



MEMORANDUM

TO: Hillary Lemos
FROM: Jeff Davis
DATE: December 28, 2020
RE: Draft - Wellfleet Environmental Protection Regulations

The Horsley Witten Group (HW) is providing this memorandum as a companion to our first draft of the updated Environmental Protection Regulations for the Town of Wellfleet Conservation Commission (the Commission). This deliverable satisfies Task 1 – 4 of the Scope of Work and completes the first phase of the project. As the Scope of Work states, this deliverable is a draft, and HW looks forward to the opportunity to review this work with the Commission and revise as needed.

The goal of the project is to ensure that the Regulations will serve to implement the proposed updates to the Town’s Environmental Protection Bylaw, with a new emphasis on accounting for the impacts of climate change. HW recognizes that some of the changes proposed to the Regulations will likely require revisions to the Bylaw as a matter of housekeeping.

This memorandum serves as both an initial report on our research and a gap analysis of the items that need to be addressed or updated in the Regulations. It also lays out several policy-direction questions for the Town to consider at this juncture, and identifies which direction was included in the first draft of the Regulations. Note that the extensive literature review conducted by the Association to Preserve Cape Cod (APCC) for the Environmental Protection Bylaw update is equally relevant to the update of the Regulations.

A Reader’s Guide for the first draft of the Regulations is included as the final section of this memorandum.

Information for Predicting Future Impacts

One of the more challenging goals of this effort is to craft regulations that govern development activities in a manner that anticipates future conditions. Increased coastal erosion, more intense storms, and sea level rise will undoubtedly change the shape, extent, and location of resource areas protected under the Wetlands Protection Act. Coastal areas will erode, new lands will become permanently or periodically inundated, and marshes will migrate. To

anticipate these items in regulation, it is important to understand the quality of scientific information we have (or may soon have) on the location of these impacts. Examples for the Commission to consider include:

1. **CZM Shoreline Change** project (past shoreline change)

<https://www.mass.gov/service-details/massachusetts-shoreline-change-project>

This project illustrates how the shoreline of Massachusetts has shifted between the mid-1800s and 2009. Coastal shorelines change constantly in response to wind, waves, tides, sea level fluctuation, seasonal and climatic variation, human alteration, and other factors that influence the movement of sand and other material within a shoreline system. The loss (erosion) and gain (accretion) of coastal land is a visible result of the way shorelines are reshaped in the face of these dynamic conditions. The Shoreline Change Project presents both long-term (approximately 150-year) and short-term (approximately 30-year) shoreline change rates at 50-meter intervals along ocean-facing sections of the Massachusetts coast.

In a broad sense, this information provides useful insight into the historical migration of Massachusetts shorelines and erosional hot spots. However, CZM itself notes that care must be used when applying this information to a specific property or section of coastline. Due to the multitude of natural and human-induced factors that influence shoreline positions over time, CZM recommends consulting with a professional when applying the Shoreline Change Project data for land-use decisions and planning purposes. CZM suggests that in no case should the long-term shoreline change rate be used exclusively before the short-term rate, uncertainty associated with each shoreline position, patterns of erosion and accretion, and other contributing factors are understood and assessed. Additionally, the data is now about ten years old and does not specifically show hard structures along the shoreline and their impacts. This tool therefore has limited utility in regulating future conditions.

2. **Sea Levels Affecting Marsh Migration (SLAMM)** model output maps for Massachusetts, produced by CZM with contractor support. Available on the MA SLAMM Viewer here:

<https://mass-eoeea.maps.arcgis.com/apps/MapSeries/index.html?appid=be25f9b2019a4f9d86605f1b89e82c9e>

This viewer presents model results at various timesteps (2030, 2050, 2070 and 2100) for various SLR scenarios, and identifies the aerial extent of varying types of marsh ecosystems. By looking at modeled future marsh locations, the user can estimate where coastal marsh systems will likely transition and migrate onto adjacent upland areas as sea level rises. This information can be used to preserve those future marsh areas to allow marsh migration to occur. Developers note that, “SLAMM does not account for coastal landform response to storm surge and other episodic events.”

3. **Sea Lake and Overland Surges from Hurricanes (SLOSH) modeling**

The viewer is available here:

<http://noaa.maps.arcgis.com/apps/MapSeries/index.html?appid=d9ed7904dbec441a9c4dd7b277935fad&entry=1>

This mathematical model/viewer was developed by NOAA and presents the predicted extent and depth of storm surge under hurricanes of differing strengths (Categories 1 through 5). These maps make it clear that storm surge is not just a beachfront problem, with the risk of storm surge extending many miles inland from the immediate coastline in some areas. These maps are predictive, and even at a Category 1 storm level show significant areas of storm surge of greater than three feet in Wellfleet. Higher category storms do spread the geographic area impacted by inundation a bit, but by and large, higher category storms mean greater inundation depths in the same places. Consequently, the boundaries for Category 1 or Category 2 storms may be an appropriate basis for setting buffers.

4. **Cape Cod Commission Sea Level Rise Viewer**

The link to the viewer is here: <https://www.capecodcommission.org/our-work/sea-level-rise/>

This tool provides a way to view available data specific to Cape Cod. Specifically, this viewer presents potential Sea Level Rise increments, [Sea, Lake and Overland Surges from Hurricanes \(SLOSH\)](#) as well as the [Federal Emergency Management Agency \(FEMA\) Flood Insurance Rate Map \(FIRM\)](#). The viewer does not actually project the individual SLOSH data layer but instead presents the NOAA Coastal Flood Hazard Composite Data Layer. The **NOAA Coastal Flood Hazard Composite** datalayer shows the spatial extents of multiple flood hazard data sets combined. However, it is not clear to HW at this time how to appropriately apply the NOAA composite datalayer, as it appears the information provided on the website about this datalayer is incomplete. It has been HW's impression that this tool is largely based on a bathtub model – i.e. based on topography, a certain increase in water levels will “fill the tub” to certain depths. The addition of the NOAA composite datalayer appears to be an effort to account for storm surge as well as sea-level rise, but more research is needed to determine if this is an appropriate basis for setting buffers or areas of jurisdiction.

5. **Evaluating Sea-level Rise Impacts in the Northeastern U.S. (USGS)**

A description of this project is here:

<https://cascprojects.org/#/project/4f8c648de4b0546c0c397b43/5012eb2fe4b05140039e03e0>

Focusing on the coastal region from Virginia to Maine, researchers examined a range of different possible sea-level rise scenarios, combined with information on features of the coastal landscape (such as elevation and land cover type), to forecast which coastal

areas would likely flood, and which would likely change or move as a result of sea-level rise. Researchers found that 70 percent of the Northeast U.S. Atlantic Coast has the capacity to change over the next several decades in response to rising seas. By distinguishing the response of coastlines to different sea-level rise scenarios, the results of this project can inform coastal land management decision-making about how to best adapt human and natural communities to potential future changes to coastal areas at a regional level. Application on a site specific level appears to be limited.

6. **NOAA Office for Coastal Management – Sea Level Rise Viewer**

<https://coast.noaa.gov/digitalcoast/tools/slr.html>

This web mapping tool can be used to visualize community-level impacts from coastal flooding or sea level rise (up to 10 feet above average high tides). Photo simulations of how future flooding might impact local landmarks are also provided, as well as data related to water depth, connectivity, flood frequency, socio-economic vulnerability, wetland loss and migration, and mapping confidence. This tool can be used to show how different levels of sea level rise over time may impact the migration of several land types. Categories that are tracked include:

- Water
- Unconsolidated Shore
- Saltwater Marsh
- Brackish/Transitional Marsh
- Freshwater Emergent Wetland
- Freshwater Shrub Wetland
- Freshwater Forested Wetland
- Upland
- Developed Open Space
- Low Intensity Developed
- Medium Intensity Developed
- High Intensity Developed

7. **Boston Coastal Flood Resilience Design Guidelines**

<http://www.bostonplans.org/getattachment/d1114318-1b95-487c-bc36-682f8594e8b2>

The Coastal Flood Resilience Design Guidelines document is a resource to help Boston property owners and developers make informed, forward-looking decisions about flood protection for existing buildings and new construction. The resilience design guidelines can also serve as a useful reference for other coastal communities since this is one of the earliest (if not THE earliest) such guidance documents developed in MA.

8. **Massachusetts Coast Flood Risk Model (MC-FRM)**

<https://cmaa-ne.org/meetinginfo.php?id=221&ts=1566389549>

Boston Harbor Flood Risk Model (BH-FRM) is a flood risk model created as part of the Massachusetts Department of Transportation (MassDOT) and Federal Highway Administration (FHWA) Resilience Pilot Project. It was developed by UMass-Boston,

Woods Hole Group, Inc. and the University of New Hampshire. It uses climate projections to simulate flooding from extreme weather and sea level rise, in order to plan for future resilience. The model incorporates Sea Level Rise as well as projected storm surge based on a probabilistic model using a large data set of past storm events. These data are incorporated into the larger Massachusetts Coast Flood Risk Model. After the BH-FRM effort was completed in 2015, the MassDOT Highway Division began efforts to expand it to the entire Massachusetts coast and islands. This expanded model is called the Massachusetts Coast Flood Risk Model (MC-FRM).

After the Governor issued Executive Order 569 for statewide climate change coordination it was determined, in consultation with the Executive Office of Environmental Affairs and the Office of Coastal Zone Management, that the MC-FRM would become the state standard for assessing coastal assets. The MC-FRM produces storm surge flood/sea level rise information for present day, 2030, 2050, 2070/2100. These scenarios will be made available to all stakeholders including state agencies and coastal communities for individual and regional resiliency strategies. The advantage of using these maps is that they will be the new “standard” for many state agencies and will be easy and consistent for applicants to read and measure buffers from. A presentation describing the MC-FRM model can be found here:

<https://aapa.files.cms-plus.com/2020Seminars/AAPA%20Coastal%20Resilience%20Webinar.pdf>

9. **Implementation of the Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan (SHMCAP).** The Commonwealth is currently developing Design Standards for state agency projects involving assets, as part of the implementation of the SHMCAP. *This effort will rely on the MC-FRM model outputs for coastal inundation probabilities in 2030, 2050 and 2070.* It seems likely/reasonable that municipalities will find it helpful to use the same data references and some of the same standards, for consistency and for legal protection. The draft report is here:

<https://www.mass.gov/info-details/resilient-ma-action-team-rmat>.

The SHMCAP implementation effort also includes the development of defensible projections of standard percent increases that can be applied to NOAA Atlas 14 values for each given 24-hr Annual Exceedance Probability design storm depth for the set of future planning horizons. This will provide a simple adjustment to design storm depths to reflect future projected rainfall patterns. While it may not be perfect, it will be the first time a statewide approach is developed (Cambridge and Boston have developed projected design storms for their geography) and it likely will be referenced by the update (underway) to the MA Stormwater Handbook.

Specific Issues to Address or Update in the Regulations

Coastal Armoring

One of the issues identified by the Commission as a high priority is coastal armoring. While much of Wellfleet's developable coastline is already armored, there are remaining stretches of coastline in a natural or unarmored condition. Further, as time goes by, property owners may be looking to alter their existing armoring to account for sea level rise or general upgrades/repairs. In areas where the coastline is exposed, the Town generally does not consider beach nourishment to be a sufficient solution and in fact sees it as sometimes problematic.

The current regulations include armoring in the larger definition of Coastal Engineering Structures (CES). These are generally not allowed for properties where the buildings on a particular property were constructed after August 10, 1978. This is the date state regulations governing these activities went into effect (310 CMR 10.21 through 10.37). For structures built prior to this date, a series of performance standards govern the use of armoring.

HW suggests potential improvements on this issue can include:

1. Consider applying uniform standards to properties regardless of the date the of construction associated with the property. Another option is to maintain the date, keeping in line with the "spirit" of state regulations, but tighten/clarify performance standards for properties where the structure is constructed prior to August 10, 1978. The first draft is silent on the date but provides consideration for lots approved before these Regulations are adopted, as well as for CES already developed.
2. Provide language that is clearer about which CES practices are more acceptable than others. More "natural" approaches are preferred and HW has provided language to that effect. For example, the regulations can require that "softer" coastal armoring strategies, involving plants and other more organic materials and structures, be used unless an applicant can demonstrate that "hard" armoring will have a more beneficial impact on the site, on neighboring properties, and on future environmental conditions.

A very helpful tool for both the Town and applicants would be a detailed map of the Town's coastline, including a description of current conditions (e.g., sea walls and other hard coastal armoring, soft coastal armoring, beaches, marshes, tidal wetlands, etc.). Having this as a baseline will allow the Town to study maps of the coastline over time, noting how different armoring strategies have impacted neighboring shorelines over time, lead to harmful erosion, or halting or minimizing positive erosion that is needed to replenish other areas of the shore. Such mapping exists for many communities on the inner Cape but has not yet been completed for outer Cape communities like Wellfleet.

HW is aware that a new shoreline boundary is being developed in conjunction with the output of the MC-FRM inundation modeling being produced for MassDOT for use by all state agencies. This shoreline mapping is intended to be more accurate than existing statewide shoreline mapping, which is generally based on interpretation of orthophotography. However, it will not differentiate between shoreline conditions or identify shoreline structures. MA CZM also funded an effort between 2009-2015 to develop a database and inventory of coastal infrastructure, which resulted in a series of reports by region as well as GIS mapping. The mapping was developed through site visits, and is available on the MORIS viewer, which is not currently being maintained and updated by CZM. However, the GIS data could also be obtained by the town from CZM for reference. The associated reports are available here: <https://www.mass.gov/service-details/inventories-of-seawalls-and-other-coastal-structures>.

Buffer Zones

During numerous discussions prior to, and during HW's work with the Town, Commission members expressed that the current 100-foot buffer with 50-foot "no-disturb" zone is not adequate and needs to be increased in depth and/or become more restrictive. This is consistent with the goals of this project, which include developing regulations that will anticipate rising sea levels, changing shorelines and coastal areas, and the extent of coastal flood inundation. There are several specific options to consider and discuss with the Town. Several options for mapping that can be used to establish and justify increased buffers are discussed further below under Basis for Climate Change Considerations. In addition, we note that coastal NH region undertook an effort relatively recently to understand buffers and make recommendations on buffer widths and condition for different purposes. This effort is called Buffer Options for the Bay (www.bufferoptionsnh.org) and the 2017 literature review from this effort is available here (https://www.bufferoptionsnh.org/wp-content/uploads/2017/12/BOB-Coastal-buffer-literature-review_11.28.17-FINAL-3.pdf).

- The Town has considered setbacks based on rate of shoreline change or erosion-based setbacks (see Hawaii examples) that take into account future predicted change (or past change if no better information is yet available).
- The Town may consider increasing the extent of the "no-build" zone, and then base any buffer beyond that on one of the mapping options discussed below under Basis for Climate Change Considerations.
- It may be possible to justify greater no-touch buffers for certain sensitive areas: ACECs, rare species habitat, etc.
- Consider creating numeric criteria for slopes, etc. per 310 CMR 10.53(1)
- Consider creating a matrix of options depending on the type and location of activity. For example:
 - What is the activity? New construction, new impervious cover, site clearing, new septic system, replacement or upgrading of existing structure or septic system, etc.
 - What is the expected lifespan of the activity?
 - What would be the risk if it were damaged/lost?

- What is the location? Consider setting buffers property by property depending on their specific conditions.

Special Transitional Areas

Transitional Areas are established in the latest version of the WEP Bylaw in an attempt to provide a stronger platform for reviewing future impacts from inundation. The current version of the Regulations uses Land Subject to Coastal Storm Flowage (LSCSF) in conjunction with the Wellfleet Harbor ACEC to address this issue. A core element of this project is improving this approach using the best available information. HW believes the Massachusetts Coastal Flood Risk Model will provide the best information for this, however, the data are not publicly available outside of a few communities.

Other considerations would be to incorporate the protection of rare species habitat – projects there to have greater buffers or to be considered transitional. Wellfleet has 38 documented rare species in the Town (some are historic), the majority of which (>70%) are wetland or resource area dependent. There are also 12 historic records – 75% are wetland dependent – but these species have not been documented in town in more than 25 years. Increasing buffers to wetlands where rare species habitat is mapped could be an important way to protect the wetland-dependent habitat.

Rising Groundwater/Expansion of Freshwater Wetlands

HW will explore changes to wetland delineation and ways to tighten Board of Health regulations around ponds/wetlands. Currently, USGS has not mapped groundwater rise projections for the outer Cape, and HW has not been able to find other sources for such mapping. It is possible that HW can estimate how much groundwater will rise based on projected Sea Level Rise and/or any SLAMM mapping. This could identify new future wetlands in low lying areas, and could impact not only septic systems, but also stormwater facilities, cellar construction, utilities and other things. However, there would be some analysis/modeling needed to refine the areas of impact, and HW would like to discuss with the Town whether such an effort would be worthwhile. If successful, these estimates could be used, for example, to adjust the Board of Health regulations used to site septic systems. Currently, the base of a leaching field must be 4-5 feet above the high groundwater level, and the Town may want to increase that in certain areas. (This is probably a matter for Board of Health regulations, but references can perhaps be made in the Environmental Protection regulations to reinforce this.) This could also be used, as noted above, to set performance standards for stormwater facilities, cellar construction, utilities and other things beyond septic systems.

Other Questions/Considerations from the Conservation Commission

Scope of Review

The Town wants to ensure that an applicant must understand that development activity in one area of the property may affect resources in another area of the property. This can be a difficult issue to navigate as, it can be argued, the application is for a specific activity, a change in the

property. The permit is being provided to approve a certain change in the property. The regulations need to clearly make the connection between the proposed activity and potential impacts to resources that are seemingly not directly impacted, as well as impacts to resources in the future.

Cumulative change over time

The Town would like to address cumulative impacts to a resource over time. This is a difficult issue to address and the best solution will change depending on the issue. In some instances, conservative (restrictive) performance standards may be the clearest solution. In other instances, using predictive modeling to extend jurisdiction may be an important component.

Dealing with off-site impacts

This issue is challenging to address and, similar to cumulative change over time, conservative (restrictive) standards that require complete mitigation on-site for different activities, or assume off-site impacts as a matter of course will be appropriate.

Consider changes to the allowed amount of alteration

Response from HW: Yes, the Town can definitely do this. Many towns cut that 5,000 square feet in half with a mandate for “good reasons” and/or have a waiver requirement to allow any alteration at all.

Nutrient management

The Commission has expressed concern over the current lack of standards addressing nutrient producing activities. On-site septic systems, landscaping (fertilizer), outdoor showers, and impervious cover are the four elements addressed in the first draft of the regulations. HW’s approach in this draft is simple and straightforward. Additional, more complex requirements can be discussed.

Framework for Amending the Regulations

Below is a matrix HW and the Town can use as a tool as we continue to identify the types of activities to be regulated and how to address them. This will evolve as solutions are reviewed and discussed and as the draft regulations are refined.



GENERAL ACTIVITY	PERMIT ACTIVITY	CONCERNS	POTENTIAL STANDARDS	INFORMATION	HW NOTES
Post-Construction Development	<ul style="list-style-type: none"> Rebuilding a Damaged Structure Building a new primary structure (including expansion) Building a new accessory structure Site clearing New Impervious cover 	<ul style="list-style-type: none"> Flooding, water quality Future impacts Direct resource alteration Habitat loss 	<ul style="list-style-type: none"> Redefine the resource area (future) Revisit and refine setback. (e.g., no build, no touch) Buffer design requirements Stormwater management Add sensitive habitat jurisdiction 	<ul style="list-style-type: none"> MC-FRM Future Inundation Modeling (pending from SHMCAP/MassDOT) CCC SLR Viewer SLAMM Modeling SLOSH Modeling NOAA Atlas 14, plus CC projections (pending from SHMCAP) Other existing local regulations 	<ul style="list-style-type: none"> The Massachusetts Coastal Flood Risk Model appears to be the most promising resource here for extending jurisdiction.
Construction	Construction	<ul style="list-style-type: none"> Water Quality Sedimentation Erosion 	<ul style="list-style-type: none"> Erosion and Sediment Control 	<ul style="list-style-type: none"> Other existing local regulations 	<ul style="list-style-type: none"> Not yet addressed in the WEP Regulations.
Resource Alteration	<ul style="list-style-type: none"> Fortifying/restoring a shoreline Clearing (see above) Disturbing a resource or resource buffer 	<ul style="list-style-type: none"> Aesthetics Habitat impact Resource function Off-site impacts 	<ul style="list-style-type: none"> Living shoreline requirements Prohibitions on berms Buffer restoration 	<ul style="list-style-type: none"> Buffer protection/restoration best practices NOAA Living Shoreline Best Practices 	<ul style="list-style-type: none"> HW has maintained the 50 and 100-foot buffer distances, but strengthened the standards.
Nutrients	<ul style="list-style-type: none"> New septic installation Replacement, upgrade Outdoor showers Landscaping 	<ul style="list-style-type: none"> Rising groundwater, system failure Inundation Runoff Fertilizers 	<ul style="list-style-type: none"> Redefine the resource area (future) Distance to groundwater Acceptable systems 	<ul style="list-style-type: none"> SLAMM Modeling USGS studies done elsewhere 	<ul style="list-style-type: none"> Modest provisions for proper siting of septic systems. Distance to groundwater may be something the Health Regulations address with some assumption for rising levels. Additional requirements for landscaping and stormwater management are proposed.

Reader's Guide for First Draft of Regulations

General/Global

1. Considerable formatting was performed on the document in an effort to:
 - a. Make the document more readable.
 - b. Clarify where a particular subsection or standard should sit within the outline hierarchy.
 - c. Provide a more detailed Table of Contents

Section 1.01 Introduction and Purpose

1. Small change adding an environmental value for ecologically important plants and trees

Section 1.02 Statement of Jurisdiction

1. Establishes a uniform term of jurisdiction: Areas Subject to Protection (ASPs)
2. Consolidates the long list of wetland features into a single term: Wetland Resource Areas
3. Clarifies language for Areas and Activities subject to jurisdiction
4. Pulls the Request for a Determination of Applicability into its own subsection.

Section 1.03 General Provisions

1. Adds specific considerations for variance.

Section 1.04 Definitions

1. Adds a few new definitions.
2. Pulls in definitions from other sections of the Regulations.

Section 1.05 Procedures

1. Very minor revisions.

Section 2.01 Wetland Area Resource Buffer Zone

1. Changes the title of the section.
2. Combines Preamble with Presumption of Significance.
3. New names for the two buffer zones: "No Disturb Zone" (0-50 feet) and "Protection Zone" (50-100 feet).
4. Restructures the section to read more intuitively.
5. Clarifies standards for each buffer, particularly the Protection Zone.
6. Reduces the amount of Protection Zone that can be disturbed.
7. Provides simple requirements for septic systems.

Section 2.02 Nutrient Management

1. This is a new section.

2. Standards for plant selection related to landscaping.
3. Additional standards for on-site septic systems.
4. Standards for “outdoor rinsing stations.”

Section 2.03 Freshwater Wetlands

1. Combines Preamble with Presumption of Significance.

Section 2.04 Coastal Bank

1. Combines Preamble with Presumption of Significance.
2. Places definition in Definitions section.
3. Adds restrictions for activities that are not considered CES (e.g., small berms, etc.)
4. Changes the structure of CES regulations: Repair, Replacement, and New CES.
5. Adds language discouraging approaches that require lots of repeated beach nourishment.
6. Adds language setting a preference for living shorelines.

Section 2.05 Inundations Protection Zone

1. Establishes new IPZ, which includes LSCSF, the ACEC, and the M-CFR inundations zones.
2. Sets stricter standards for new structures within these areas.

Section 2.06 Small Vessel Identification and Permitting Program

1. Not reviewed.

Items not yet addressed, for discussion:

1. Erosion and Sediment Control provisions.
2. Any standards that rely on mapping of rare species habitat.
3. Expansion of the core buffer zones (i.e., 0-50 and 50-100 feet)