A concept plan which expresses preferred site relationships is shown in **Figure: IV-2.**

Recommendations which may enhance the relationships between the essential elements shown on the concept plan may include:

- Location of parking and support facilities which are not water-dependent outside the recommended shoreline buffer areas.

- For large and highly visible facilities, parking areas can be enhanced by shrub and tree islands with little loss of storage capacity.

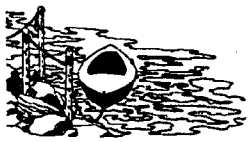
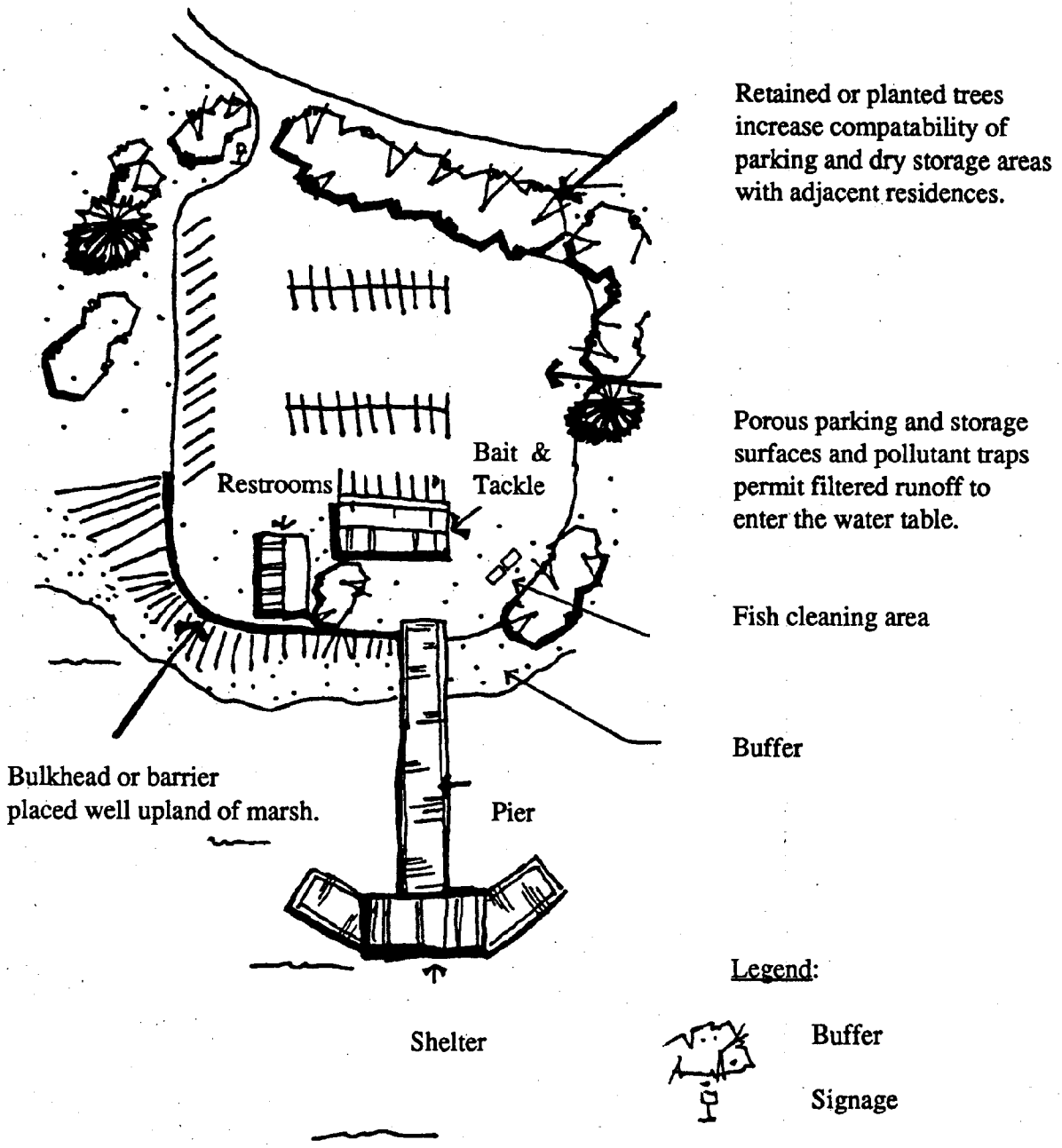


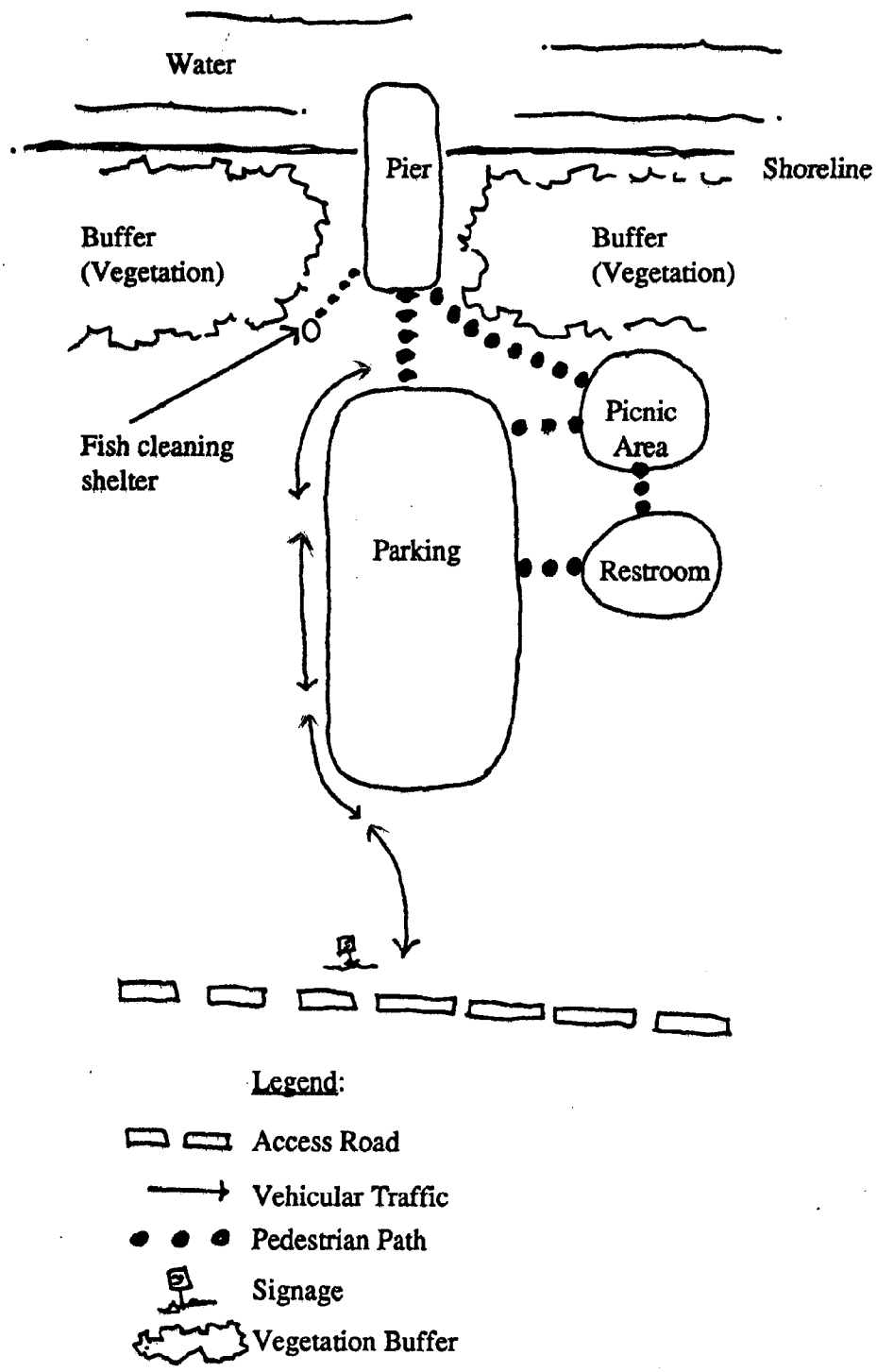
Figure: IV-1

Pier and Bank Fishing Access Schematic Plan



Source: Recreation Planning & Design Criteria, U.S. Army Corps of Engineers, July, 1987.

Figure: IV-2
Concept Layout for Pier and Bank Fishing Access



- Where steeper slopes exist, locate parking areas above the crests to avoid extensive regrading and maintain or reestablish the natural vegetation on the hillside. Also, stabilize the toe of the slope to prevent erosion.

- Where steep slopes to a water body exist, use of pier access is recommended.

- The scale, species, and spacing of plants should be compatible with those of the surrounding, undisturbed shoreline areas.

- Site grading should be implemented to create rounded earth forms compatible with those of the natural shoreline.

- Development of fish access areas should protect and enhance views and visual access to water and shorelines.

- Pollution along a water body should be examined.

- The availability of utilities to the site should be considered on larger access sites where facilities are essential for site development.

3. Land Requirements

The land requirements for the development of fishing access are entirely resource dependent. For example, the size and physical characteristics of the site being considered for development determines the number of visitors and the size and type of support facilities which the site can effectively serve. In determining the land requirements for a potential fishing access area, it is imperative to assess the carrying capacity of the site and the adjacent lands to preserve the integrity of the fishing resource.

The land requirements determined for proposed facilities may be applied to a site based on the environmental considerations and site limitations considered during the site inventory and needs assessment.

a) Area Requirements

The anticipated visitation levels and user patterns can be determined from visitation records, observation of existing use, and user survey data sources at existing fishing sites. For new fishing sites, the visitation trends at similar areas in other locations could be used to determine the appropriate size requirements for the site and support facilities.

Generally, the minimum river width for fishing is about 30 feet with a safe casting area of 15 feet of clear space behind the angler. The number of anglers able to use a stretch of water at one time varies according to water quality and type of fishing. An acceptable spacing for recreational anglers along a bank is approximately 20 yards apart.

The site from which casting takes place must be on firm, level ground covered with short grass or sand. The casting area must be clear of trees but some bushes and trees suitably located near the water may provide adequate cover. A surrounding woodland environment for fishing will tend to reduce the outside noise and increase the seclusion of the area, which is preferred by most anglers.

b) Water Depth and Subsurface Conditions

An assessment of the water depth and subsurface conditions at a proposed fishing access site is necessary to determine fishing activity. Water depth should be a minimum of 2 feet at low tide. Different fish species prefer and are attracted to specific habitats; therefore, various characteristics for consideration include water current, water clarity, water depth, numbers and types of aquatic plants, and the nature of subsurface material. A combination of these characteristics affords fish protection, food, and security and provides habitat diversity needed for desirable fishing conditions. Backwaters, marshes, and sandbars should receive special management protection because of their importance as fish spawning and nursery grounds.

c) Vehicular Considerations

Vehicular entrances for proposed fishing sites should be separated from and should not adversely impact other uses. External access roads to parking areas should meet appropriate secondary road standards with the road width of at least 20 feet and shoulders or berms at least 3 feet wide. Guardrails or posts should be provided on 6 foot centers along embankments over six feet in height. Proper traffic signs should be posted both inside and outside the site with access available for emergency vehicles.

Parking

Parking areas should be located within 800 feet of the shoreline, with 500 feet being desirable provided the water resource or vegetation adjacent to the shoreline is protected. Once the visitor capacity of the site is determined, parking should be provided at the rate of one parking space for every three visitors. The layout of the parking area should minimize pedestrian conflict with vehicular circulation. The spacing of parking lanes should be 10 by 20 feet with a 25 foot turning strip between the two parking lanes for a total of 65 feet from end of car to end of car. Based on these dimensions approximately 150 cars may be parked per acre of land. Parking areas should be appropriately surfaced and have parking stripes, bumper blocks, and guardrails or posts. An adequate number of parking spaces should be provided for the physically handicapped. These spaces should be connected to a handicapped accessible walkway leading to the fishing area.

d) Pedestrian Consideration

Separate pedestrian access should provide safe access to the fishing facilities. Walkways, ramps, and stairs which are separate from vehicular circulation patterns should be provided from the parking areas and other support facilities to the fishing area. Handicapped accessibility considerations including appropriate slope, walkway width, and handrails should be incorporated into the pedestrian design. The walkways should be designed with well defined edges and should be a minimum of 4 feet in width. Access for the physically handicapped should be a walkway constructed of a durable material at least 4 feet wide and have a slope not greater than 5 percent.

In cases of dune protection along the shoreline, it may be necessary to provide a series of raised walkways to accommodate access across the site without disturbing the natural dune. Raised walkways should be a minimum of 4 feet wide and constructed of treated wood and should be designed to provide handicapped

accessibility. When the on-site grade change is greater than 5%, handicap ramps should be provided to enhance accessibility to the site facilities. Crosswalks should be constructed with curb ramps on each side whenever they cross vehicular traffic patterns. Trails may be recommended in areas receiving less use. Trails may have varying widths and be constructed of several materials, providing they are constructed out of a suitable surface for street shoes and are handicapped accessible.

e) Special Development Requirements

1) Unique Requirements

Each access site requires a different combination of development features which relate to the uses planned and the anticipated level of use for the site. The following elements should be considered during site development:

Fishing Pier Construction

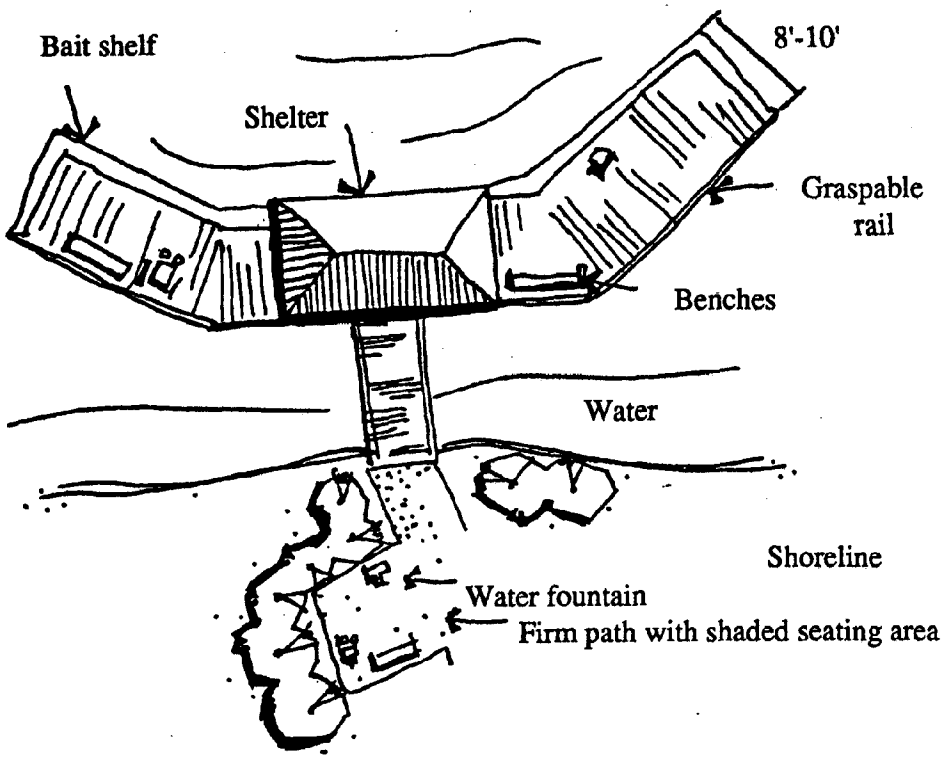
Wood for piers should be treated to retard decay. Pressure treated (CCA) wood is preferred because it can be ordered with various amounts of treatment and is durable over time. CCA wood that is in continuous contact with salt water should be treated to a level of 2.5 pounds of retention per cubic foot. Wood which will occasionally be in salt water should have 1.5 pounds per cubic foot retention, and wood that is rarely in contact with salt water should have 0.6 pounds per cubic foot. All hardware used in the pier construction should be hot dipped galvanized and, if in frequent contact with salt water, should be stainless steel to protect against rust.

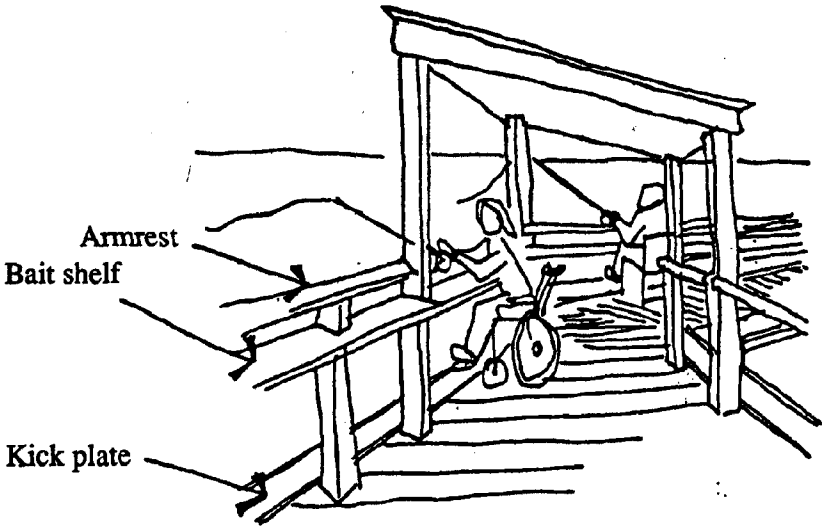
The design and construction of the fishing pier should be such that it will accommodate safe pedestrian use and be able to withstand typical storms for the area. One major consideration for pier construction is how the pilings will be installed. They can be driven with some type of pile driver, or pumped into place using high pressure jets of water from water pumps if the bottom is free of large rocks. This procedure is usually called "jetting" the pilings into place. The piling is held upright and a high pressure stream of water is used to loosen the soil around and under the piling. The piling continues to settle as the area is probed with the end of the nozzle. Once the piling has settled as far as it will go, or the proper depth has been obtained, rocks may need to be tamped around the piling to stabilize it. A piece of metal water pipe flattened on the end to increase velocity is usually satisfactory as a nozzle for this procedure.

Decking should overlap the stringers by no more than 2 inches to help keep the decking from flipping up in the event it comes loose and someone steps on the end. Overlapping the decking 2 inches also prevents most splitting of the decking when it is nailed in place. Spacing between planks on deck should be less than 1/2 inch apart.

Fishing piers should be designed to provide shade, space for gear, and benches. Fishing piers should be handicapped accessible by firm surfaced trails that are flush with the surface of the pier. Piers should also provide a bait shelf, 8 to 12 inches wide, and an arm/pole rest inclined about 30°. They should provide a 4 inch kickplate along the edge of the pier for safety. (see **Figure IV-3**)

Figure: IV-3
Fishing Piers





Source: A Guide to Designing Accessable Outdoor Recreation Facilities, Heritage Conservation and Recreation Service, Department of Interior, January, 1980.

Signage

Adequate signage should be posted to inform the public of the layout and regulations for the access site.

Solid Waste

Trash and garbage collection should be furnished by the locality or a privately owned refuse company. The provision of appropriately designed refuse containers and an adequate maintenance program are essential. Fish cleaning facilities should also be incorporated into these access areas.

Public Safety and Emergency Services

Local fire protection as well as local police security and emergency medical services should be available. Location of emergency services along with emergency telephone numbers should be posted in a visible area on the site and telephone service provided.

Play Areas

It is desirable, where possible, that other activities such as picnicking or play areas be provided near fishing areas. This provision can best be accomplished by designating the necessary space for users to participate or spectate in an area that will minimize impacts on the environment. These play areas should be located outside the designated buffer area in conjunction with other supporting facilities such as parking, restrooms, and water. Additional support items to consider are benches, trash receptacles, water fountains, trails, fencing, etc.

Play areas should be designed and located in areas which do not require the pedestrian to cross vehicular roads to reach the facility. If road crossings cannot be avoided, play areas should be located so that necessary crossings occur where there is adequate stopping distance and appropriate signage along the roadway. Speed control devices such as rumble strips or speed bumps may be used if necessary. Deck construction may be implemented to avoid impact to environmentally sensitive areas particularly across marshland, and dunes adjacent to the shoreline.

2) Electricity

Electricity should be provided as necessary to support the bank and pier fishing facility. The location of electrical lines may affect the aesthetics, costs, and management of the site. Consideration should be given to the costs of installing, operating, and maintaining the electrical systems. Proposed systems must meet all state and local codes and standards for health and safety. Normally, all utility lines should be placed underground unless special conditions make such an installation prohibitive. Underground utilities should be located outside the roadway to avoid any disturbance to traffic during utility maintenance activities. If electric and telephone lines are located underground, they may be placed in a common trench.

Lines between use areas and lines from site boundaries to use areas can be placed above ground only if they do not interfere with safety, maintenance, or aesthetics. Overhead power lines should be aligned behind forest cover and out of view, where feasible.

Lighting for safety and security should be incorporated into the design of the facility. All major road intersections and major facilities such as parking areas, restrooms, group shelters, and walkways, should have adequate lights.

Telephones should be available for emergency use and public pay phones should be provided in public use areas.

3) Water Supply and Distribution System

An adequate water supply and distribution system is desirable for providing public drinking water, fire protection, and for the maintenance and operation of the access facility. It is recommended that the water supply, treatment, and distribution be planned to correspond with wastewater collection, treatment, and disposal.

Wherever possible, fishing access facilities with high use levels should be connected to an approved external public water system. This feature will eliminate the development cost and annual operational expenses of the water supply and treatment facilities. If public water is not available, an on-site well is suggested.

The water supply and distribution system should be planned under the direction of a sanitary engineer and should meet local planning and health department requirements.

4) Sewage Disposal/Restrooms

The most desirable method for sewage disposal is to tie into a public or municipal system. Where municipal waste treatment systems are not available, an on-site treatment and disposal or a holding tank and pump out facility should be used. Land treatment should be evaluated as an alternative to any positive discharge treatment system. The design and specifications for sewage disposal systems is site-specific. The selected system must be cost effective and meet all required state and local standards. Accurate visitation projections are required to determine sewage volumes. The location and selection of sewage disposal should be in accordance with state and local regulations. Do not overlook the proper disposal of waste at any fish cleaning stations.

5) Stormwater Management

Parking areas may create potential environmental problems related to increased runoff and polluted discharge. Best management practices should be implemented during site development and after construction is completed to reduce these potential impacts. The following design measures may be incorporated into the site design for pier and bank fishing facilities to avoid or alleviate site runoff.

- Installation of catch basins and filters to trap pollutants.
- Avoidance of direct channeling of runoff water onto tidal wetlands or into adjacent water bodies.
- Use of porous gravel or a perforated paving block surfacing in place of impervious surfaces.

C. MANAGEMENT/ MAINTENANCE

Management and maintenance refers to agency actions needed to keep a facility in desirable condition for public use. Legal liabilities may be incurred in administering a fishing facility; therefore, the facility should be maintained in a safe condition. The administering agency of a facility is obligated to remove dangers and warn users of dangerous conditions. The legal responsibilities of the administrator should be researched and discussed with counsel when establishing or expanding a fishing facility. Legal obligations may increase in proportion to the potential dangers and if user fees are charged.

1. Maintenance Concerns

Good maintenance practices should be extended to the access waters and shoreline in addition to the access site facilities. The maintenance plan may be established as a matrix outlining the types of maintenance tasks and the frequency which a site would require this maintenance. Categories of maintenance frequency generally include frequent (weekly to daily), periodic (less than weekly), and special (as needed). The following maintenance duties should be considered in developing a maintenance plan:

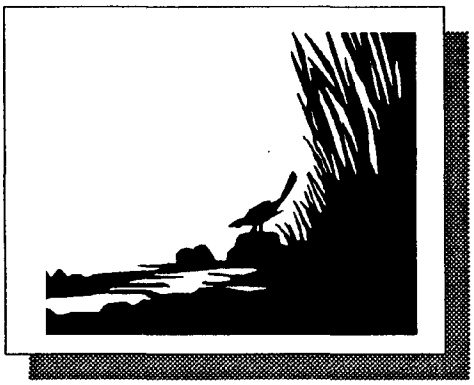
- Fishing pier maintenance
- Removal of shoreline and beach debris
- Restroom clean-up
- Fish cleaning shelter clean-up
- Maintain trash collection schedule
- Shoreline erosion control
- Parking/pavement access maintenance
- Signage maintenance
- Lighting maintenance
- Landscape maintenance/mowing
- Stormwater facility upkeep
- Seasonal upkeep - preseason inspections, regular inspection schedules, etc.
- Post storm cleanup plan

The level of maintenance anticipated at a site is directly correlated with the use level at the facility and the location of the site. Maintenance at public sites is an extremely important issue as it relates directly to the safe use of the facility. A public agency responsible for the operation and maintenance of a pier and bank fishing facility is responsible for any liability associated with safe maintenance practices at the site.

2. Management Concerns

The management of fishing access should provide a safe, comfortable environment for the angler. The management concerns for fishing access are dependent on the level of development and anticipated number of users at a particular site. Less active use areas will generally involve fewer management requirements, while larger, more active sites will require greater amounts of upkeep and a more detailed management plan.

V. Natural Area Access 1



A. SITE SELECTION

A natural area is generally land which has scientific or educational value. A designated nature area is managed to ensure continued preservation of the natural resources it supports. In many states, Natural Area Preserves have been established to protect special natural areas through formal recognition and articles of dedication which provide stringent legal safeguards for preservation. The preserve system is administered and usually managed by a state agency. State officials must choose carefully which areas are important enough for long-term protection. Many states use the state natural heritage inventories to identify the areas possessing the most significant natural values. Natural Area Preserves are protected for scientific, ecological, research, interpretive, and scenic values.

Encouraging proper public use of open spaces protected for their natural resource values is an essential part of long-term stewardship. The fragility of various areas within a preserve should be determined so that procedures can be established to insure that the most important and vulnerable areas receive special protection. In selecting a site for public access on a natural area, the design and construction of the access site should cause minimal disturbance of the natural environment. The access developments should ensure the safety and enjoyment or education of the users, protect adjacent resources, consider the aesthetic qualities of an area, and adequately function as a tidal public access site. Public access and visitation can occur with minimum damage to the resource if access points and trails are designed to control visitor activity.

1. User Considerations

Providing the public with quality passive recreational and educational opportunities while protecting and preserving the natural resource is a major management concern and a difficult balance to achieve. Mode of travel, site access, trail environment or setting, location of sensitive features, physical demands on the user, imposed controls, expectations of the user, and volume of use are factors which must be considered as planning objectives and management criteria. Section I of this report describes the process and resources available for assessing the need for public access. Natural areas and preserves are not public parks or areas managed for their harvestable resources such as state forests, wildlife areas, or state parks; therefore, activities such as camping, picnicking, and swimming, may not permitted. Natural area access is recommended for passive recreational uses such as nature study, birdwatching, hiking, and nature photography. Encouraging the proper public use of natural areas is an essential part of long-term stewardship.

2. Environmental Considerations

Anticipation of potential environmental impacts should be considered during the planning phases and development of the public access. This will minimize or eliminate the adverse environmental effects on the site. The evaluation of environmental factors should begin with a thorough inventory of all sensitive resource areas and potential access points to the site. The design of the access into the natural area should reflect consideration of the topography, vegetation, soil types, weather, wetlands, drainage patterns and cultural resources along and adjacent to the access site. All of these factors should be evaluated to determine site development suitability, how the access should be located, and how the site will function.

a) Topography

Terrain and elevation changes should not be extreme at the point of access for a natural area. Trail grades and other access roads should run parallel to the contours as much as possible. As a general rule, a slope should not be steeper than 10 percent (10 foot rise in 100 linear feet). Slopes of less than 7 percent are preferable.

b) Soils and Substrate Materials

Pedestrian access trails into natural areas should be located on stable soils. Access to or through wetlands is usually discouraged; however, the location of access facilities in these areas may be desirable in certain circumstances. To best protect sensitive wetlands, access point trails should be raised 3 feet above mean high water on decked platforms.

c) Surface Water and Groundwater Hydrology

The surface water drainage and circulation of a site should not change upon development of public access, particularly in wetland areas. Whenever possible, access should be located on an upland site with an adequate vegetated wetland buffer. Strict erosion and sedimentation preventive measures should be taken. If work is being done in wetlands, the structures should be elevated on pilings and bottomless arched culverts should be installed to maintain natural drainage.

d) Vegetation/Wildlife/Habitat Areas

Access development for a natural area should avoid potential impacts to plants, animals, and natural communities. The purpose of the access should be to provide the public with an appreciation of the environment; therefore, trails should contain vistas, observation points, or overlooks for observing wildlife at a distance and vegetation in its native context. State Natural Heritage Programs focus on identifying significant habitats for rare species, natural communities such as freshwater tidal marshes, and other natural features such as migratory bird concentrations. The natural heritage inventories provide information to public agencies for making informed decisions and development plans. Site selection for public access to natural areas should consider only those sites that, if developed, will not affect rare, endangered, or unique biological communities. The protection of high quality habitats or biological communities may be incorporated into natural areas or buffer zones adjacent to the access site. Construction practices which avoid direct and indirect impacts

to sensitive habitats should be implemented. The limits of construction should incorporate sensitive areas and should be clearly marked prior to construction.

e) Water Quality

Existing and projected water quality conditions within the vicinity of the access site should be assessed to determine the potential for adverse changes being caused by access related factors. Strict erosion and sedimentation measures should be implemented as part of the Best Management Practices to avoid degradation of water quality during development of the access site.

f) Wetland Delineation

The delineation of wetlands boundaries should be determined by an on-site visit. In most cases, the local delineation map or map series will be used in order to identify the general location of wetlands. The National Wetland Inventory maps produced by the U.S. Fish and Wildlife Service may also be useful in the general location of existing wetlands. The Combined Federal Wetland Delineation Methodology should be followed for the site specific designation of wetland areas. This method is a systematic approach which considers soils, hydrology, and vegetative characteristics of a site. The identification and delineation of wetlands should be accomplished pursuant to an objective to avoid or minimize impacts to the resource.

g) Cultural Resources

For interpretive and educational purposes, the location of site features and access trails within the natural area access site should protect and focus on natural, historical, cultural and scenic resources.

Cultural resources should be evaluated at each potential access site. A site may be listed, nominated, or eligible for listing on the National Register of Historic Places. The historic or archaeological significance of a site may not be obvious; therefore, during the site evaluation the appropriate State Historic Preservation Officer should be contacted. Information regarding the National Register of Historic Places and the National Natural Landmark Program may be obtained from the National Park Service (see **Appendix A-4**).

h) Other Considerations

Other site features and related off-shore conditions appropriate for inclusion in the environmental inventory may relate to:

Scenic and Visual Opportunities

The identification of good and poor views both on-site and off-site should be considered. An overall visual analysis of the site may be necessary for the preservation of visual quality.

Noise

The existing and projected noise levels at the development site and in the surrounding area should be assessed. Special attention should be given to the problems that traffic and traffic-related noise could create for the user of the access trail and for sensitive habitats within the natural area.

i) Site Limitations

Site limitations should be identified based on the inventory and analysis of natural factors and environmental considerations. A site analysis which outlines the physical opportunities and constraints for a property should be conducted to facilitate the assessment of the site. This analysis may simply involve overlaying the identified environmental factors and evaluating the overall conditions of the site, noting areas which are not suitable for developing.

Desirable Site Characteristics Include:

- Natural areas which can provide educational and interpretive opportunities.
- Natural areas already coexisting with some level of human influence.

Undesirable Site Characteristics Include:

- Sensitive plant and animal habitats which would be disturbed by passive recreation activity.
- Natural areas which are extremely remote, and if developed as access points, would unnecessarily introduce human influences.

j) Compatibility Issues

Several passive recreational or access-related uses may be planned for a single access site within a natural area. For example, multi-use trails for may be provided for walking, biking, and horseback riding. Facilities for picnicking, camping, fishing, and swimming may also be considered. However, the compatibility of these uses with one another and the resource must be considered to avoid potential on-site conflicts.

B. DESIGN CRITERIA

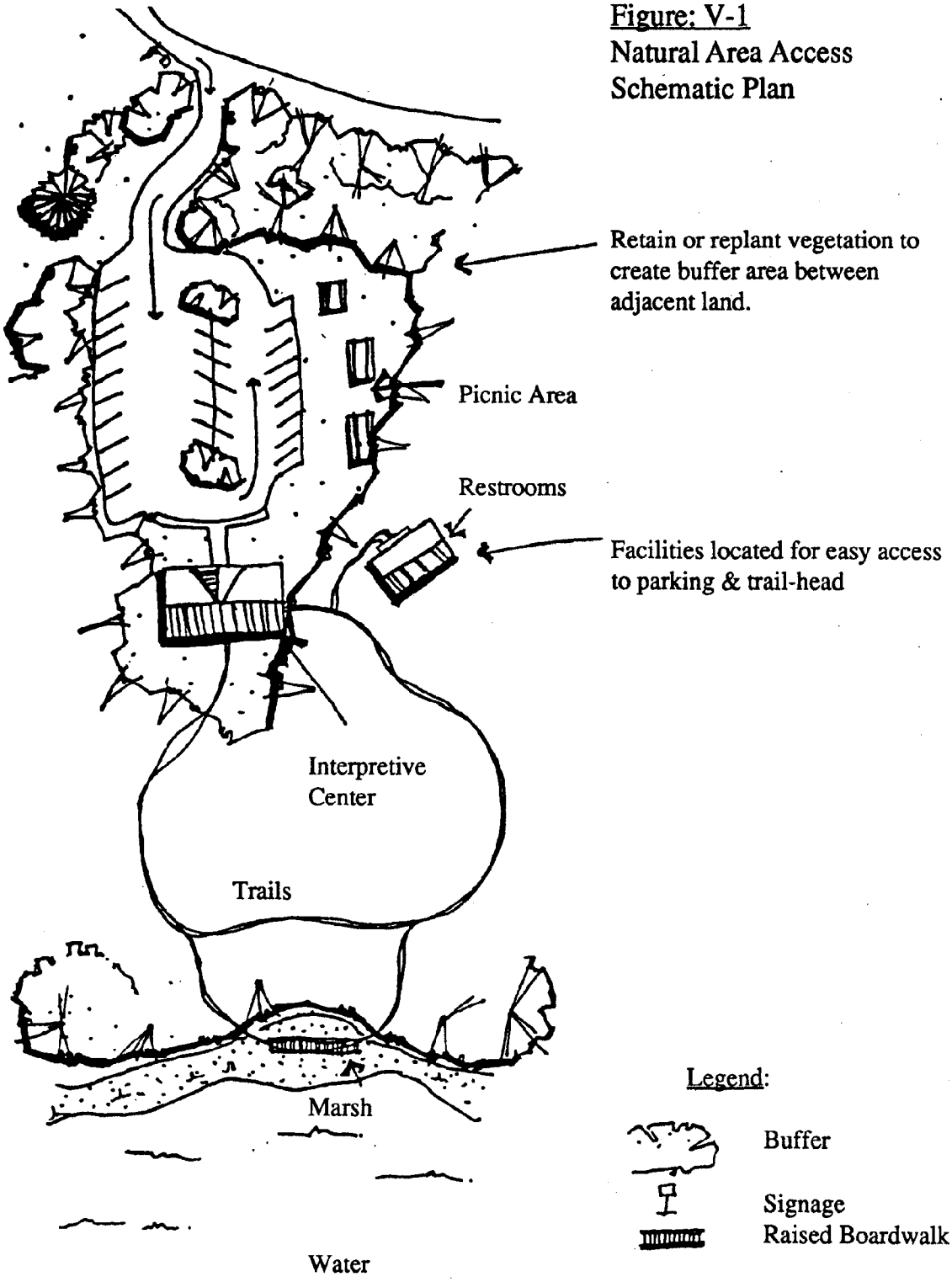
1. Site Plan Layout

A natural area access site should be designed to produce minimum disturbance to the environment, considering the safety and enjoyment of the users, the volume and type of traffic, the protection of adjacent resources, and the aesthetic quality of an area. The site plan layout should also incorporate features to minimize adverse impacts on the environment while providing passive recreation, educational opportunities, and interpretive features (see **Figure V-1**). Such an access site should exhibit a quality environment with low maintenance requirements.

2. Essential Elements and Desired Relationships

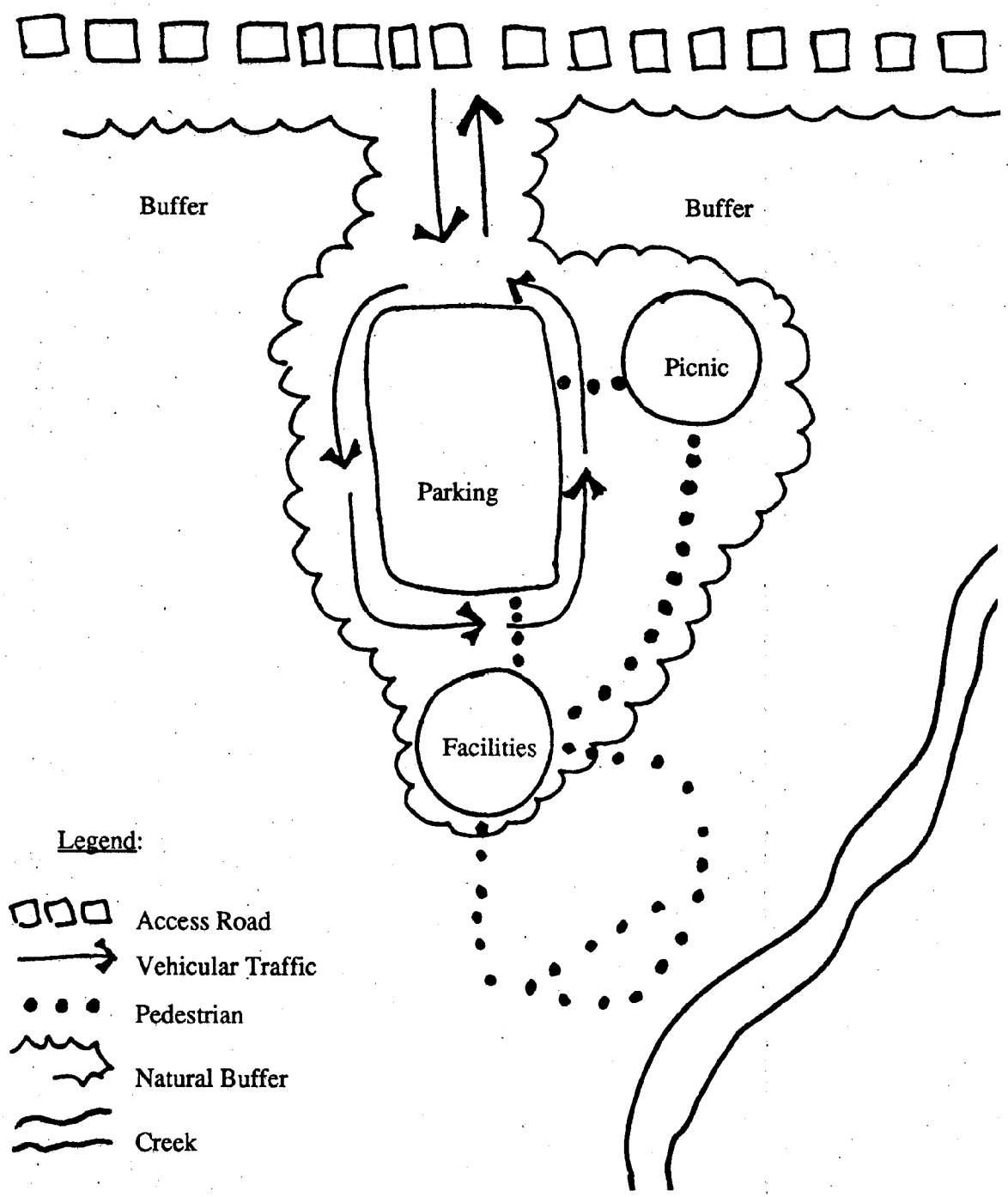
Essential elements and their location within natural areas include convenient access to the site, designated trails, adequate parking, picnicking areas, play areas, restroom facilities, utilities, interpretive centers, and maintenance facilities. A concept plan depicting the general relationship of the selected site elements may be helpful to establish the overall site plan layout; **Figure: V-2** illustrates the preferred relationships for these elements. Pedestrian access extends from the parking area to the interpretive center and restroom facilities. The trailhead for the natural area is located at the interpretive center.

Figure: V-1
Natural Area Access
Schematic Plan



Source: Recreation Planning & Design Criteria, U.S. Army Corps of Engineers, July, 1987.

Figure: V-2
Concept Layout for Natural Area Access



3. Land Requirements

Specific site conditions, including habitat requirements, land availability, environmental factors, regulations, and proposed degree of use, must be assessed to determine the land requirements and potential user capacity for a particular access site. The land requirements for the development of natural area access are entirely resource dependent. For example, the size and site conditions of a designated natural area determines the visitor capacity of the site. The determined visitor capacity relates directly to the size and type of support facilities required for the site.

a) Area Requirements

Typical area requirements for natural area facilities will vary according to other passive recreational facilities and amenities planned at the site. A natural area access may include facilities such as raised boardwalks and trails; observation platforms and blinds along water resource areas for viewing unique natural features, vegetation, and/or wildlife; access roads; parking; an interpretive center; and restroom facilities. Additional amenities such as picnicking areas, camping areas, and other recreation-related facilities may be desired at certain sites and may require additional land.

b) Water Depth and Subsurface Conditions

The water depth, subsurface conditions, and wetlands within a designated natural area should be left undisturbed. Water depth and subsurface conditions are not a consideration for determining the suitability of a site to function as a natural area.

c) Vehicular Considerations

If natural area managers decide that roads and parking areas are needed, these areas should be designed to have minimum impact on the natural resource. The use of any type of motorized vehicles in areas other than on designated access roads should be prohibited in natural areas. The destructive effects of vehicles and soil compaction related to vehicular use in these areas has been proven to harm wildlife. Proposed access into a natural area should only be developed where vehicle entrances are feasible and where the roadway does not interfere with other uses, create safety hazards, or adversely impact the area. External access roads to the site should meet secondary road standards with road widths of at least 20 feet and shoulders or berms at least 4 feet wide. Guardrails or posts should be provided on 6 foot enters for embankments over 6 feet high on all internal and external access roads. Proper traffic signs should be posted.

Parking

Parking areas should be located within convenient walking distance of the pedestrian access facilities, trailheads, interpretive centers and observation areas. Parking areas serving natural area access should be located in areas which cause the least direct and indirect disturbance to significant habitats. The amount of parking should be determined from the carrying capacity of the access site. In general, one parking space should be provided for every three visitors. Additional parking may be required where multiple use activities are provided. The layout of the parking area should minimize pedestrian conflict with vehicular areas and circulation. The standard parking layout for

compact and conventional types of automobiles is 150 cars per acre. The spacing of parking lanes should be 10 feet by 20 feet with a 25 foot turning strip between the two parking lanes for a total of 65 feet from end of car to end of car. Bumper blocks and guardrails or posts should also be installed where necessary. In natural areas, gravel and crushed stone surfaces are preferable to asphalt or concrete paving. Slope and drainage factors should be considered during the design of these facilities. An adequate number of parking spaces should be provided for the physically handicapped. These spaces should be connected to a walkway suitable for handicapped access which leads to the site's support facilities and trails.

d) Pedestrian Considerations

Designated pedestrian access should provide safe connections to site facilities including maintenance areas, parking lots, restrooms, interpretive centers, and trails. These areas receiving high level of pedestrian use should be physically separated from vehicular traffic as a safety precaution. These heavily used areas should also be surfaced with a hard material, while trails and passive areas may be constructed using more natural materials. Access walkways should be designed for handicapped accessibility with well-defined edges and should be a minimum of 4 feet in width.

Raised boardwalks are generally appropriate for access into natural areas where trails at grade are not feasible or appropriate. The boardwalks should be a minimum of 4 feet wide with railings constructed of treated wood with a slope of 5 percent or less. When on-site grade change is greater than 5%, handicap ramps should be provided to enhance accessibility to the site facilities. Crosswalks should be constructed with curb ramps on each side whenever they cross vehicular roads.

e) Special Development Requirements

1) Unique Requirements

Each access site requires a different combination of development features which relate to the activities planned and the anticipated level of use for the specific site. The following elements should be considered during site development.

Trails

Factors to consider when designing a trail are alignment, topography, vegetative cover, aesthetic value, points of interest, road crossings or other potential dangers, and final destination. Trails should allow users to enjoy passive activities such as nature photograpy, birdwatching, and natural history interpretation. The trail should begin and end near the interpretive building. The entrance should be clearly marked with a sign which includes a trail map that marks the highlights of the area. An interpretive trail could deal with the history of an area, the natural resources, and the different habitats found on the land.

Trails can be designed for the visitor to travel alongside, through, or over resource protected areas. This can be done by a raised boardwalk or footbridge which permits maximum observation without destruction to the protected areas. It is recommended that trails lead to points of interest via routes carefully chosen to minimize erosion, soil compaction, and disturbance to wildlife.

Foot trails should be designated for hiking only. Motorized vehicles are not compatible with non-motor uses. Barriers such as logs, stairways, and narrow stream crossings can be utilized to discourage non-pedestrian users. However, some trails should be handicapped accessible.

Trail Construction

Trail dimensions should be based on the type and volume of use anticipated, on the stability of native soil, and on the type of terrain along the proposed route. Generally, a pedestrian trail tread width should not be less than 2 feet wide for foot trails. Main trails should be approximately 6 feet wide and fire trails a minimum of 8 feet wide. Additional width could be considered to reduce impacts from heavy traffic. As a rule of thumb, the width of the trail varies according to its use. Short trails within heavily used recreation areas will normally be considerably wider than the trails designed for an area that will not be used as often. Bushes and trees that are in the route of the trail should be cut flush with the ground. Trees and stumps should be removed if the tree roots will interfere with grading. Overhead limbs should be removed to a height of 8 feet above the finish grade of the trail.

Tread width - 2 feet minimum
Clearing width - 4 feet
Height of clearing - 8 feet minimum
Maximum sustained trail grades - 8-10%

Trail Layout

In general, the layout of the trail should be inconspicuous. The trail should have a variety of experiences taking advantage of views, open spaces and forested areas, and whenever possible, it should run along water bodies and habitat areas of interest.

Trail Base Preparation

In preparing the base for a trail, the subsurface material and slope of the land should be considered. If the site is wet, the trail should be raised six inches above the surrounding area. This is done through the use of board walls or grading, if environmentally acceptable. In some situations trails may run along hillsides where cuts must be made in order to achieve level treads as shown in **Figure: V-3**.

The following characteristics should be incorporated in trail surfacing:

- Use of compacted materials.
- Resistance to anticipated foot traffic and erosive factors.
- Usability when wet, and minimal dust when dry.

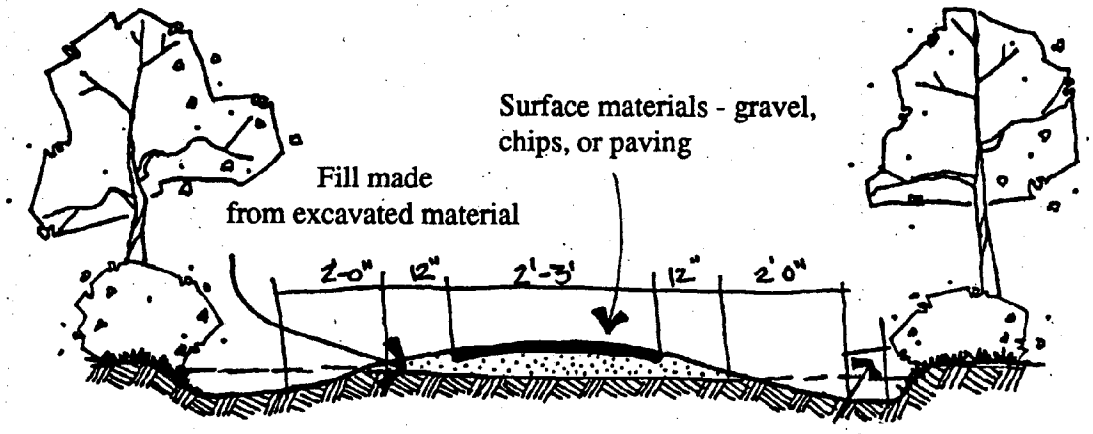
Grade

Trails should be built to follow the contour of the land if at all possible. A grade of 10 percent or less is recommended for ease of hiking and to prevent erosion.

Length

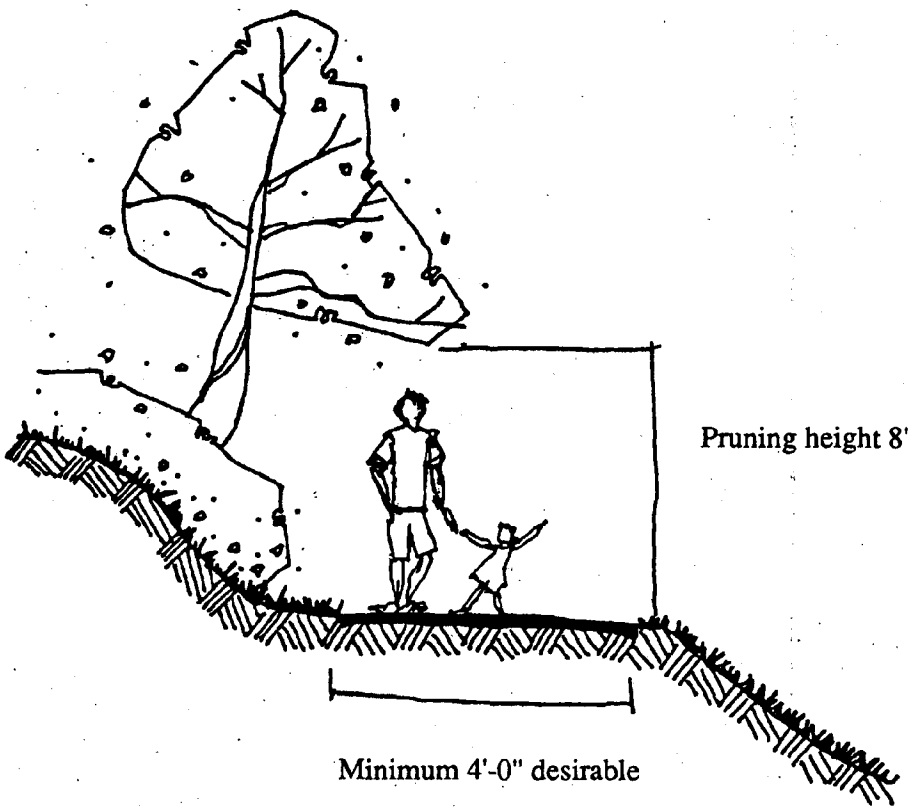
Trails should be of a loop design returning to their point of beginning. Options to terminate a hike or extend a hike for a greater distance along the trail are desirable for day users.

Figure: V-3
Trail Construction



Width necessary to take care of drainage

*Minimum excavation and fill 3" for trail and drainage



Source: Trail Planning and Layout, Ashbaugh, B.L., National Audubon Society, 1967.

Drainage

Drainage is one of the most important items in trail construction. Water must be kept within manageable limits to prevent erosion and maintain a trail throughout the year. To facilitate surface runoff, the tread of the trail should be graded so that the outside is three inches lower than the inside edge along a hillside. This is referred to as outsloping. To prevent excess water from accumulating along a trail, water breaks or bars and grade dips may also be used. (see **Figure: V-4**)

Surfacing

Surfacing is a costly item in trail construction and natural materials should be used wherever feasible. Hard surface materials may be used on walkways located at an interpretive center or at points of concentrated use. Otherwise, surfacing material that is durable and blends with the environment should be used.

Signage

Adequate signage is essential at the beginning of a trail, at intersections, and at locations on the trail where the direction is not readily discernible. Trail signs should include distances to various points of interest along the way. Frequent mileage markers along the trail are helpful to the hiker and useful in the operations and maintenance of the park. Interpretive markers and information are desirable features on any type of trail. Trail signs should conform with the standards of the natural area.

Revegetation

During the design and construction process adequate revegetation using native plant materials should be planned for areas where existing vegetation had to be removed.

2) Electricity

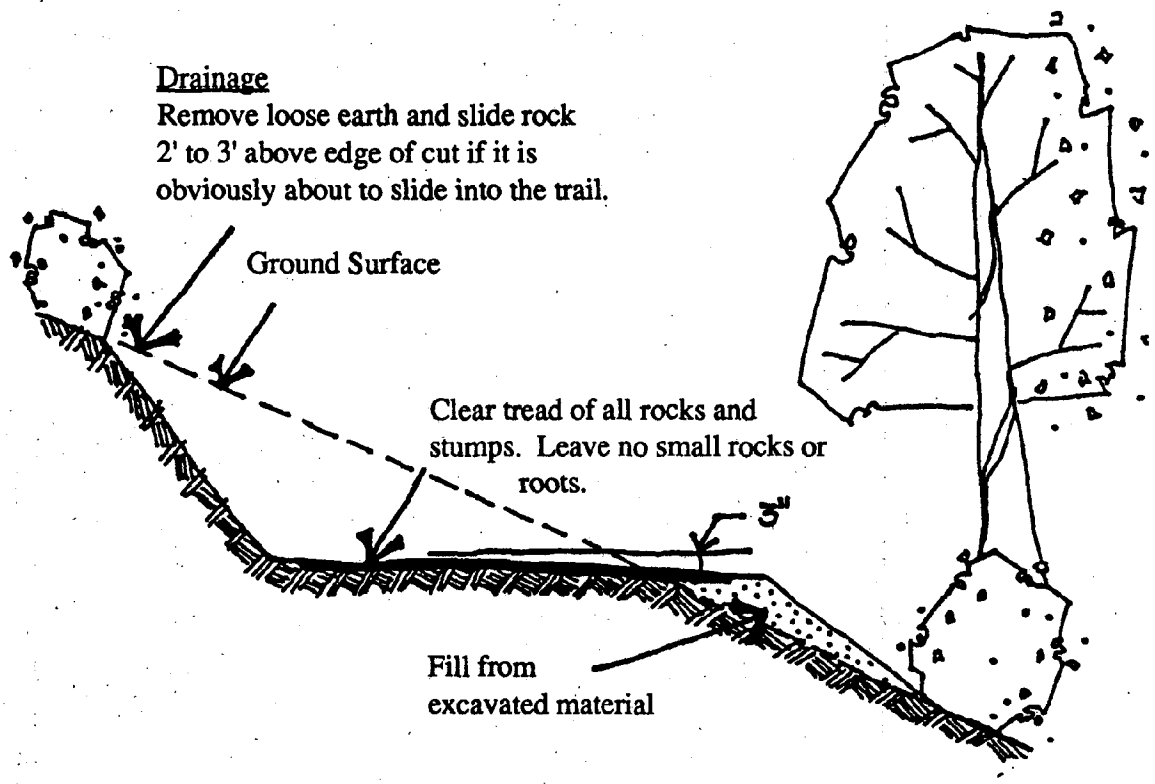
Public telephones should be placed where they are easily found, generally at comfort stations, visitor information buildings, or near the parking lot. All lines should be placed underground, unless special conditions make such an installation impossible.

Adequate lighting around the parking area should be considered for safety if the natural area will remain open after dusk. In order to reduce the impacts of night lighting on adjacent land uses, low-height lighting fixtures are recommended. Lighting should be directed toward the facility use areas, shielded from adjacent properties and vandal proof.

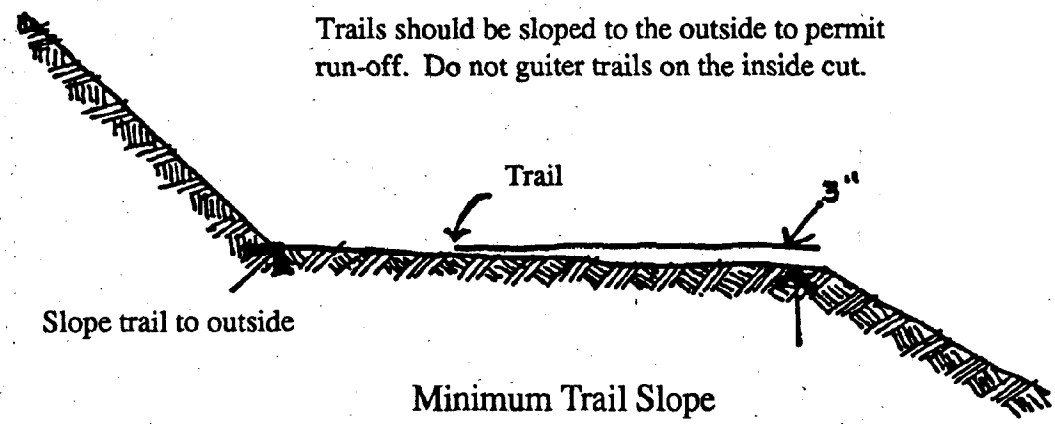
3) Water Supply and Distribution System

An adequate water supply and distribution system may be desirable to provide public drinking water and fire protection, and for the maintenance and operation of the access facility. It is recommended that the water supply, treatment, and distribution be planned to complement the wastewater collection, treatment, and disposal system.

Figure: V-4
Trail Drainage



Trail Construction



Minimum Trail Slope

Source: Trail Planning and Layout, Ashbaugh, B.L., National Audubon Society, 1967.

Natural areas at remote sites which are open as access sites on a limited basis would not require restroom facilities. In high use areas, however, restroom facilities should be connected to an approved external public water system or an on-site well.

The water supply and distribution system should be planned under the direction of a sanitary engineer and should meet local planning and health department requirements.

4) Sewage Disposal/Restrooms

If use of a natural area is such that disposal and/or treatment of waste is necessary, all designs for sewage disposal shall be in compliance with state and local requirements.

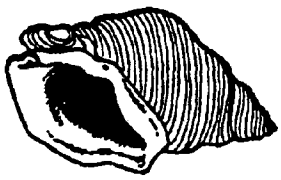
The most desirable method for sewage disposal is to tie into an existing system. If an existing system is not available, on-site treatment is required. Prior to the design of an on-site treatment system, the proposed area for treatment should be evaluated according to local regulations. The design and specifications for sewage disposal systems is site-specific.

Permanent restroom facilities should be a priority at larger heavily used natural area access sites. The facilities should be sited conveniently to the access trailhead and other support facilities. The restroom facilities must meet the public health requirements of local, state, and federal agencies within whose jurisdiction they are to be built. A minimum of one toilet fixture and lavatory per sex for every 30 parking spaces is recommended. Restrooms should be designed to meet all requirements for access to and use by the handicapped. Waste-water from these facilities may be (1) tied into the local sewer system; (2) processed in an on-site septic system; or (3) collected on site in a holding tank and disposed off-site.

5) Stormwater Management

Parking areas may create potential environmental impact related to increase runoff on-site. Best management practices should be implemented during site development and after construction is completed to avoid or mitigate these potential impacts. The following design measures may be incorporated into the site design for natural area access facilities to avoid or alleviate site runoff.

- Installation of catch basins and filters to trap pollutants. In natural areas stormwater management devices should be constructed of stone or made to blend with the surrounding environment.
- Avoidance of direct channeling of runoff water onto tidal wetlands or other sensitive resource areas.
- Use of porous gravel or a perforated paving block surfacing for parking areas and pedestrian walkways.



C. MANAGEMENT/ MAINTENANCE

Management and maintenance refers to agency actions needed to keep a facility in desirable condition for public use. The objectives of appropriate management are to provide for user safety and convenient access and to protect adjacent resources. Unsafe conditions should be corrected, as legal liabilities may be incurred if situations prove unsafe.

1. Maintenance Concerns

To ensure that the maintenance objectives are met, the maintenance plan may be established as a matrix outlining the types of tasks and the frequency with which each would be required. Categories of maintenance frequency generally include frequent (weekly to daily), periodic (less than weekly), and special (as needed). The following maintenance duties should be considered in developing a maintenance plan:

- Restroom cleanup (if applicable)
- Maintaining a regular trash collection schedule
- Parking/pavement access maintenance and litter control
- Maintenance of signage and interpretive/ educational display
- Lighting maintenance
- Trail maintenance
- Landscape maintenance/mowing
- Stormwater facility upkeep
- Seasonal upkeep - preseason inspections, regular inspection schedules, etc.
- Post-storm cleanup plan

The level of maintenance anticipated at a site is directly correlated with the use level at the facility and the location of the site. Maintenance at public sites is an extremely important issue as it relates directly to the safe use of the facility.

2. Management Concerns

The primary objective for the management of natural area access is to maintain the integrity of the natural area being protected while allowing public access for interpretive, educational, and scientific purposes. The management concerns for each natural area site will vary according to the setting, use patterns, and natural features found there. Management plans based on the preservation of the ecosystem and biological requirements of rare species and other special features are recommended for each natural area site.

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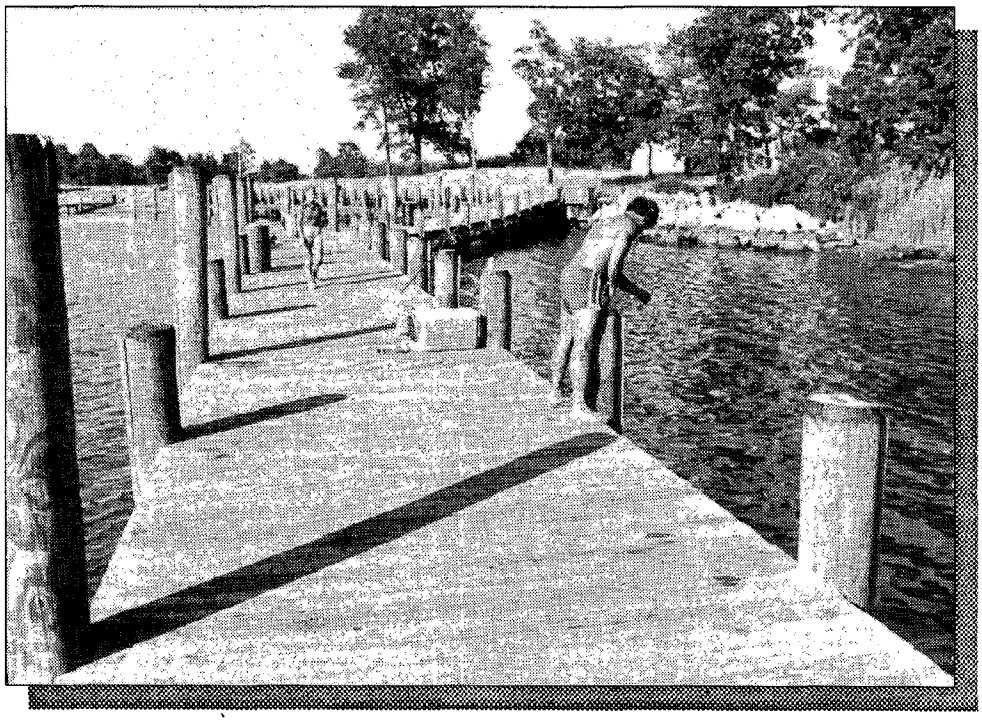


STATE GOVERNMENT RESOURCES

The following is a list of state government agencies providing assistance to localities planning public access.

VIRGINIA

Dept. of Conservation & Recreation
Division of Soil & Water Conservation
Division of Planning & Recreation Resources
203 Governor Street
Richmond, VA 23219
(804) 786-2064 and 786-2556
FAX (804) 786-6141

Council on the Environment
903 Ninth Street Office Building
Richmond, VA 23219
(804) 786-4500
FAX (804) 225-3933
TDD (804) 786-6152

Dept. of Forestry
P.O. Box 3758
Charlottesville, VA 22903
(804) 293-8605

Dept. of Game & Inland Fisheries
4010 West Broad Street
P.O. Box 11104
Richmond, VA 23230
(804) 367-1000
FAX (804) 367-9147
TDD 800-252-7717

Virginia Dept. of Health
Division of Waste Water Engineers
903A Madison Blvd.
109 Governor St.
Richmond, VA 23219

Dept. of Transportation
1401 East Broad Street
Richmond, VA 23219
Attn: Aerial Photography Dept.
(804) 786-2575
FAX (804) 786-1788

Dept. of Waste Management
101 North 14th Street 11th Floor
Richmond, VA 23220
(804) 225-2667
FAX (804) 225-3753
TDD (804) 371-8737

Virginia Institute of Marine Science
The College of William & Mary
Gloucester Point, VA 23062
(804) 642-7000

Chesapeake Bay Local Assistance Dept.
701 Eighth Street Office Building
Richmond, VA 23219
(804) 225-3440
TDD 800-243-7229
FAX (804) 225-3447
(See Appendix C for Requirements of the Chesapeake Bay Preservation Act.)

Virginia Marine Resources Commission
P.O. Box 756
Newport News, VA 23607
(804) 247-2200

MARYLAND

Dept. of Natural Resources
Boating Administration
902A Commerce Road
Annapolis, MD 21401
(301) 974-7616 (Planning and Policy)
(301) 841-5607 (Waterway Improvement Division)

Dept. of Natural Resources
Forest, Park and Wildlife Service
Tawes State Office Building
580 Taylor Avenue
Annapolis, MD 21401
(301) 974-3195

Dept. of Natural Resources
Capital Programs Administration
2012 Industrial Drive
Annapolis, MD 21401
(301) 974-7656 (Land Planning Services)
(301) 974-7231 (Program Open Space)
(301) 974-7853 (Shore Erosion Control)
(301) 974-7741 (Engineering Services)
(301) 974-7250 (Enterprise Development)

Dept. of Natural Resources
Tidewater Administration
Coastal Resources Division
Tawes State Office Building
Annapolis, MD 21401
(301) 974-3382

Dept. of Transportation
State Highway Administration
707 North Calvert Street
Baltimore, MD 21202
(301) 333-1122

Chesapeake Bay Critical Area Commission
275 West Street, Suite 320
Annapolis, MD 21401
(301) 974-2426

PENNSYLVANIA

Pennsylvania Fish Commission
450 Robinson Lane
Bellefonte, PA 16823
(814) 359-5127

DISTRICT OF COLUMBIA

District of Columbia
Dept. of Recreation and Parks
3149 16th Street, N.W.
Washington, D.C. 20010
(202) 673-7692

District of Columbia
Dept. of Consumer and Regulatory Affairs
Environmental Control Division
5000 Overlook Drive, S.W.
Washington, D.C. 20032

National Park Service
National Capital Region
Land Use Coordination
1100 Ohio Drive, S.W.
Washington, D.C. 20242

FEDERAL GOVERNMENT RESOURCES

The following is a list of federal government agencies to contact for information.

U.S. Dept. of Agriculture
Soil Conservation Service
Virginia Office
400 North 8th Street, 9th Floor
Richmond, VA 23240-9999
(804) 771-2463

U.S. Dept. of Agriculture
Soil Conservation Service
Maryland Office
John Hanson Business Center
339 Revell Highway, Suite 301
Annapolis, MD 21401
(301) 757-0861

U.S. Environmental Protection Agency
Region Three Office
841 Chestnut Building
Philadelphia, PA 19107
(215) 597-9800

U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460
(202) 382-5043

U.S. Environmental Protection Agency
Chesapeake Bay Program Liaison Office
410 Severn Avenue
Annapolis, MD 21403
(301) 266-6873

National Park Service, National Registry Programs
U.S. Department of the Interior
P.O. Box 37127
Washington, D.C. 20013-7127
(202) 343-9559

U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, MD 21203
(301) 962-3070

U.S. Army Corps of Engineers
U.S. Army Engineer District, CENAP
U.S. Custom House
Second and Chestnut Streets
Philadelphia, PA 19106-2991
(215) 597-0703
(215) 597-4848

U.S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, VA 23510
(804) 441-7652

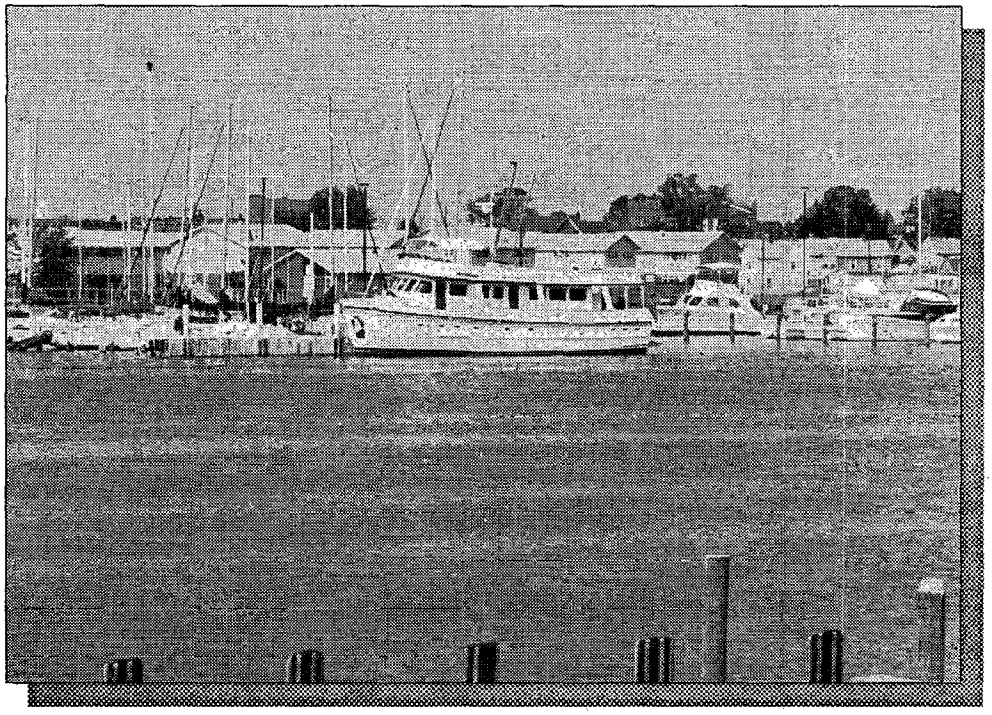
U.S. Fish and Wildlife Service
Northwest Office
One Gateway Center, Suite 700
Newton Corner, MA 02158
(617) 965-5100

National Park Service
Planning Department
Mid-Atlantic Region
143 South Third Street
Philadelphia, PA 19106
(215) 597-7386

Appendix B-1

COST ESTIMATE

The following provides general cost estimate information for the construction of items commonly used in access facilities. It is necessary to add 4 to 10 percent for architecture and engineering costs and 10 percent for contingency events. The costs shown are for budget and preliminary cost estimate only. In order to achieve a more accurate estimate, the estimator must consider quantities of material, prices of material and labor within the area of the access site as well as the location of the site itself (e.g., remotely located, near an urban area or a major highway, etc.), the anticipated length of time of construction, bid preparation time, availability of contractors, and the complexity of the job.



Appendix B-2

DESCRIPTION	UNIT	COST
1. Site development		
◆ Clearing and grubbing		
General: clean brush & saplings;	Per acre	$700-$1,000
Select: handwork	Per acre	$1,200 -$2,000
◆ Grading		
Rough grade: furnish & spread topsoil 4" deep & fine grade	M.S.F.	$305
◆ Roads, parking spurs & parking lots		
Asphalt surface 3" thick on 4" compacted base & subgrade (over 10,000 S.F.)	S.Y.	$12.00
Crushed stone 4" thick compacted on compacted subgrade (over 2,000 S.F.)	S.Y.	$10.50
Shoulders, 2" gravel	L.F.	$1.50
Curbs, 6" x 12" vertical concrete cast in place, includes excavation & backfill	L.F.	$9.50
Parking, 2" gravel on prepared compacted base	Per space	$400
◆ Sidewalks		
Concrete, 6" reinforced with 6" gravel base broom finish includes expansion joints		
(1,000 S.F. or less)	S.Y.	$53.00
(Over 1,000 S.F.)	S.Y.	$49.00

DESCRIPTION	UNIT	COST
Brick pavers, 2 1/4" thick on finished compacted subgrade with dry joints and 2" sand base	S.Y.	$7.00
◆ Trails		
Hiking, 4' wide, clearing & grading includes drainage structures, prepared 4" base, 1" asphalt surfacing	L.F.	$12.00
Bicycle, 8' wide, clearing & grading includes drainage structures, prepared 4" base, 1" asphalt surfacing	L.F.	$20.00
◆ Fishing piers		
Decking, pressure treated wood, 30" above grade; 2" x 6" decking; 4" x 8" beams; 2" x 8" joists @ 2' O.C.; 4" x 4" posts; concrete footings	S.F.	$10.00
Railings, 2" x 4" posts pressure treated wood & galvanized hardware	L.F.	$15.00
◆ Boat launching ramp		
2 lane concrete ramp with courtesy dock		$26,000
◆ Picnic shelter	S.F.	$30.00
◆ Children's play areas Depends on size, age group, and amount of custom design		$10,000 -$50,000
◆ Grass seeding		
Hand seeding, fine grading, fertilizer & mulching	Per Acre	$1,800

DESCRIPTION	UNIT	COST
Hydroseeding, fine grading, fertilizer & mulching	M.S.F.	$55.00
◆ Swimming facilities		
Beaching areas, complete, including beach sand, lifeguard chairs, buoy lines, beach house (dressing rooms, restrooms, showers, concession, lifeguard and first aid quarters, storage, power, water & sewage), parking, landscaping, plumbing and electricity, etc.		$900,000+
◆ Buildings		
Office, maintenance building, etc.	S.F.	$60.00
2. Utilities		
◆ Storm sewage systems		
Sewage treatment plant (secondary treatment) installed cost. The cost of treatment plants will depend on type of units and degree of treatment required. These costs assume that there is no tertiary treatment required. However, the standards and requirements are established by the prevailing state federal agencies for the particular site	10,000 gal/day	$60,000
	20,000 gal/day	$75,000
	100,000 gal/day	$200,000
	200,000 gal/day	$350,000

DESCRIPTION	UNIT	COST
◆ Water and sewage lines		
Average cost per linear foot Prices vary according to size and type of pipe and the amount of excavation involved; so if the total linear feet of all types of pipe on a project is multiplied by $10, a reasonably accurate figure should be obtained for an overall estimate.		$10.00
Sewage lines	L.F.	$12.00 - $15.00
Forced mains	L.F.	$20.00 - $25.00
Manholes		$500 - $700
Hydrants		$600 - $700
◆ Water reservoir		
50,000 gal. prestressed concrete including mechanical equipment		$55,000 - $70,000
50,000 gal. steel, including mechanical equipment		$40,000 - $55,000
◆ Sewage pump station		$55,000
◆ Electric power lines & equipment		
Overhead	L.F.	$350
Overhead lines (4 aluminum triplex wire) (per 1,000)	L.F.	$180 - $200
Underground, direct-burial cable	L.F.	$8.00 - $10.00

DESCRIPTION	UNIT	COST
Insulated direct-burial cable copper, single-conductor (per 1,000)	L.F.	$530
30' class 3 wood poles, installed (shipping not included)	Ea	$250
Metering equipment & service equipment	Ea	$300

NOTE: These are minimum figures. Estimating for utilities is highly variable as far as costs are concerned. If extensive work is proposed, contractors and utility companies usually are helpful in providing needed information.

ABBREVIATIONS

M.S.F = Thousand square feet
S.Y. = Square Yard
C.Y. = Cubic Yard
S.F. = Square Foot
L.F. = Linear foot
Ea = Each
O.C. = On Center

Appendix C-1

Requirements of the Virginia Chesapeake Bay Preservation Act

In 1988, the Virginia General Assembly passed the Chesapeake Bay Preservation Act to address the degradation of the waters of the Bay by nonpoint source pollutants such as sediment, nutrients, and hydrocarbons. To implement the Act, the Chesapeake Bay Local Assistance Board issued regulations which Tidewater local governments must adopt into comprehensive plans, zoning ordinances, and subdivision ordinances. The regulations apply to all land use and development activities within Chesapeake Bay Preservation Areas (sensitive lands adjacent to the Bay and its tributaries). The goal of the regulations is to achieve a no net increase of pollutants resulting from new development activities, a 10% decrease in pollutants resulting from redevelopment activities, and a 40% decrease in polluntants resulting from land uses such as agriculture and forestry.

Under the Act, land use and development activities are stringently regulated within tidal shorelines, tidal wetlands, streamside wetlands, and the 100-foot vegetated buffer area landward of these features. Redevelopment of existing structures and construction of water-dependent facilities are the only two types of development activity allowed within these areas. "Water-dependent facilities" is defined to include both public recreation areas and boat docking structures. However, development of water-dependent facilities is neverthless subject to certain performance standards which will ensure the protection of water quality.

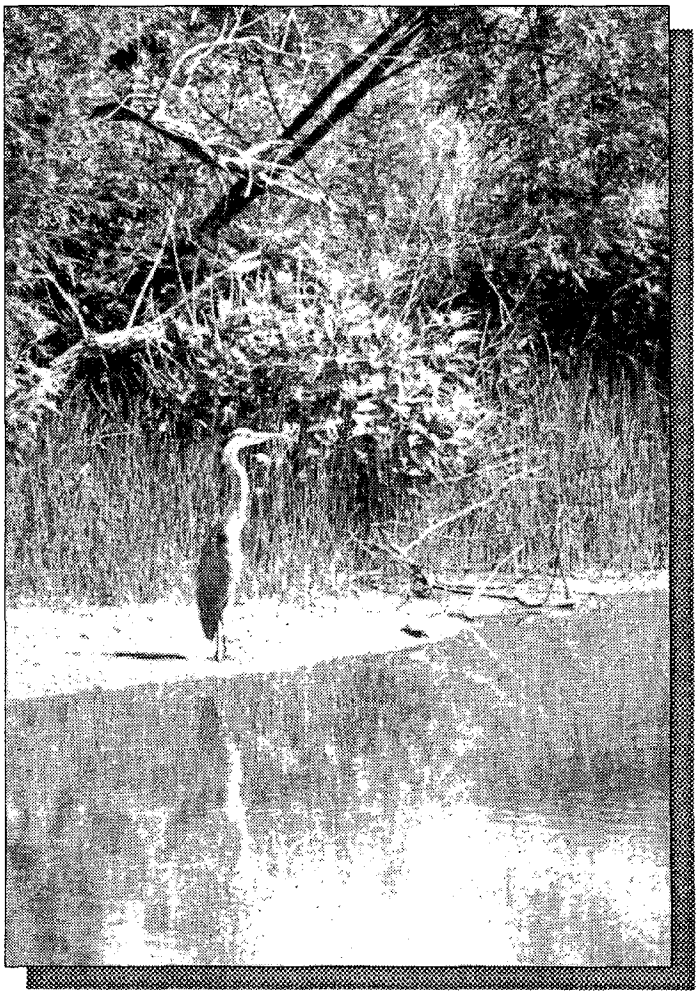
The first of these requirements is that the location of a proposed facility must be in accordance with the local comprehensive plan. Thus, as part of the planning process associated with the Act, Tidewater Virginia local governments must address the issue of water-dependent facilities in their comprehensive plans. The plan must identify potential conflicts between increasing recreational opportunities on the Bay and the protection of water quality.

To accomplish this, Tidewater local governments will be identifying areas where water quality/ resource protection should take precedence over the construction or expansion of boat related facilities. The planning objective is to designate particular creeks and shorelines for intensive recreational uses such as marinas and other areas for passive recreation and limited boat usage. In this way, public access goals are achieved while protecting important living resources such as wetlands, submerged aquatic vegetation, and shellfish grounds.

Under the Act, the construction of water-dependent facilities is subject to site design requirements which are intended to minimize adverse water quality impacts. These requirements will vary from locality to locality, since the state regulations are tailored to meet local conditions. Generally, however, the developer of a water-dependent facility will have to prepare a water quality impact assessment as part of the plan review process. This assessment should delineate the boundaries of all sensitive land features and include ecological, hydrological, and landscaping considerations. The proposed facility will have to be designed so that all non-water-dependant components of the project are located outside of the 100-

foot buffer area. Land disturbance will be restricted to the minimum necessary, and access ways through the buffer to the shoreline must be carefully planned. In addition, construction of the non-water-dependent components will be subject to stringent erosion and sediment control and stormwater management standards.

The Chesapeake Bay Local Assistance Department, the state agency responsible for the implementation of the Act, is providing Tidewaer local governments with technical assistance in the adoption of the water-dependant facilities requirements. The Department's Local Assistance Manual will soon contain planning and site design recommendations for water-dependent facilities. The Department may be contacted at (804) 225-3440.



Appendix D-1

The Maryland Chesapeake Bay Critical Area Protection Program

(The following is excerpted from the brochure "*CHESAPEAKE BAY CRITICAL AREA PROGRAM...and how it effects you*", prepared by the Governor's Office of Chesapeake Bay Public Information and the Chesapeake Bay Critical Area Commission.)

The Chesapeake Bay Critical Area Commission was established by law in 1984 (Annotated Code of Maryland, Natural Resources Article, §8-101 - §8-1816) to develop a protection program for the vitally important land and water resources of the Chesapeake Bay and its tributaries.

The "Critical Area" consists of all land within 1,000 feet of the mean high water line of tidal waters or the landward edge of tidal wetlands or tributary streams. It also includes the tidal waters themselves, and the lands under those waters. Sixty counties and towns in Maryland are affected by the Critical Area Law.

The Critical Area Commission consists of 26 members appointed by the Governor. The members represent a variety of public and private interest groups, including state and local governments, developers, envrionmentalists, foresters, and farmers. The Commission also has a Chairman, an Executive Director, and staff who oversee implementation of the Critical Area Law.

The Commission was charged with developing a Critical Area Protection Program to meet the following three goals:

- Minimize adverse impacts on water quality that result from pollutants that are discharged from structures or conveyances that have run off from surrounding lands;
- Conserve fish, wildlife, and plant habitat in the Critical Area; and
- Establish land use policies for development in the Chesapeake Bay Critical Area which accommodate growth and also address the fact that, even if pollution is controlled, the number, movement, and activities of persons in an area can create adverse environmental impacts.

To carry out its goals, the Commission established criteria for the protection of the Critical Area. These criteria were to be used by the 60 affected jurisdictions (16 counties and 44 towns) to develop and implement their own Critical Area Programs.

WATER-DEPENDENT FACILITIES IN THE CRITICAL AREA

Water-dependent facilities, such as marinas, piers, or docks, are facilities that require location at or near the shoreline. The Critical Area criteria, through the local jurisdictions, makes provisions for the development of these facilities, but only if they meet certain criteria.

COMMERCIAL MARINAS AND PIERS

Commercial marinas in the Critical Area must meet guidelines that include the following:

- No new marinas are allowing in Resource Conservation Areas unless they are part of a public project.
- New or expanded marinas are permitted in Intensely Developed and Limited Development Areas under certain criteria.
- Existing marinas in Resource Conservation Areas may be expanded if there are no adverse effects on water quality as determined by the local jurisdictions.

COMMUNITY PIERS

Noncommercial piers, including community or neighborhood facilities, may be located in the Critical Area under these conditions:

- They may not offer food, fuel, or other sales of goods.
- They must be community owned.
- Certain guidelines for slip and mooring density for community piers are followed.

OTHER FACILITIES

Provisions are also made for the location of other types of water-dependent facilities in the Critical Area. Water-dependent facilities are regulated as to their location and type of activity. For example:

- Industrial- and port-related facilities are only permitted along the shoreline of Intensely Developed Areas.
- Public beaches and other public water-oriented recreation or education areas are permitted provided adequate sanitary facilities are provided, minimal disturbance to vegetation occurs, and permeable surfaces are used.
- Research facilities and fisheries activities can locate along the shoreline. However, structures not considered to be water-dependent (e.g., parking lots) must be kept out ot the 100 foot buffer.

For more information please contact:

Chesapeake Bay Critical Area Commission
275 West Street, Suite 320
Annapolis, MD 21401
(301) 974-7656

Glossary

Berm - A narrow raised ridge of soil that provides a visual screen, absorbs sound, or channels overland water flow.

Buffer - The separation of use areas at public facilities from neighboring properties consisting of either natural or established vegetation.

Culvert - A drain or waterway structure, usually under a roadway.

Cutting side - The side, generally of a river, on which the current has an erosive effect.

Fetch - Open water distance over which wind blows unimpeded.

Floodplains - All lands that would be inundated by flood water as a result of a storm event of a 100-year return interval.

Impervious surface - Materials through which water will not pass (i.e., roofs, sidewalks, roads, etc.).

Littoral drift - The movement of sand or other natural materials along a shoreline. The drift is the direction toward which the material is moved.

Mean low water - An average of all measurements of low water over a given period.

Percent of grade - The rise or fall of a surface. The percent is determined by dividing the change in vertical height by the horizontal distance and multiplying the results by 100.

Sediments - Eroded soils and other materials that are transported from the land into rivers and the Bay.

Siltation - The deposition or accumulation of silt and sediment.

Wake - The track left by a ship or other body in the water usually in the form of waves moving from and at an angle to the ship or other body.

Wetland - Land that under normal circumstances has sufficient water to support wetland vegetation or aquatic life.

Notes

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