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Title:	Town of Falmouth Wetlands Regulations
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Abstract

The Town of Falmouth’s Wetland Regulations recognize that “special transitional areas,” portions of coastal floodplains that are immediately landward of salt marshes, coastal dunes, and barrier beaches, require special protection. To that end, these regulations require that relative sea level rise be considered in development proposals, and that buildings and other structures in special transitional areas be designed to incorporate a relative sea level rise of at least one foot per 100 years in “A-zones” (coastal storm flowage zones) and at least two feet per 100 years in “V-zones” (velocity zones). Similarly, in FWR 10.39, Land or Waters within Black Beach/Sippewissett Marsh District of Critical Planning Concern, two barrier split zones highly valued for their ecological diversity and their structural function as storm surge barriers, all structures, including septic systems, must be designed to accommodate a relative sea level of at least one foot within FEMA A and V zones.

Resource

FALMOUTH WETLANDS REGULATIONS

July 15, 1998, Effective August 15, 1998, Includes 2003 and 2004 updates.

Part II – Regulations for Coastal Wetlands

§ 10.38: Land Subject to Coastal Storm Flowage

§ 10.39: Land and Water in the Black Beach/Great Sippewissett Marsh District of Critical

FWR § 10.38 Land Subject to Coastal Storm Flowage

(Additional regulations regarding land subject to coastal storm flowage in the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern are found in FWR 10.39. Additional regulations regarding land subject to coastal storm flowage in the Waquoit Bay ACEC are found in FWR 10.40).

(1) Introduction

Land Subject to Coastal Storm Flowage is significant to storm damage prevention and flood control. Land Subject to Coastal Storm Flowage is also likely to be significant to wildlife habitat, recreation, aesthetics, erosion and sediment control and water pollution control.

Storm Damage Prevention, Flood Control & Erosion and Sediment Control:

Velocity zones (V-zones) and AO-zones of Land Subject to Coastal Storm Flowage (V-zones especially so) are areas which are subject to hazardous flooding, wave impact, and, in some cases, significant rates of erosion as a result of storm wave impact and scour. V- and AO-zones in coastal areas are generally subject to repeated storm damage which can result in loss of life and property, increasing public expenditures for storm recovery activities, historic taxpayer subsidies for flood insurance and disaster relief, and increased risks for personnel involved in emergency relief programs. Alteration of land surfaces in A-zones could change drainage characteristics that could cause increased flood damage on adjacent properties. A number of complex and inter-related factors determine the wave height and the landward extent of wave run-up in V- and AO-zones, including shoreline orientation, nearshore/off shore bathymetry, onshore topography, wave fetch, storm frequency and magnitude, and the presence of coastal engineering structures. The topography, soil characteristics (e.g. composition, size, density,- & shape of soil material), vegetation, erodibility and permeability of the land surface within V- and AO-zones are critical characteristics which determine how effective an area is in dissipating wave energy and in protecting areas within and landward of these zones from storm damage and flooding. The more gentle and permeable a seaward-sloping land surface is, the more effective that land surface is at reducing the height and velocity of incoming storm waves. Wave energy may be expended in eroding and transporting materials comprising the land surface within the V- and AO-zones, as well as by percolation or the downward movement of the stormwater through more permeable land surfaces, thereby lessening the effects of backrest, scour and erosion.

Development in V- and AO-zones poses environmental problems since construction and development activities can impair or destroy those characteristics cited above which are critical to the stated resource area values.

Dredging or the removal of materials within V- and AO-zones acts to increase the landward velocity and height of storm waves, thereby allowing storm waves to break further inland and to impact upland and wetland resource areas which might not otherwise be impacted. Filling and the placement of solid fill structures within V- and AO-zones may cause the refraction, diffraction and/or reflection of waves, thereby forcing wave energy onto adjacent properties, natural resources, and public or private ways potentially resulting in otherwise avoidable storm damage. When struck with storm waves, solid structures within V- and AO-zones also may increase localized rates of erosion and scour.

In some cases, the placement of fill in hydraulically constricted portions of the coastal floodplain may increase flood levels in conjunction with heavy rainfall events. The

placement of fill in AH-zones, where ponding occurs generally as a result of overwash in coastal floodplains, may increase flood levels on the subject and adjacent properties above pre-fill flood levels.

Relative Sea Level Rise Considerations:

Those portions of coastal floodplains which are immediately landward of salt marshes, coastal beaches, barrier beaches, coastal dunes or coastal banks require special protection. These areas are likely to be in a state of transition as the entire complex of coastal wetland resources gradually moves landward because of the fact that, "for the past thousands of years, relative sea level has been rising in Massachusetts, and it is still rising", (Smith, Clayton, Mayo and Giese, 1978), resulting in inundation of more landward area. As sea level rises, the shoreline may retreat and areas are successively inundated more frequently by storm and tidal activity. Activities carried out within these 'special transitional areas' of coastal floodplains may interfere with the natural landward migration of the adjacent coastal resource areas. Therefore, maintaining these special transitional areas in their natural state is necessary to protect the interests of other wetland resources.

Historical sea level measurements indicate that relative sea level in Massachusetts is rising at approximately 1 foot per 100 years. In FEMA designated A-zones, where stillwater flooding predominates, the increased flood elevations are proportional to that increase in the current relative sea level rise rate in Massachusetts. However, in FEMA designated V-zones, the increased flood elevations will exceed that of a proportional increase in sea level rise.

Therefore, buildings and other structures should be designed to incorporate a relative sea level rise of at least 1 foot per 100 years in A-zones and at least 2 feet per 100 years in V-zones.

(2) Definitions, Boundaries, and Critical Characteristics

(a) Definitions

1. Land Subject to Coastal Storm Flowage

Land Subject to Coastal Storm Flowage means land subject to any inundation caused by coastal storms up to and including that resulting in a 100 year flood, surge of record, or flood of record, whichever is greater. One hundred year flood (or base flood as it is also referred to) means the flood having a one percent chance of being equaled or exceeded in any given year.)

2. Velocity Zones (including V-, VE-, & Vi-30)

Velocity Zones are those portions of Land Subject to Coastal Storm Flowage which are coastal high hazard areas or areas of special flood hazard extending from the inland limit within the 100 year floodplain seaward supporting waves greater than three feet in height.

3. AO-Zones

AO-zones are those portions of Land Subject to Coastal Storm Flowage which are subject to inundation by moving water (usually sheet flow on sloping terrain) where average depths are between one and three feet. In Massachusetts, coastal

AO zones are commonly associated with overwash and generally border on the landward side of V-zones.

4. A-Zone (including A-, AE-, AI-30, & A99)

A-zones are those portions of Land Subject to Coastal Storm Flowage which are subject to inundation by types of 100 year flooding where Stillwater flooding predominates.

5. AH-Zone

AH-zones are those portions of Land Subject to Coastal Storm Flowage which are subject to shallow flooding, usually ponding resulting from overwash, where average water depths are between one and three feet.

6. Overwash

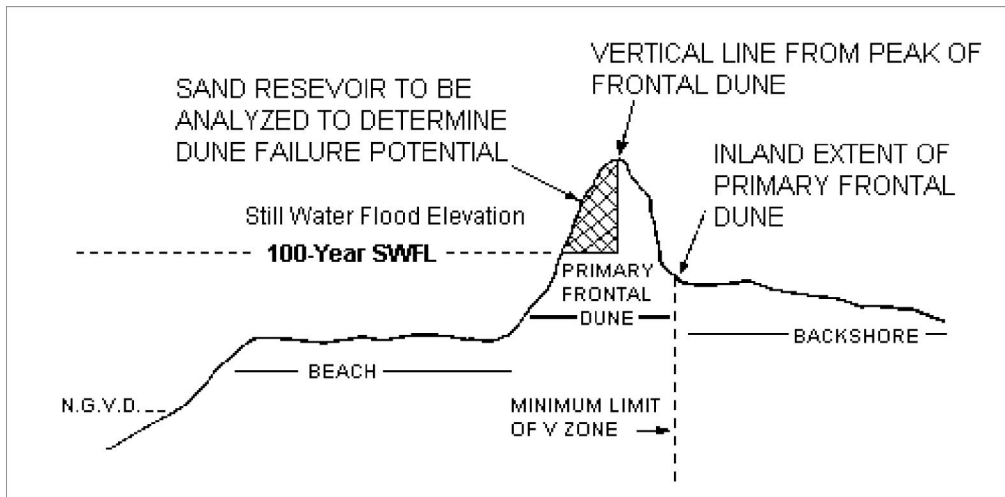
That portion of storm wave uprush that carries over the crest of a berm, dune, or man-made structure, oftentimes depositing sediment or other storm laden material.

(b) Boundary & Boundary Modification Procedure

1. The boundaries of the V-, AO- and AH-zones within Land Subject to Coastal Storm Flowage shall be determined by reference to the most recently available flood data prepared for the Town of Falmouth under the National Flood Insurance Program. The landward boundaries of the AO- and AH-zones shown on the Flood Insurance Rate Map (FIRM) for the community shall be presumed accurate

2. The landward boundary of the A-zone within Land Subject to Coastal Storm Flowage shall be determined by reference to base flood elevation on the most recently available flood data prepared for the Town of Falmouth under the National Flood Insurance Program. The boundaries determined by the baseflood elevation

topographical plan of the parcel performed by a registered engineer or other professional competent in such matters and shall be presumed accurate.



3. The landward boundaries of the V-zones shall be presumed to be twenty-five feet (25 ft.) landward of the boundaries shown on the Flood Insurance Rate Map (FIRM).
4. The landward boundary of the 10 year floodplain is the estimated maximum lateral extent of the flood water which will theoretically result from the statistical 10 year storm. Said boundary shall be determined utilizing the 10 year Stillwater elevation as published in the community Flood Insurance Study.
5. Where NFIP flood data are unavailable, the boundary of any zone within Land Subject to Coastal Storm Flowage shall be the maximum lateral extent of flood water typical of that zone which has been observed or recorded.
6. In the event of a floodplain boundary conflict, the Commission may require the applicant to determine the boundary by engineering calculations which shall be:
 - a. based upon the 100-year Stillwater flood elevation published in the effective Flood Insurance Study for the community for the affected shoreline reach or a revised 100 year Stillwater flood elevation calculated to account for hydrologic changes occurring subsequent to the effective date of the community Flood Insurance Study;

b. based upon the appropriate wave height or wave run-up methodology for the affected shoreline reach as set forth in the FEMA Publication, Guidelines and Specifications for Wave Envelope Determination and V-Zone Mapping, FEMA, 1989; and

c. prepared and certified by a registered professional engineer.

7. Notwithstanding FWR 10.38(2)(b)6.a. though c., where a V-zone has been depicted on the latest Federal Insurance Rate Map on a barrier beach with a frontal dune reservoir less than 540 square feet (as explained in the National Flood Insurance Program and Related Regulations [44 Code of Federal Regulations, Chapter 1, Section 65.11]), the V-zone shall be remapped pursuant to the provisions of FWR 10.38(2)(b)4.b. and c. (see illustration)

(c) Critical Characteristics

1. The topography, soil characteristics (i.e. composition, size, shape & density of material), vegetation, erodibility, and permeability allow for the dissipation of storm wave energy and, therefore, are the physical characteristics of Land Subject to Coastal Storm Flowage which are critical to the protection of the statutory interests of flood control and storm damage prevention. In addition, for areas in AH-zones that are subject to ponding or A-zones that are hydraulically constricted areas, the ability to store a volume of flood water is a critical characteristic. Hydraulically constricted A zones are those in which the base flood elevation is lower on the landward side of the constriction.

2. In addition to the above cited critical characteristics, the proximity of floodplain areas to water bodies and other wetland resources, makes them critical to water pollution control of these abutting resource areas.

3. In order to protect existing coastal or freshwater wetland resource area values, the geographic extent/area of the resource must be maintained. Thus, in order to maintain the ability of a resource area to migrate landward in response to relative sea level rise without loss of area the critical characteristics of Land Subject to Coastal Storm Flowage are topography; frequency, depth and duration of inundation; and proximity to a coastal or freshwater wetland.

(3) Presumptions

(a) Where a project involves removing, dredging, filling, building upon, degrading or otherwise altering of Land Subject to Coastal Storm Flowage, the Commission shall presume that said area is significant to, and the proposed activity will have a significant or cumulative effect upon, the resource area values Specified in FWR 10.38(1).

(b) The following activities proposed within Velocity zones of Land Subject to Coastal Storm Flowage shall be presumed to have a significant or cumulative adverse affect on the protected resource area values;

Construction of:

1. new structures, including buildings, sheds and garages, and additions and substantial improvements to existing structures;
2. new parallel/shear walls or vertical walls for existing structures;
3. impermeable paving for new roads, driveways and parking lots;
4. new or proposed expansions of coastal engineering structures;
5. changes in grade including new mounded septic systems.

(c) The following activities proposed within the AO-zone of a beach, dune or barrier beach of Land Subject to Coastal Storm flowage are likely to have a significant or cumulative adverse effect on the protected resource area values:

Construction of:

1. new structures, including buildings, sheds and garages, and additions and substantial improvements to existing structures supported on a solid foundation or proposed below the base flood elevation;
2. new parallel walls/shear walls, vertical walls or breakaway walls, foundation piers, grade beams, or foundation/structural slabs for existing structures;
3. new or proposed expansions of roads,, driveways or parking lots, or impermeable paving for existing unpaved roads, driveways or parking lots;
4. new or proposed expansions of coastal engineering structures;
5. new septic systems.

(d) These presumptions are rebuttable and may be overcome only upon a clear showing that said area does not play a role in the protection of said resource area values. In the event that the presumptions are deemed to have been overcome, the Commission shall make a written determination to this effect, setting forth the grounds.

(4) General Performance Standards

(a) When the Commission determines that Land Subject to Coastal Storm Flowage (A, AO, AH and/or V zones) overlays other resource areas listed in FWR 10.00, the

applicable performance standards for each resource area shall be independently and collectively applied and the project shall be appropriately conditioned to protect all stated resource area values.

(b) When Land Subject to Coastal Storm Flowage (A, AO, AH and/or V-zones) is significant to the resource area values of flood control and storm damage prevention, the following performance standards shall apply:

1. Any activity shall not have an adverse effect by increasing the elevation or velocity of flood waters or by increasing flows due to a change in drainage or flowage characteristics (e.g. change in direction) on the subject site, adjacent properties, or any public or private way.
2.
 - a. Relative sea level rise and the landward migration of resource areas in response to relative sea level rise shall be incorporated into the design and construction of structures and other activities proposed in Land Subject to Coastal Storm Flowage.
 - b. At a minimum, for activities proposed in A-zones, the historic rate of relative sea level rise in Massachusetts of 1 foot per 100 years shall be incorporated into the project design and construction.
 - c. At a minimum, for activities proposed in the V-zone, a two foot elevation per 100 years shall be incorporated into the project design and construction.
 - d. Any activity within the 10 year floodplain of Land Subject to Coastal Storm Flowage shall not have an adverse effect by impeding the landward migration of other resource areas within this area of the floodplain.

(c) When the AH-zone (or an A-zone which is hydraulically constricted) is significant to the interests of flood control or storm damage prevention, the following additional performance standards shall apply:

1. A proposed activity shall not result in flood damage due to filling which causes lateral displacement of flood waters that, in the judgment of the Commission, would otherwise be confined within said area; unless,
2. Compensatory storage is provided for all flood storage volume that will be lost as the result of a proposed project within this area when, in the judgment of the Commission, said loss will cause an increase or contribute incrementally to an increase in the horizontal extent and level of flood waters.

Compensatory flood storage shall mean a volume not previously used for flood storage and shall be incrementally equal to the theoretical volume of flood water at each elevation, up to and including the 100 year flood elevation, which would be displaced by the proposed activity. Compensatory flood storage shall be provided

within the same general area as the lost area and must maintain or create an unrestricted hydraulic connection within said area.

(d) A proposed project within a Velocity-zone shall not destroy or otherwise impair the function of any portion of said landform and/or shall not have an adverse effect on adjacent wetland resource areas. Activities and their ancillary uses in Velocity zones which result in alterations to vegetative cover, interruptions in the supply of sediment to other wetland resources, and/or changes to the form or volume of a dune or beach will have an adverse effect on said landform's ability to provide storm damage prevention and flood control and are, therefore, prohibited. These activities include, but are not limited to: Construction of:

1. new structures., including buildings, sheds and garages, and additions or substantial improvements to existing structures;
2. foundations other than open pilings or columns;
3. new or proposed expansions of roads, driveways or parking lots, or impermeable paving for existing unpaved roads, driveways or parking lots;
4. new or proposed expansions of coastal engineering structures;
5. new septic systems.

(e) Notwithstanding the provisions of FWR 10.38(4)(a) through (d), the Commission may permit the following activities provided that the applicant demonstrates, to the satisfaction of the Commission, that best available measures are utilized to minimize adverse effects on all critical characteristics of Land Subject to Coastal Storm Flowage, and provided that all other performance standards in FWR are met:

1. Beach, dune and bank nourishment and restoration projects, including fencing and other devices designed to increase dune development and plantings compatible with natural vegetative cover;
2. Boat launching facilities used in the service of the public and navigational aids;
3. Improvements necessary to maintain the structural integrity/stability of existing coastal engineering structures;
4. A project which will restore, rehabilitate or create a saltmarsh or freshwater wetland;
5. Projects that are approved, in writing, or conducted by the Division of Marine Fisheries that are specifically intended to increase the productivity of land containing shellfish, or to maintain or enhance fisheries;

6. Projects that are approved, in writing, or conducted by the Division of Fisheries and Wildlife that are specifically intended to enhance or increase wildlife habitat.

(f) Notwithstanding the provisions of FWR 10.38(4)(a) through (e), the Commission may approve small additions to an existing structure provided:

1. All other provisions of FWR are met;
2. The structure is not in any resource area other than Land Subject to Coastal Storm Flowage;
3. The structure is not in a area subject to FWR 10.18 Resource Area Buffer; and
4. The cumulative size of addition(s) to the structure since (effective date) does not exceed 200 square feet.

(g) Notwithstanding the provisions of FWR 10.38(4)(a) through (f), no project may be permitted which will have any adverse effect on habitat sites of rare species.

FWR § 10.39: Land or Waters within Black Beach/Sippewissett Marsh District of Critical Planning Concern

(Pursuant to Barnstable County Ordinance 96-1 and Section 22(c) of the Cape Cod Commission Act, expansions and alterations of single-family residential dwellings in existence as of July 1, 1989, are not subject to the provisions of FWR 1.39 provided the total gross floor area of such expansion or alteration does not exceed 25% of the total gross floor area of the dwelling in existence as of July 1, 1989. Additions which exceed this threshold are subject to the provisions of FWR 10.39. Single-family dwellings constructed after July 1, 1989, multifamily dwellings, and nonresidential structures are subject to the provisions of FWR 10.39 regardless of the size of the expansion or alteration. Exemption from FWR 10.39 does not exempt the applicant from any other provision of FWR 10.00 or any other local bylaw, or state and federal statutes. The definition of total gross floor area is found in Section 240-13 of the Code of Falmouth under "GROSS (Leasable) FLOOR AREA").

(1) Introduction. The land and waters within the Black Beach/Sippewissett Marsh District of Critical Planning Concern (the District) are likely to be significant to the prevention of flood damage by limiting of development in flood hazard areas, prevention of damage to structures and natural resources as a result of erosion, improvement of water quality, protection and enhancement of existing vegetative cover in order to maintain water quality and wildlife habitat, protection of wildlife, waterfowl, and plant habitat and the maintenance of existing populations and species diversity, prevention of loss or degradation of critical wildlife and plant habitat, prevention of new stormwater runoff discharges and the improvement of existing stormwater runoff discharges, protection of coastal ecosystems which support the continued viability of harvestable shellfish and finfish habitat, public access to water and land, improvement of groundwater recharge, and

the minimization of the impact of new development, reconstruction and/or expansion on the resource area values listed above.

The land in this resource area may also be significant to protection of public and private water supply, protection of ground water supply, flood control, storm damage prevention, prevention of pollution, protection of land containing shellfish, protection of fisheries, protection of wildlife habitat, protection of aesthetics, prevention of erosion, protection of recreation, depending on what other resource area(s) may be present.

This resource area contains nationally significant ecological and natural resources including freshwater and tidal wetlands, waterfowl, shorebird and migratory bird habitat, rare species, shellfish and finfish, mud and sand flats, and a barrier beach/dune/marsh system which possess recreational, scientific, and educational values.

In recognition of the presence of these resources, the federal Fish and Wildlife Service completed an Environmental Assessment (1993) which proposed federal designation of the Sippewissett Marshes National Wildlife Refuge, encompassing a portion of the

District. The District is also located on Buzzards Bay which has been designated by the Environmental Protection Agency as an estuary of national significance leading to a program to enhance water quality and natural resources through the Buzzards Bay

Project National Estuary Program.

The marshes, Fresh Pond, and two other small ponds west of Great Sippewissett Marsh (the Marsh) are designated by the Association for the Preservation of Cape Cod as critical habitat due to their many functional values. In addition, the Sippewissett Marshes have been identified by the Northeast Coastal Areas Study as one of seven sites from the Cape and Islands Region that provide significant coastal habitat. According to the Fish and Wildlife Service, five coastal habitat types and approximately 40 species of special emphasis or management concern are supported by the Sippewissett Marshes ecosystem. These marshes provide breeding/spawning, nursery, feeding/staging, wintering and migratory habitat of importance to several species of regional or national significance.

The area is home to several state-listed rare and endangered species. The Massachusetts Natural Heritage and Endangered Species program has designated and mapped the area as a "high priority site of rare species habitat and exemplary natural community" and noted the presence of two state listed species within the proposed District: the federally listed piping plover (*Charadrius melodus*) and the federally listed Arethusa (*Arethusa bulbosa*) -- a perennial orchid- and New England Blazing Star (*Liatrix scariosa* v. *novae-angliae*).

The Fish and Wildlife Service identify the presence of a number of state and federally listed species within the area including Least Terns (*Sterna albifrons*), Northern Diamondback Terrapin (*Malaclemys terrapin*), Saltpond Grass (*Diplachne maritima*),

Bushy Rockrose (*Helianthemum dumosum*).

In addition to rare species present within the District, the Fish and Wildlife Service has conducted an extensive survey of plant and wildlife habitat found within the Sippewissett Marshes area. Their analysis notes that the area provides feeding and overwintering habitat for American Black Duck (*Anas Rubripes*), Canada Geese (*Branta canadensis*), forage for terns, herons, egrets, and bitterns, nesting habitat for osprey and various songbirds, and migratory bird habitat for neotropical migrating birds.

The marshes and associated creeks and shallows provide nursery areas for commercially important fish species including winter flounder, bluefish, striped bass and tautog.

Menhaden and American sandlance use the marsh as a nursery area and a variety of smaller resident species provide a food source for larger sport and commercial fish species. Soft shell (*Mya arenaria*) and hard shell clams (*Mercenaria mercenaria*) occur on the mud flats and along the outer beach, and the area has supported occasional bay scallop (*Argopecten irradians*) fisheries providing a potential commercial and recreational shellfishing resource. The first shellfish closures of the area due to bacteriological contamination occurred in approximately 1983. The area is currently classified as "seasonally approved" and shellfishing is permitted during winter months.

It is important to maintain the features of the beach which make it critical habitat, and a Natural Heritage high priority site for these species, as well as essential habitat for all species that depend upon the marsh/barrier beach complex. However, the water quality and ecological values of the marsh/beach complex are threatened by increasing development and current management practices.

According to the Massachusetts Division of Marine Fisheries Sanitary Survey Report (1993) stormwater runoff, coupled with poor flushing, is one of the primary sources of shellfish contamination problems in the District. Site preparation and development activities including grading, clearing, alteration of topography and the construction of structures, roads and driveways may alter drainage patterns and introduce pollutants and sediment to the Marsh through runoff. Grading and filling activities increase the compaction of subsurface soils, decrease soil fertility and change permeability and drainage characteristics. Grading of areas contributing direct discharge to the marsh also causes increased turbidity, decreased pH, changes in salinity and reduced dissolved oxygen levels that will adversely affect fish and invertebrate populations. The Massachusetts Highway Department (MHD) storm drainage system on Route 28A has two drainage pipes that lead directly to the Marsh. Stormwater runoff has been indicated to be a primary source of fecal coliform contamination in the Marsh -- an important indicator of shellfish quality according to the 1993 Sanitary Survey. High fecal coliform counts have been particularly prevalent during the summer months.

Runoff from developed upland areas other than roads can also contribute significant amounts of contaminants to the Marsh.

Runoff from upland areas can contain fertilizers and pesticides from lawns and contaminants from precipitation on roofs and driveways. Natural buffer strips can significantly reduce contaminant loads from developed areas. The efficiency of buffer strips depend on their width, slope and type and extent of vegetation.

Buffer strips are also important for the role that they play in protecting and maintaining wildlife habitat. According to the Fish and Wildlife Service, the alteration or elimination of surrounding upland and backdune habitat, and associated transition zones has a pronounced adverse impact on resident and migratory wildlife. Additional development within the District is likely to result in the removal of vegetation, particularly the wooded buffer areas bordering the Marsh and associated wetlands. This will result in alteration of vegetative structure, species composition and distribution patterns, and habitat fragmentation contributing to the direct loss of wildlife habitat and biodiversity.

According to the Fish and Wildlife Service, disturbance of piping plover and least tern nesting areas by human and domestic animal incursions is a serious problem throughout the region, and has led to the abandonment of many former piping plover and tern colonies. Human/animal disturbances are likely to have an adverse impact on many other species as well.

The District contains two barrier spits. These are known as Black Beach and the Saconessett Hills Barrier Spit. They are designated as Fm-31 and Fm-30 respectively by the Massachusetts Coastal Zone Management's 1982 Barrier Beach Inventory Project. Black Beach is also a federally designated unit of the Federal Coastal Barrier Resource System.

The barrier spits protect the Marsh, shoreline areas, and upland areas behind the Marsh by serving as a buffer to storm waves and storm surges. It is a dynamic area where the beach and dunes are constantly changing as a result of wind and wave action, influenced by natural and human activities as well as relative sea level rise. Like most barrier beaches, Black Beach is attempting to move landward, as indicated by visible storm overwash fans deposited in the marsh behind the dunes. This landward migration is part of the natural cycle of barrier beaches and the process of overwash plays an important role in the dissipation of wave energy and protection of upland areas behind the barrier beach. As storm waves erode the seaward side of the barrier beach, overwashed material is carried into the marsh and provides a substrate for the formation of new dune areas, shifting the barrier beach landward.

On an undeveloped barrier beach, this process can occur unimpeded, however, development on barrier beaches including buildings, septic systems, roadways, seawalls, revetments, and groins alters this natural cycle. Such structures prevent overwash and interfere with beachgrass and dune growth, contributing to erosion in surrounding areas. These disturbances are damaging to the stability and function of the system as a whole and over the long term will interfere with the landward migration of the barrier beach and make the beach increasingly susceptible to breaching. According to "Guidelines for

Barrier Beach Management in Massachusetts (1994), "once the natural beach and dune rebuilding processes are interrupted, the barrier beach defenses against future storms are diminished. In an attempt to "stabilize" the barrier beach through armoring, such as building a seawall or revetment, the beach areas adjacent to and in front of the armoring erode or scour at an accelerated rate and may entirely disappear over time. The Guidelines recommend that "whenever possible, coastal banks serving as sediment sources for adjacent barrier beaches remain or be returned to an undeveloped, unarmored state in order to allow for healthy beaches and dunes." The same is true for coastal dunes that function in the same manner.

Existing houses, the marsh, adjacent shoreline and upland areas will become vulnerable to direct wave attack, in the event of a breach in Black Beach. Protecting the integrity and function of the barrier beach system requires attention to three components -ensuring sediment supply to the area, maintaining vegetative cover and maintaining the beach elevation.

Existing and future development will continue to adversely affect the natural process of erosion and migration on the barrier beach. Expansion of existing houses and increased intensity of use of a property on the primary dune or barrier beach may weaken the integrity and elevation of the barrier itself. Septic systems and cesspools within this area may result in the introduction of bacteria and viruses to the Marsh due to shallow depth to groundwater and periodic flooding. In the V-zone, during catastrophic or extreme storms the septic system effluent can be released into the water. Development on the beach also results in the removal of stabilizing vegetation. The continued reliance on revetments, seawalls and jetties to protect property on the beach, will further starve downdrift areas of sediment and further weaken the barrier beach.

In addition, most of the District is within FEMA V and A flood zones. Approximately 50% of the District is in the mapped FEMA Velocity zone. This is an area which is subject to hazardous flooding, wave impact, and erosion as a result of storm wave impact and scour. Development in these areas is at extreme risk -- and can pose a hazard to nearby areas. For example, dredging or removal of materials within V-zones acts to increase the landward velocity and height of storm waves, thereby allowing them to break further inland and to impact adjacent upland and wetland areas which might not otherwise be impacted. Filling and the placement of solid structures within V-zones may cause the refraction, diffraction and/or reflection of waves, thereby forcing wave energy onto adjacent properties, natural resources, and public or private ways potentially resulting in otherwise avoidable storm damage and/or increased rates of erosion and scour. (U.S. Army Corps of Engineers, 1984)

Most of the remainder of the District is located in the FEMA A-zone. Alteration of land surfaces in FEMA A-zones will change drainage characteristics that can result in increased flood damage on adjacent properties. In addition, flooding within these areas leads to property damage. Loss of property resulting from wave and wind damage in V-zones, as well as from stillwater flooding within A-zones, is responsible for millions of dollars in

flood insurance claims and taxpayer costs in Massachusetts. As a result of just three storms in 1991-1992, the repair of public roads, seawalls, sewer and water lines, buildings and other public facilities in Massachusetts cost to tax-payers over \$50 million (in addition to monies paid from the National Flood Insurance Program).

The area within the District received a significant amount of storm damage as a result of Hurricane Bob. In addition, the elevation of the dunes was lowered due to lack of sediment supply as a result of revetments and groins along the coastline and redistribution of sand from Hurricane Bob, leaving the area vulnerable to future storms. Future hurricanes will likely affect this area in a similar manner.

Finally, storm damage in the future is likely to be even more devastating as a result of relative sea level rise. Historical sea level measurements indicate that relative sea level is rising at approximately 1 foot every 100 years (Giese, et al., 1987). As a result, the Massachusetts Coastal Zone Management Program and the Barnstable County Regional Policy Plan both recommend that buildings, Septic systems, and other structures be designed to accommodate a relative sea level rise of at least 1 foot within FEMA A- and V-zones. More recent research, indicates that a 2 foot increase in elevation within V-zones is likely to be necessary due to increases in wave height within these areas. Research by the Cape Cod Commission on naturally vegetated areas adjacent to wetlands and waterbodies notes the importance of maintaining fringing upland areas around these resources in order to allow landward migration of both inland and coastal wetlands in response to sea level rise. If these areas are not protected, wetlands are likely to become flooded and lost as sea level rises.

Much of the available knowledge concerning the function and human value of the New England saltmarsh, including the information summarized in this preamble, has been learned from scientific research conducted in the Great Sippewissett Marsh.

During the past two or three decades, over 100 scientific reports and theses have been published on all aspects of saltmarsh ecology, based on research at the Great Sippewissett Marsh. The accumulated scientific data is without equal in the world and the protection of this natural system will allow this important research work to continue to build upon past efforts.

The Black Beach/ Marsh area described above qualified under Section 10(a) of the Cape Cod Commission Act for designation as a District due to the following factors:

- the presence of significant natural, coastal, and scientific resources; and
- the presence of substantial areas of sensitive ecological conditions which render the area unsuitable for development.

As proposed by the Town, and in accordance with the District of Critical Planning Concern Guidance Document, dated December 1990, this District was designated as a Wildlife, Natural, Scientific and Ecological District; and a Hazard District. The Ecological District

contains important and identifiable wildlife, natural, scientific and ecological resources including but not limited to, plant, animal and marine life and their habitats, as well as unusual geological features. The District is highly susceptible to hazards due to natural or man-made conditions including but not limited to, marginal soil, or topographic conditions which render it unsuitable for intense development, flooding, waste treatment, groundwater, erosion, construction problems, salt water intrusion, and pollution.

(2) Definition, and Boundary

(a) Land or Waters Within the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern includes all areas within the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern that was created by Barnstable County Ordinance 96-1.

(b) Unless otherwise stated or otherwise specified in the Falmouth Zoning Code, the definitions in Barnstable County Ordinance 96-1 shall apply to FWR 10.39.

(c) Total cumulative resource area impacts means all areas of a lot and/or parcel of land not in a naturally vegetated condition and includes but not is limited to: rooftops, driveways, parking areas, gardens, lawns, paths, walkways, docks, and piers.

(d) Naturally vegetated condition means an area on a lot or parcel of land that:

1. is left in a natural, undisturbed vegetative state;
2. has existed in a primarily natural, undisturbed state, but has been enhanced with indigenous plantings conducive to improved wildlife habitat according to a plan approved by the conservation commission; or
3. has been disturbed; but is revegetated with indigenous plantings that will return the land to its predisturbance condition according to a plan approved by the conservation commission.

(e) The boundary of the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern is depicted on the attached map "Black Beach/Great Sippewissett Salt Marsh DCPC."

(3) Presumption.

(a) Where a project involves removing, filling, dredging, building upon or otherwise altering of land or waters within the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern, the Commission shall presume that such area is significant the resource area values specified in FWR 10.39(1). This presumption is rebuttable and may be overcome upon a clear showing that said land does not play a role in the protection of said resource area values. In the event that the presumption is deemed to

have been overcome, the Commission shall make a written determination to this effect, setting forth the grounds.

(b) In the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern, the following activities shall be presumed to be significant to some or all of the resource area values specified in FWR 10.39(1). This presumption is rebuttable and may be overcome upon a clear showing that said land does not play a role in the protection of said resource area values. In the event that the presumption is deemed to have been overcome, the Commission shall make a written determination to this effect, setting forth the grounds.

1. The use of septic systems is significant to improvement of water quality and the protection of coastal ecosystems which support the continued viability of harvestable shellfish and finfish habitat;

2. The construction, use, and maintenance of docks and piers is significant to impacts on prevention of flood damage 10.39: continued by limiting of development in flood hazard areas, prevention of damage to structures and natural resources as a result of erosion, protection and enhancement of existing vegetative cover in order to maintain water quality and wildlife habitat, protection of wildlife, waterfowl, and plant habitat and the maintenance of existing populations and species diversity, prevention of loss or degradation of critical wildlife and plant habitat, protection of coastal ecosystems which support the continued viability of harvestable shellfish and finfish habitat, public access to water and land, and the minimization of the impact of new development, reconstruction and/or expansion on the resource area values listed above.

(c) In the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern, the following activities shall be presumed to adversely affect some or all of the resource area values specified in FWR 10.39(1). This presumption is rebuttable and may be overcome upon a clear showing that said land does not play a role in the protection of said resource area values. In the event that the presumption is deemed to have been overcome, the conservation commission shall make a written determination to this effect, setting forth the grounds.

1. any proposed septic system or repair to an existing septic system proposed that is not in compliance with the setback requirements of FWR 10.03(3)(c)

2. existing stormwater discharges, where no mitigation is provided pursuant to FWR 10.39(25);

3. existing docks and piers; and

4. land not in a naturally vegetated condition.

(4) General Performance Standards. Work in the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern shall meet the performance standards for any other resource areas within which work is proposed and, where the presumption set forth in FWR 10.39(3) is not overcome, FWR 10.39 (5) through (29) shall apply.

(5) When the Commission determines that Land or Waters within Black Beach/Sippewissett Marsh District of Critical Planning Concern overlays other resource areas listed in FWR 10.21 through 10.60, the applicable performance standards for each resource area shall be independently and collectively applied and the project shall be appropriately conditioned to protect all stated resource area values.

(6) (a) Work on an undeveloped lot shall minimize the total cumulative resource area impacts pursuant to FWR 10.05(7)(f)1.

(b) Work on a developed lot where the existing total cumulative resource area impacts are less than that specified in FWR 10.05(7)(f)1., shall be designed so that the total cumulative resource area impacts after the proposed project is completed, do not exceed those specified in FWR 10.05(7)(f)1.

(c) Work on a developed lot where the existing total cumulative resource area impacts are greater than FWR 10.05(7)(f)1. may be permitted provided that the total cumulative resource area impacts after the proposed project is completed, have been reduced.

1. The conservation commission shall presume that an applicant has satisfied the requirements of FWR 10.39(6)(c) if 10% of the land area in excess of the amount specified in FWR 10.05(7)(f)1. is returned to a natural vegetated condition.

The determination of which area of a lot is returned to a naturally vegetated condition pursuant to this presumption shall be at the discretion of the applicant.

(7) Notwithstanding the provisions of FWR 10.39(6), no project shall remove, fill, dredge, build upon, degrade, or otherwise alter land that is in a naturally vegetated condition and acts as a buffer to the following resource areas: land under the ocean; land under estuaries; salt marsh; land under a salt pond; land containing species that are endangered, rare, threatened, or of special concern; freshwater wetlands; land under waterbodies; or vernal pool. A buffer width of at least 200 and no more than 300 feet is required unless otherwise specified in FWR 10.39. The Commission shall determine the exact buffer width based on the following factors:

(a) existing wetland functions, values and sensitivity to disturbance;

(b) buffer characteristics;

(c) land use impacts; and

(d) buffer functions.

(8) Notwithstanding the provision of FWR 10.39(7), the distances specified in FWR 10.39(7) may be modified in a manner consistent with the provisions of FWR 10.18, but in no case shall the buffer distance be less than one hundred (100) feet.

(9) Notwithstanding the provision of FWR 10.39(7), the Commission may permit the following in the area specified in FWR 10.39(7) and (8):

(a) activities having minimal adverse impacts on buffers and no adverse impacts on the resource area for which the buffer is provided. These activities may include low intensity, passive recreational activities such as pervious trails, nonpermanent wildlife watching blinds, short term scientific or educational activities, and sports fishing or hunting.

(10) A building setback line of 15 feet is required from the edge of any land in its naturally vegetated condition pursuant to FWR 10.39(7). Minor structural intrusions into the area of the building setback may be allowed if the conservation commission determines that such intrusions will not negatively impact the resource area values specified in FWR 10.39(1). The setback shall be identified on a site plan which is filed as an attachment to the Order of Conditions.

(11) No new, or expansion and/or enlargement of an existing, bulkhead, revetment, seawall, or other coastal engineering structure shall be permitted on a coastal bank.

(12) Notwithstanding the provisions of FWR 10.39(6) through (11), no project shall be permitted which will have any adverse effect on land under the ocean, or if proposed on land under a salt pond, on lands within 100 feet of the mean high water line of a salt pond, or on land under a body of water adjacent to a salt pond, shall be permitted which will have any adverse effect on the marine fisheries or wildlife habitat of the salt pond, or ability of the public to access the land and waters of the salt pond.

(13) Notwithstanding the provisions of FWR 10.39(6) through (12), the Commission may issue a permit for limited dredging for the purpose of improving tidal circulation and water quality, to improve or provide tidal flow through relict or existing tidal channels to openings through the railroad dike,

(14) Notwithstanding the provisions of FWR 10.39(6) through (12), no project, including the reconstruction or repair of existing coastal engineering structures, shall be permitted which will have any adverse effect on a coastal beach.

(15) Notwithstanding the provisions of FWR 10.39(6) through (14), no project, including the reconstruction or repair of existing coastal engineering structures, shall be permitted on a coastal dune or within 100 feet of a coastal dune which would have an adverse effect on the dune by:

- (a) affecting the ability of waves to remove sand from the dune;
- (b) disturbing the vegetative cover so as to destabilize the dune;
- (c) causing any modification of the dune form that would increase the potential for storm or flood damage;
- (d) interfering with the landward or lateral movement of the dune;
- (e) causing removal of sand from the dune artificially; or
- (f) interfering with mapped or otherwise identified bird nesting habitat.

(16) Notwithstanding the provisions of FWR 10.39(15), the Commission may permit a repair or replacement to an existing septic system on a coastal dune or within 100 feet of a coastal dune, provided best available measures are used to minimize any adverse effect on the dune caused by:

- (a) affecting the ability of waves to remove sand from the dune;
- (b) disturbing the vegetative cover so as to destabilize the dune;
- (c) causing any modification of the dune form that would increase the potential for storm or flood damage;
- (d) interfering with the landward or lateral movement of the dune;
- (e) causing removal of sand from the dune artificially; or
- (f) interfering with mapped or otherwise identified bird nesting habitat.

(17) FWR 10.39(14) and (15) shall apply to all coastal beaches and to all coastal dunes which make up a barrier beach in the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern.

(18) Notwithstanding the provisions of FWR 10.39(14) through (17), the Commission may permit a project on a beach, dune, or barrier beach, provided:

- (a) the project is a resource area restoration project consistent with the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern Management Plan approved by the Cape Cod Commission pursuant to Barnstable County Ordinance 96-1;
- (b) the project meets the other provisions of FWR 10.00; and
- (c) the project meets the provisions of 310 CMR 10.00; or

(d) the project is the repair or replacement, but not the expansion and/or enlargement, of a lawfully located structure in existence as of January 17, 1996, owned by the Town of Falmouth and used in the service of the public.

(19) Notwithstanding the provisions of FWR 10.39(6) through (18), when a project is proposed on a salt marsh, on lands within 100 feet of a salt marsh, or in a body of water adjacent to a salt marsh, the project shall not destroy any portion of the salt marsh and shall not have an adverse effect on the productivity of the salt marsh. Alterations in growth, distribution and composition of salt marsh vegetation shall be considered in evaluating adverse effects on productivity.

(20) Notwithstanding the provisions of FWR 10.39(6) through (18), no project, except for resource area restoration project consistent with the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern Management Plan approved by the Cape Cod Commission pursuant to Barnstable County Ordinance 96-1, shall be permitted which will have any adverse effect on land under a water body, an inland bank, freshwater wetland, or vernal pool habitat.

(21) Notwithstanding the provisions of FWR 10.39(6) through (20), the Commission may approve the reconstruction of roads and common drives existing as of January 17, 1996, provided such road and common drives are constructed of crushed 3/8, 1/2, 3/4 stone, bank run gravel, or like material, and does not contain a binder material such as asphalt, "processed stone, "stone dust," or like material, or where a town way, private way or common drive was paved as of January 17, 1996, the commission may approve repaving provided the width of the paved surface does not increase.

(22) No new, or replacement, or substantial repair of an existing, dock or pier shall be permitted.

(23) Consistent with FWR 10.28, and 10.38, no septic tank may be placed in ground in a dune, and no changes in elevation may take place in the velocity zone.

(24) The design of the system for stormwater management for new projects shall be consistent with the provisions of FWR 10.16(3) unless otherwise specified in FWR 10.39(24)(a) through (d).

(a) No increase will be allowed in the peak rate of runoff for 2, 10, 25, and 100-year 24 hour storm events.

(b) The total volume of post-development runoff shall not exceed the pre-development runoff volume for storms up to the two year, twenty-four hour design storm.

(c) Treatment for the first flush shall be provided to achieve 80% removal of total suspended solids, and treatment processes to remove nitrogen at an efficiency rate of 30% or greater.

(d) No micropool extended detention basins or biofilter shall be approved.

(25) Notwithstanding the provisions of FWR 10.14(3) and 10.39(24),

(a) any project that contains 10% impervious lot coverage or less shall not be required to meet the requirements of FWR 10.14(3) and 10.39(24), provided said impervious cover is not connected³⁰ to a resource area specified in FWR 10.39(7);

(b) any redevelopment/reconstruction project that contains more than 10% impervious lot coverage, or any impervious lot coverage, shall be required to meet the requirements of FWR 10.39(24)(b) through (d), and shall have a non-erosive discharge for the two year storm.

(26) Notwithstanding the provisions of FWR 10.39(6) through (25), the provisions of FWR 10.39(6) through (25) shall not apply to the routine maintenance of existing roads and driveways, provided that the overall width of the traveled surface is not widened.

Routine maintenance shall be limited to winter sanding operations, regrading, and filling of potholes.

(27) Notwithstanding the provisions of FWR 10.39(6) through (25), no project shall be permitted which will have any adverse effect on habitat sites of rare species.

(28) Notwithstanding the provisions of FWR 10.39(6) through (27), no project shall be permitted which will have any adverse impact on land containing shellfish.

(29) Notwithstanding the provisions of FWR 10.39(6) through (28), the Commission may permit a research project that requires a location in the Lands and Waters of the Black Beach/Great Sippewissett Marsh District of Critical Planning Concern.