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Pools sited in Land Subject to Coastal Storm Flowage
Chatham Wetlands Protection Regulations Abstract

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For a number of reasons, pools are now a popular accessory structure on properties. There has been a noticeable increase in the number of applications and installations. This has led to a question: Do the Chatham Wetlands Protection Regulations allow for pools to be sited within Land Subject to Coastal Storm Flowage? For ease, the acronym LSCSF shall be used.

Pools within LSCSF will likely need to be elevated above the ground as the groundwater is generally closer to the surface within the LSCSF. For the purposes of this analysis, it will be assumed that some or all of the pool is above ground.

(3) Performance Standards
(a) Any activity which is permitted on land subject to coastal storm flowage shall not have an adverse effect on the interests protected by the Bylaw by:
(1) reducing the ability of the land to absorb and contain flood waters;

The installation of a pool does represent the creation of an impervious surface that will reduce the ability of the land to absorb and contain floodwaters. There are a few options to counteract this. Drainage can be added to enhance the remainder of the site thereby offsetting the loss in pervious area. An underdrain can be placed under the pool that will allow surficial flood water to drain into the ground until the ground is saturated. Once the ground is saturated with flood water, ground water and stormwater runoff, the ability of the ground to absorb flood water is eliminated.

The containment of flood waters on a property is an important concept in many flood plains, particularly riverine flood plains where the flood waters are contained within a basin. In the case of coastal floodplain, the flood waters rise to an elevation, then fall as the tide ebbs. Because of this, the amount of fill needed to increase flooding on an adjacent property is substantially more than the volume of a pool.

(2) reducing the ability of the land to buffer more inland areas from flooding and wave damage;

Projects that remove soil material and/or vegetation would potentially result in a greater impact for landward areas during a storm event. The installation of a pool within an already disturbed area would most likely not reduce the ability of the land to buffer. If the pool is placed with a direct exposure to the water, it will more likely serve as a breakwater which can be positive if designed correctly.

(3) displacing or diverting flood waters to other areas;

The question of displacement is critical in AO and AH flood zones and less important in AE flood zones. The flooding in a river basin or an AH Zone is confined and when a portion of the floodplain is filled, the water will have to go elsewhere which is the reason behind the concept of compensatory storage. In the case of coastal floodplain (AE Zone), generally, an excessive amount of fill or structure is needed before a noticeable change in the flood elevation can be observed. A pool is too small to cause a measurable change.

An example of this is the ever changing shoreline. When more sand causes the water to be further seaward, it does not change the elevation of the water, it just changes the location. When a massive change occurs like the 1987 or 2007 inlets in North Beach, the tidal range did change in more landward estuaries. As the same Barrier Beach migrates south, we can expect the tidal range to vary in Pleasant Bay.

The question of diversion is important in the coastal flood plain (AE). Flood waters move into the flood plain; there are energies present. The placement of a structure in such a way that directs these energies towards adjacent properties can cause damage within a reasonable distance of the structure. Avoiding deflection is important and should be a primary consideration with the placement of any structure within LSCSF.

(4) causing, or creating the likelihood of, damage to other structures on land within the flood plain as debris (collateral damage);

The pool itself would need to be constructed to withstand the floodwaters. As it would contain pool water and as the hydrostatic pressure would be balanced during a flood, this is not a concern.

(5) causing ground, surface or saltate pollution triggered by coastal storm flowage;

Pools using certain treatments could cause minor pollution with or without a flood. A full chlorine pool is generally not proposed within Conservation Jurisdiction and generally salt water pools are proposed out of concern for the environment.

(6) reducing the ability of the resource to serve as a wildlife habitat and migration corridor through activities such as, but not limited to the removal of substantial vegetative cover and for installation of fencing and other structures which prevent wildlife migration across property.

If a pool is proposed in an already disturbed area and if other areas are dedicated to wildlife habitat and migration corridors, then it will have minimal reduction on the habitat and corridor. Pool fencing is often a difficult topic with the Commission. The fencing can be reduced or eliminated with the installation of an auto-cover, but there are insurance companies who will not insure properties without pool fences. The building code requires that pool fences be constructed a minimum of four feet high with gaps less than 4". Elevated pools that are more than four feet above the ground do not need fences as the elevation is covered, however, where people walk on decking around the pool, a handrail or similar is required to ensure people do not fall from such a height. The requirements for the rail are not as strict as the pool fence.

(b) No activity, other than the maintenance of an already existing structure, which will result in the building within or upon, removing, filling, or altering land subject to coastal storm flowage shall be permitted, except for activity which is allowed under Part IV, section 4.01(d) or any other activity permitted under a variance from the regulations granted pursuant to Part IV, section 4.03.

Variances are required for many activities within LSCSF.

The following is the preamble with **bolded** notes.

2.10 Land Subject to Coastal Storm Flowage

(1) Preamble
Land subject to coastal storm flowage - including coastal beaches, salt marshes, banks, barrier beaches, salt ponds, dunes, land containing shellfish, land under the ocean, and banks of and land underlying fish runs - is important for the protection of public and private water supply, groundwater and groundwater quality, flood control, erosion and sedimentation control, storm damage prevention, water pollution prevention, wildlife and wildlife habitat, fisheries, and shellfish.

The wetlands values of specific resource areas, including those identified above, that lie within the area of land subject to coastal storm flowage and are otherwise addressed in the Bylaw, and the regulations promulgated thereunder are incorporated in this section by reference.

Storm Damage Prevention

Land subject to coastal storm flowage includes land that lies at the margin between upland and land subject to average (normal) coastal and wind-driven processes. When coastal conditions are not the norm - during extreme high tides and hurricanes, for example - **the ability of the land to absorb flood waters and buffer more inland areas from flood and wave damage is significant.**

Velocity zones (V and VE zones) and A-zones (A, AE, AH, AO, AR, A99) of Land
Subject to Coastal Storm Flowage 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. Alteration of land surfaces in A-zones can change drainage characteristics resulting in increased flood damage on adjacent properties.

The topography, soil characteristics (e.g., composition, size, density & shape of land 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 backrush, scour and erosion.

Dredging or removal of materials within the 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 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 (Shore Protection Manual, US Army Corps of Engineers, 1984 V. 1, pg. 5-3 & 5-5).
In some cases, the placement of fill in hydraulically constricted portions of the coastal floodplain may increase flood levels in 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.

Placing man-made structures in floodplain areas may result in direct and collateral damage to such structures - and to other structures similarly situated - during storm and heavy rain events, by wave impact and flood water inundation, and by storm-driven debris.

Prevention of Pollution

Natural or relatively undisturbed coastal floodplains can reduce erosion and sedimentation, and in a vegetated state can prevent pollutants contained in surface runoff from directly entering waterways and other wetland areas during flood events. Since the flood plain contains areas (as do other wetland resources) in which the water table is close to the surface, during a coastal storm pollutants in the flood plain, including the contents of septic systems and fuel tanks, are likely to affect public and private water supply, groundwater quality, wildlife and wildlife habitat, fisheries and shellfish.

Wildlife Habitat

Coastal floodplain areas are low-lying areas that are ecologically transitional between marine/estuarine ecosystems and upland areas. **Resource areas within the 100-year floodplain are important habitats for a large variety of wildlife species.**

For example, salt marshes provide habitat for many crustaceans and mollusks and serve as critical nursery areas for numerous fin fish species which in turn provide food for species higher up in the food chain, e.g., herons, osprey, mink and raccoon. These resource areas also provide important over-wintering and stopover areas for many species of waterfowl.

Areas of coastal floodplains adjacent to other wetland resource areas provide important wildlife functions, such as nesting and roosting habitat, and serve as wildlife corridors connecting coastal zone resources with freshwater wetland resources. Adjacent areas within the coastal floodplain also serve as transitional zones needed to protect the coastal wetland resources' ability to provide essential habitats (Guidance Specifying Management Measures for Sources of Non-point Pollution in Coastal Waters, EPA, 1993: Castelle, et aI., 1992, pgs 5 & 6).

Chatham's coastal flood plain is the town's largest single interconnected resource area, not only bordering the seacoast itself but migrating substantial distances inland along embayments, estuaries, rivers, streams, and their adjacent areas of low topography. To the extent that it remains undisturbed, the flood plain can serve as one of the town's most important wildlife habitats, especially as wildlife retreat from the continued development of upland wooded properties.

Sea Level Rise

Areas 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. For thousands of years, relative sea level has been rising in Massachusetts, and it is still rising (Smith, Clayton, Mayo and Giese, 1978), resulting in gradual inundation of landward area. Historic sea level measurements indicate that relative sea level in Massachusetts is rising at approximately 1 foot per 100 years (Giese, et aI, 1978).

As sea level rises, the shoreline may retreat, and areas of the coastal floodplain will successively be 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. Maintaining these special transitional areas in their natural state is significant to the protection of the interests of other wetland resources.

(2) Definitions
(a) "Land Subject to Coastal Storm Flowage" shall mean that land subject to tidal water, flooding, or any inundation caused by coastal storms up to and including that caused by the 100year storm, the surge of record or the storm of record, whichever is greatest. Land Subject to Coastal Storm Flowage is delineated as the 100-year flood plain, zones, A, AO, AH, AE, AR, A99, V, and VE on the Flood Insurance Rate Maps, prepared by the National Flood Insurance Program for the Town of Chatham, effective date of July 16, 2014 or as most recently amended or as otherwise documented.